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Manual for Biologists Aboard Domestic Groundfish Vessels

1989

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PREFACE

This manual has been prepared to assist you in your duties as an observer aboard domestic groundfish vessels operating in the eastern Bering Sea and Northeast Pacific. This manual plus training sessions and your perusal of reports filed by previous observers should adequately prepare you for your observer experience. It must be borne in mind, however, that conditions can and do change and that no set of instructions covering as broad an area as we have attempted to cover here can ever be complete. It is therefore the responsibility of the observer to objectively evaluate each unfamiliar situation on the vessel before deciding on a course of action. Study the manual carefully, refer to it often and consider ways in which it may be improved as a guide for future observers.

ROLE OF THE OBSERVER IN THE DOMESTIC FISHERIES OBSERVER PROGRAM

As American harvest of groundfish resources replaced the foreign and joint venture fisheries, domestic observer programs were implemented to provide biological data to take the place of the data base formerly provided by the Foreign Fisheries Observer Program. The re-authorization of the Marine Mammal Protection Act of 1972 mandates observer coverage of 20 - 35% of groundfish trawlers to monitor incidental take of marine mammals but this coverage requirement will be superseded by a domestic observer program created by amendments to the Bering Sea and Gulf Of Alaska Groundfish Fishery Management Plans. Under the new program, there is a 100% observer coverage requirement on all vessels 125 feet or greater in length and 30% coverage on vessels from 50 - 125 feet, 100% of shoreside processing plants receiving more than 10,000 metric tons (mt) of groundfish annually and 30% coverage of plants receiving from 1,000 to 10,000 mt annually. Though the stocks of fish are now harvested by U.S. vessels, the need for observers to make independent observations of the fishing operations has not changed.

The primary objectives of the observers are to: record fishing effort and obtain daily catch rates; determine species composition; monitor for the incidental take of marine mammals; gather data on species, size, and age compositions; determine incidence of Pacific halibut, salmon, king crab and Tanner crab in the landings; and report on possible violations of U.S. fishing regulations. The estimates of catch rates by species obtained through the observers, matched with data on the number of vessel days on the ground and production log data, enables the National Marine Fisheries Service (NMFS) to estimate total daily landings of the various fisheries and pace the progress of the groundfish fisheries towards the quotas.

Data collected by observers aboard U.S. fishing vessels will be used in much the same way as data collected by observers in foreign and joint venture fishery operations. The data will be used in: helping to assess the status of the stocks; estimating the bycatch rates of non-target and prohibited species; investigating population interrelationships; assessing the impacts of proposed fishery management plan amendments; assessing the impacts on fisheries of proposed actions by other federal agencies (e.g. oil leasing); assisting fishery development activities; and analyzing fishery-marine mammal interactions.

Data obtained by the observers on catch size and species composition will give fishery biologists some idea of the catch per unit effort of each species in a fishery, an important factor in determining the status of the stocks. Length frequencies and age structure collections of the target species obtained from the commercial catch are also vital in determining the condition of a fishery resource, and hence, of determining how much is available to be caught without causing fishery deterioration. Mathematical models used to assess certain fish populations (such as Shelikof Strait pollock, Bering Sea pollock, yellowfin sole, Greenland turbot, and others) are dependent upon a measure of the current age composition of the commercial catch. Without these data and models, the ability of fishery scientists to determine the condition of commercially important stocks of fish would be diminished. Resulting decisions on allowable catches will be based on a higher degree of uncertainty and thus may be more conservative.

Another important use of observer data is to obtain estimates of the percentage of bycatch in each of the domestic fisheries. As one fisherman's discarded bycatch may be another fisherman's target species, the determination of bycatch rates is important in calculating the total removal of each species. This also applies to the determination of the incidence of salmon, halibut, and crab in the groundfish catches. These data, along with individual size, average weight, viability, and distribution data can help determine the impact the groundfish fisheries have on the shellfish, salmon, and halibut fisheries and provide information for studies in ways of reducing that impact. As a step in that direction, the prohibited species management proposals developed by the North Pacific Fishery Management Council's, (NPFMC's), Bycatch Committee require that each target fishery's bycatch requirements be estimated annually based upon the best estimates of bycatch rates from each target fishery. Without data provided by domestic observers, data from some other source such as joint venture catch rates would have to be used to determine domestic annual processing (DAP) bycatch needs and to set the bycatch caps by which those DAP fisheries will be managed. Bycatch data collected by observers will be beneficial to both the industry and fishery managers in determining realistic DAP bycatch needs.

Data obtained by domestic observers should be useful in studying particular fisheries questions, such as the stock relationships between pollock caught in the Shelikof Straits and those caught off East Kodiak. Another study in which observer information may play a part is analyzing the extent of interaction between killer whales and sablefish longline fishermen. Observer data will be used to estimate the frequency of the interactions and the economic impact to the fishermen of killer whale predation. In addition to planned uses, there are many other uses of data which come up as the need arises. Examples include the use of the data to help estimate the impact of impending oil lease sales on the commercial fisheries, or the location of marine cables or closed military activity areas. Our experience with the Foreign Fishery Observer Program has indicated that it is impossible to foresee all of the important questions that the observer data may help answer.

Because the management councils are dependent upon the data obtained by observers in order to assess the impact of fisheries upon the stocks, the necessity for accuracy in data collections, accurate determinations of species, and complete fulfillment of the sampling plan cannot be overstressed. Data forms must be carefully completed and <u>checked</u>. Sample forms in this manual serve as guidelines. (All observer data and reports are subject to certain restrictions of the Privacy Act and Trade Secrets Act, so any private use of them must be cleared by your contracting agency, who must receive permission from the National Marine Fisheries Service--please refer to "Observer Return and Completion of Duty".)

This manual, along with the training sessions, should adequately prepare you for an observer trip. Because of the variations in fish handling by different ships, observers may be confronted with sampling problems not fully covered in the training sessions. We ask that you adapt to whatever sampling procedure is necessary to insure unbiased samples and devise sampling methods that insure representative samples of the landings for your ship. If you devise your own sampling procedure, make sure that you are able to collect all of the necessary data we ask you to obtain.

OBSERVER DUTIES AND PRIORITIES

Primarily, the observer's duties and priorities consist of collecting catch information, determining catch weight estimates, sampling for species composition and the incidence of king crab, Tanner crab, halibut and salmon in the catch, collecting biological data on various species, and watching for incidental take of marine mammals. Priorities may change according to cruise, so observers will be notified of the specific duties and priorities. A list of the observers main duties is given below.

1. Record daily catch rates of the vessel and gather tow information. Special instructions will be issued describing methods of obtaining these estimates and how your estimates of catchshould be used.

2. Record species, numbers, and viability of incidentally-caught marine mammals and occurrence of marine mammals in the fishing areas.

3. Determine the species composition of the catch according to specified instructions.

4. Record the numbers, and weights, of certain "prohibited species" in the catch as per instructions. These species include, but may not be limited to: king crab, Tanner crab, halibut and salmon.

5. Send a summary of this information (items 1, 2, & 3) to Seattle weekly.

6. Obtain biological data and samples on target and other species as directed. This may include length frequencies, sexes, otoliths or scales for ageing, stomach content samples, or other information as requested.

7. Observe the compliance or lack of compliance to U.S. fishing regulations and document instances of violations when observed.

8. Obtain factory production information from the vessel when needed.

SPECIAL CAUTION ON DEPORTMENT

As a guest of the vessel:

1. Fisheries observers have traditionally been treated courteously, and in turn you should show the same respect to the vessel and everyone on board.

2. Observers should make a conscious effort to remain clean and neat, particularly at mealtimes, while aboard vessels.

3. Accommodations may be different from what you are used to. Women may find themselves sharing a cabin with male crewmen. Meals are generally good, but some vessels lack a cook and others have meals served when the cook feels like it rather than on a schedule. Adaptable observers with an easygoing attitude in these regards are apt to receive more consideration than those who criticize and make demands.

As a fisheries observer:

1. You must abide by the standards of conduct developed by your hiring contractor.

2. When conflicts or sampling problems occur which affect your attempts to get unbiased samples of the catch (presorting of fish for example), you can usually work it out by talking with the crewmen, factory forman or deck boss. If this doesn't help, you might talk to the captain and ask him to help you, don't demand. If talking fails, you might have to change your sampling system.

3. Do not offer, even if asked, any <u>authoritative</u> advice on what a vessel can and cannot do under terms of the permit under which they are operating. If you know the answer to a question about fishing regulations, answer the question with a qualifying statement such as, "I think...". If you are not sure, admit it and refer the captain to his Code of Federal Regulations, (CFR), book.

4. Maintain a friendly demeanor to vessel personnel. Your behavior should be governed by remembering that, politically, you are highly visible. Before acting in any given situation, be mindful of the diplomatic nature and sensitivity of your position. Tactful, mature handling of problems is expected. Remember, you are on the job 24 hours per day.

5. Consumption of alcoholic beverages by observers at sea is prohibited. Remember that your conduct must be above reproach at all times. While in port, drinking a glass of wine or beer with a meal or having one or two drinks while relaxing during off hours is permissible. When you are in port, your alcohol consumption should be kept at a very low level. Observers are not allowed to be intoxicated, much less drunk, while deployed. Anything that damages your character in the eyes of the people you are working with -- now or later -- is detrimental to your effectiveness on the job.

6. Observers should never accept gifts, (even of fish to take home), as this may appear to compromise your impartiality.

7. An obvious point (but one of extreme importance) is the prohibition of any sexual activity while deployed as an observer.

8. The use of illegal drugs such as marijuana and cocaine while employed as an observer, is strictly prohibited. Under the Zero Tolerance policy, discovery of **any** amount of illegal drugs on a U.S. vessel may lead to the seizure of the vessel and the arrest, where appropriate, of those in possession on board. (Vessels have been seized after finding only a few marijuana seeds!) The Coast Guard will strictly enforce the law during the normal course of its duties. It would be disasterous for a representative of this program to be the cause of such actions.

9. As an observer you will abide by all rules and regulations relating to the conduct of the host vessel. You shall not utilize, for any purpose other than obtaining required data, any species which the governing permit prohibits the vessel from fishing for or retaining, including especially salmon, halibut, crabs, and marine mammals. (This includes eating them in the ship's mess, if served.) "Prohibited species" is interpreted as including also shrimp, scallops, snails, corals, and other species which the vessel is not specifically permitted to retain. Do not accept or transport any item violating laws relating to endangered or protected species. (The permit in the appendix does allow you to bring back sea lion or seal canine teeth for age analysis by the National Marine Mammal Laboratory. However, no specimen materials may be taken from walrus.)

10. If your host vessel is boarded by the Coast Guard, do not attempt to interfere with their activities, or those of NMFS enforcement agents, in any way. You may let them know that you are aboard, then stand by.

11. Once you are aboard your sampling ship, avoid making visits to other vessels. Sometimes other ships, tenders, or catcher boats may tie up to our vessel. Consider going aboard in these circumstances only if your transfer there and back can be made under extremely safe conditions and if your work performance is not affected. Do not make social visits to other vessels if they are not tied up to your vessel. Do not stay away from your vessel overnight. This is necessary to insure that planned levels of observer coverage are met.

12. Consider safety first in everything you do.

PREPARATION AND DEPARTURE

COMMUNICATIONS

While deployed as an observer, it is not uncommon to feel as if you are "way out on a limb". Trying to communicate with your contractor and/or NMFS can be frustrating at times. Patience, perspective and maturity will be needed. Please remember that you are employed as a professional and all your communications should reflect this. Know that all voice radio communications at sea are **public**, not private. Transmitted messages are often passed through company offices as well as to your contractor and to NMFS so **no idle comments, offhand remarks, or unauthorized personal business please.** Make all messages complete, but concise and to the point. Remember that no one will be in the NMFS Seattle office on Saturdays, Sundays or federal holidays.

Observers will not receive mail through NMFS or their contractor while at sea. To receive mail while in training or after your cruise, you must make your own arrangements either through your contractor or the place where you're staying. Observers have had personal mail forwarded to and from the vessel through the fishing company, but keep in mind that this is done only as a favor to the observer and **no demands** can be made by an observer for this service. Any mail you wish to send out via the company must be stamped and ready for mailing. Do not send or expect to receive any personal messages while at sea except in the event of emergencies. Before you depart, provide the contractor with phone numbers and addresses of whom to contact in case of emergencies or drastic changes in your scheduled return. Any person listed should be notified to contact anyone else who should know of the change in plans or emergency. If a family emergency should arise at home, relatives should contact your hiring contractor.

The following list of phone numbers is supplied for your reference. These individuals should only be contacted if you are unable to contact your contractor.

Observer Program Staff in Seattle:

Russ Nelson (supervisor) (206) 526-4194
Janet Wall (supervisory assistant) or Bob Maier (program manager) (206) 526-4195
Angela Dougherty (logistics & catch messages) (206) 526-4191
Karen Teig (training) (206) 526-4191
Mike Brown (training) (206) 526-4192
Gear Office, Debriefing Room (206) 526-4192

THE TRAINING PERIOD

The observer who requires certification training will spend approximately two and one half weeks in Seattle for orientation and training. Training will consist mainly of learning how to identify common species of fish and crabs found in the Bering Sea and Northeast Pacific, explanations of the sampling procedures, and familiarization with groundfish fishing regulations. The following outline lists some of the activities covered during the training period. The outline is not necessarily complete and the items are not necessarily given in the order that they will be presented.

DOMESTIC OBSERVER TRAINING SYLLABUS

Day 1

Orientation Day: Administrative information, introductions all around.
Introductory video about the Observer Program
MFCMA and management of the EEZ, (brief overview lecture).
Slides and lecture on the history of N.E. Pacific groundfish fishing, commercially important fish, vessel types and their operations.
Observer sampling duties - emphasis on terminology, visual orientation and safety on board.
Seasickness, medical advice, living accommodations, clothing and other items to bring.
Communications - with home, NMFS.

Day 2

Slide show on Alaskan ports, safety in boarding and disembarking vessels, life at sea, hazards, and observer work.
Hardships, deportment, and conduct lecture.
Statistical areas and vessel check-in reports.
Duties: objectives and priorities, workload.
Guest Lecture: Dr. Aron, Director of Alaska Fisheries Science Center.

Day 3

Species Identification: a general review of identification terminology and slides of various representatives of N.E. Pacific fish families: presented by a U.W. ichthyologist.
General instructions on data forms, use of GMT and the metric system.
Obtaining haul information: data forms 1 and 2US.
Estimation of catch size - by the observer.
Classroom practice of haul weight estimation.
Overnight homework assignment.

Day 4

Estimation of catch size - by the ship.
Correction of homework and quiz over haul data form.
Video on navigation and classroom practice on use of a navigational chart.
Identification of Sebastes and Sebastolobus (rockfish) and other species: lecture, slides and laboratory session presented by U.W. ichthyologist.

Day 5

Definitions of species report groups and prohibited species.
Catch Composition Sampling: determining a sample weight.
Methods for random, representative and unbiased sampling.
Slide presentation on sampling.
Data entry on species composition form 3US.
Classroom practice of sampling methods and data entry.

Homework practice assignment.

Day 6

Correction of homework.

Collecting biological information from Tanner crab, king crab, halibut and salmon in samples: weights and lengths, viability, sex, and salmon scale sampling.

Molting crab study.

Collecting data on tagged fish and crab.

Computations for weekly radio messages, (forms RM, RM-1, & RM-3) (lecture, classroom exercise and homework).

Day 7

Formatting weekly and daily radio messages for transmission.

Length frequency sampling, (form 7US).

Otolith and scale sampling, (form 9US).

Fish dissection and otolith removal: slides and lab practice.

Species identification of crab: slides and classroom practice.

Day 8

Vessel reporting requirements, production logbooks, ADF&G Fish Tickets.

Practice addressing the crew; interactions with vessel personnel.

Considerations and requirements for sampling shoreside delivery vessels.

Longline vessels: Gear and fishing methods, sampling longline catches.

Assignment of 2nd data exercise.

Day 9

Identification of flatfish and salmon species: lecture, slides and laboratory session presented by U.W. ichthyologist.

Background study: Review of previous cruise reports and reading files.

Receive special project instruction.

Day 10

Safety videos and discussion on hypothermia, medical emergencies at sea, fire control and sea and shore survival.

Medivacs, radiotelephone procedures and preparation of a medical diagnostic chart.

Checkout of survival suits.

Survival suit and life-raft water practice.

Day 11

Correction of homework

Observer's logbook entries, methods of documentation.

Obtaining vessel production information and product recovery sampling.

Guest Lecture: Scientist from the National Marine Mammal Laboratory showing slides on identification of marine mammals at sea.

Recording information on marine mammals: as incidental take, (form 10); sightings, (form 11).

Day 12
Species identification exam.
Gear issue: familiarization and care of equipment, gear check-out and calibration of scales.

Day 13
Final Exam.
Problem solving using small discussion groups and in-class presentations.
Guest speaker: Debriefing supervisor discusses data review process and final reports.
Preparation for first day aboard.
Travel rules and parting information from contractors.

If a complete grasp of the duties is not demonstrated, the observer will not be certified. An observer will be de-certified or dismissed by their contractor if they violate rules of conduct, rules of data confidentiality, or lack the appropriate human relation skills necessary for the job.

Vessel and observer schedule arrangements are a difficult task. Though you may express a preference for a vessel type, an observer must be willing and able to accept any assignment. The observer-in-training should be prepared for changes in ship assignments and Seattle departure times. Some observers stay in Seattle longer than was originally planned, so be prepared for this eventuality, and be patient. Similarly, dates of return may also be affected by vessel schedules, so notify your contractor, before leaving, if you have any pressing dates soon after your expected return (such as the beginning of a school quarter).

After completing their trip at sea, the observers return to Seattle and are required to work with their contracting agency until their data forms have been properly completed and their cruise reports have been accepted by NMFS. Observers are normally paid for five full working days after their return to Seattle.

OBSERVER CLOTHING AND EQUIPMENT

NMFS will provide the scientific observers with adequate rainproof clothing and boots. All equipment necessary for the collection of biological data will be similarly provided. The observer is responsible for the transport and return of the sampling gear issued. If the observer goes out on a number of short cruises during the same trip, it may be possible to arrange for the replacement of torn raingear or lost equipment between cruises.

Observers will provide their own personal clothing, warm work clothes for wearing under raingear, toilet articles including a towel, and other items of a personal nature. Unless otherwise informed, the vessel upon which the observer is to be stationed will be expected to provide adequate quarters and meals. It is expected that the vessel captain will allow the observer an adequate and safe space in which to carry out the sampling duties.

The following pages are lists covering the clothing and equipment necessary to perform 60 days sampling aboard a U.S. vessel.

Personal Items Supplied by Observer

The following is a recommended list of personal clothing. The amount and type of heavy clothing is dependent on personal preference, fishing area, and time of year.

Work clothes--minimum number and type

Shirts, wool - 2 (1 light, 1 heavy)
Shirts, cotton - 2
Shirts, cotton sweat - 1
T-shirts - 3
Trousers, wool work - 1
Trousers, cotton - 2
Wool knit cap
Slippers or sandals
Handkerchiefs, large - 3
Underwear, long-thermal - 2 pairs
Underwear - 5 pairs
Socks, wool work - 2 pairs
Socks, cotton - 5 pairs
Jacket, medium wool or synthetic - 1

Other items or articles

Towel, medium cotton - 2
Pillowcase - 1
Toilet articles
Duffel bag - sturdy, medium size, old or inexpensive - 1
Traveler's checks purchased with the cash advanced

Optional/Recommended Items

Felt/wool boot insoles (not liners)
Needle and thread, safety pins, and duct tape for repairs
Extra eyeglasses/contacts
Camera and film
Watch and travel alarm
Medication for seasickness
Vitamins
Hand cream
Paperback books
Small cassette player and tapes
Water bottle (1 qt.) - to keep drinking water in your cabin

Sampling Gear Provided by NMFS

To be packed loose in baskets:

Baskets (2 to 6) with at least one wooden lid
Set of castors or wheels for one or two baskets
Rope (one length, approximately 15 - 20 feet)
Clipboards (2)
Log book (1)
Scouring powder (1 can)
Lubrication oil (16 oz. bottle with applicator cap)
50 kg scale (1) - (observer should check accuracy with standard weights on all scales before leaving)
5 kg scale (1)
2 kg scale (1)
Sponges (2)
Scale envelopes (50-200)
Plastic bags for salmon snouts (5)
Plastic bags (15)
Glove liners (3 pair)
Hardhat and chin-strap (1)
First aid kit (1) - (check contents for completeness)
Plastic measuring strips (3)
Plastic sheets:
- Basket sample form (2)
- Prohibited species form (2)
- Otolith form (2)

To be packed in cardboard box in basket:

Pencils #2 (6)
Pencils #3B (2) - (soft lead - for use on plastic forms)
Pens (4)
Pencil erasers (2)
Plastic ruler (1)
Looseleaf rings for extra forms (3)
Scotch tape (1 roll)
Thumbtacks (1 container; about 25 tacks)
Forceps (2)
Rubber bands (1 container; about 40 rubber bands)
Scalpel handles (2)
Hooked scalpel blades (10)
Tape measure (1 small, steel, 2 meter)
Tape measure (1 large, reel-type, 15 meter)
Thumb counters (1) - (mothership observers take 2; longline observers take 3)
Twine (1)

Knife (1)
Whet stone (1)
Flashlight and 2 size "N" batteries

<u>The following items will be checked out either before or during gear issue:</u>

Sleeping bag (1)
Survival suit (with strobe-check expiration date on battery, whistle and wax)
Life vest (with whistle)
Rain pants and jacket (1 set)
Boots (1 pair)
Rubber gloves (3 pair)
Manila folder containing:
  Carbon paper (10 sheets)
  Graph paper (5 sheets)
  Shipping Label for basket (1)
Data forms (important!-check for completeness!)
Calipers (1) - for those who are to measure crab
Otolith vials (200-600) - for those who are to collect age structures
Vial block (1) (if collecting otoliths or cod scales)
Liter bottle of alcohol (1) (if collecting otoliths or cod scales)
Squirt bottle for alcohol (1) (if collecting otoliths or cod scales)
Stopwatch (an optional item for motherships and large trawlers)
Safety goggles (for observers on longliners, optional item for others)
Earplugs (2 pair) (optional by request)

<u>The following gear will be handed out during training class:</u>

Observer Sampling Manual (1)
Mechanical Pencil (1) with extra lead
Calculator (1)
Extra calculator batteries (2)
Book - Hart (1)
Book - Hitz (1)
Book - Eschmeyer (1)
Laminated photo guide (for new observers only, unless requested)
Species identification manual (check for completeness)
Marine mammal guide

<u>Number of Data Forms to Take:</u>	2 months	3 months
Form 1US	28	40
Form 2MUS	10	10
Form 2US	28	40
Form 3US (for trawlers)	200	300
Form 3US (for longliners)	200	300

Form 7US	40	60
Form 8	6	8
Form 9US	30	45
Radio rpt. worksheets RM	25	40
Radio rpt. worksheets RM-1	20	30
Radio rpt. worksheets RM-3	20	30
Cruise report	6	8

Preparation and Care of Sampling Equipment

The sampling gear provided for you may not be new, but should be in good working order. Most gear is expected to be used for several observer cruises, therefore we depend on you to give proper care and maintenance to the equipment. All gear given to you will be examined upon return, to see that it is in good condition before it is checked in. There are facilities for cleaning gear at NWAFC if this could not be done aboard ship. All returned gear must be clean and free of scales. All metal parts must be clean, free of rust, and oiled. Here are a few tips for shipboard maintenance that should make your job easier:

1. Keep all paper products and small, loose equipment (pencils, pens, thumb tacks, scissors, counters, etc.) in plastic bags throughout your trip.

2. Try to keep as dry as possible: calculator, stopwatch, thumb counters, and tape measure.

3. Books should be protected from water and slime at all times.

4. Most important: Every day after use, the 2 kg, 5 kg, and 50 kg scales must be cleaned and oiled. They have steel springs inside which will rust - oil must be squirted up inside the scales.

5. Tape measures, calipers, and thumb counters must also be cleaned (and oiled if necessary) each day when used. (Be careful to keep oil away from plastic forms, since pencil marks tend to wipe off a slick surface). (Do not oil thumb counters.)

6. It is recommended that your knife be kept clean and sharpened.

7. Keep your otolith alcohol in your room. Sometimes crew members consume alcohol which has been left at the work station.

Remember--others must use this gear after you, and proper care of equipment will help make all our work easier.

Do not give away any gear or books. You will have to replace any government equipment that you give away. Replacement calculators cost about $30.00 and must be of the type specified. The laminated photo guide cannot be replaced; they originally cost over $50 each in materials alone.

Calibrate your scales during gear check-out. Then prepare a known weight by selecting items which may be easily assembled later. (i.e. a basket, the laminated photo guide, etc.) List the items weighed and their total weight. This known weight may then be used later to check your scale adjustment or to check the accuracy of shipboard scales.

Just prior to the start of basket sampling, prepare the weighing scale to read zero when the basket is attached. Do this by adjusting the set screw at the top of the scale. With the scale adjusted, all measurements will then reflect the weight of the basket contents only.

Accurate weights are sometimes hard to obtain when the ship is rolling. When possible, secure the top of the scale directly to a fixed structure, such as a ceiling brace. If the top of the scale has to be attached to the ceiling by a length of rope, use three ropes attached to widely separated points on the ceiling to minimize the swing of the scale. Shortening the length of the ropes to the basket also helps. Scales located close to the center of the ship tend to swing less. If a flatbed scale belonging to the ship is available for your use, by all means use it, but check it for accuracy first.

All sampling gear and forms will be packed in sampling baskets for transport to and from the vessel. The baskets may be exposed to salt spray, therefore sensitive items should be packed in plastic bags. Pack the life vest so that it will be accessible prior to ship boarding. Remove the casters from the basket to avoid their loss before checking in your baggage at the airport.

TRAVEL TO THE SHIP

Vessel assignments are arranged by your contractor with the vessel owner. Logistic arrangements are also made by your contractor. Observers must be aware that fishing schedules are often changed by weather, mishap, or fishing success and are often the cause for changes in observer schedules. If you find out that the ship you are on is planning to leave the fishing area unexpectedly, transmit a message explaining the matter. Do not make changes in your schedule yourself. Observer coverage of vessels is a large logistical "net". Movement in one part affects the whole and your contractor has logistical perspective that you cannot see.

Shipment of Gear

The observer carries the sampling baskets with him to the various ports whether traveling via auto, bus, train, or airplane. If traveling by plane, the baskets are normally transported as part of your personal luggage. Excess baggage costs may be avoided by careful planning and keeping the number of personal and equipment items at a minimum. Your personal baggage should not weigh more than about seventy pounds. Distribute baggage weight between your pieces of luggage so that no piece exceeds the weight limit of the airline you are flying with. The usual procedure is to pay cash for the amount of excess baggage at the time of check-in, so it is very important to limit the amount of personal items and to allocate enough cash to pay for the excess baggage upon your return. (Excess baggage charges will typically run $200-250 from Dutch Harbor to Seattle.) Do not ship your baggage unaccompanied. You cannot do your job without your gear. If you get separated from your luggage, initiate a luggage search from your end immediately. **Do not board a vessel without your luggage even if you are told it can be brought out to you later.**

On the flight to the embarkation port, carry the observer training manual in your carry-on luggage. (Some extra sampling supplies are kept at Dutch Harbor in the event that the airline loses your baggage; manuals are not kept at Dutch Harbor, however, because it is too difficult to keep up with changes.) On the return journey from the ship, carry the completed data forms with you. If these forms are lost, your whole trip is essentially wasted. Some observers have had their otolith alcohol confiscated by the airlines because we do not have a blanket permit for the transport of alcohol. If the airline personnel do not permit you to take the alcohol, do not argue--dump the alcohol, rinse the container if necessary, and when you get to your destination, purchase rubbing alcohol to replace the ethyl alcohol that was dumped. Inform the debriefing staff upon your return and note on the top of the Form 9's that rubbing alcohol was used as the preservative.

Expenses Incurred While Traveling

The contracting agency should inform the observer before departure, on the procedure for accounting for money spent while traveling from Seattle to the vessel and back again. While in some cases it may not be necessary, it is a good idea to save all receipts for transportation, hotels, meals, and other legitimate expenses. Be cautious in spending your travel advance. Costs are high in Alaska and observers are frequently delayed in both getting on their ships and in port between assignments. Some hotels and restaurants in Dutch Harbor, Ak. do not accept credit cards but you may be able to use them as identification for a personal check. If you have to pay cash for any excess baggage charges on your return flights, don't forget to allow enough money (and get a receipt). Remember, excess baggage charges from Dutch Harbor to Seattle can typically run from $200-250. Retain any unused airline tickets and turn them in to your contractor upon your return.

Transport to the Ship

Normally, airplane flights are arranged so that an observer arrives at the embarkation port at least one day in advance. This is often necessary since the weather is notoriously bad in certain parts of Alaska, and flights are often postponed. Delays caused by weather may be unavoidable, but it is important that the observer not be the cause of delays by missing the flights, or having his equipment miss the plane. If you miss your flight, notify your contractor immediately, and make new arrangements, on another airline if necessary. Notify your contact person if your arrival date is affected. If you are going to miss your pick-up time at port, notify your contracting agency as soon as possible.

Upon arrival at the embarkation port, follow your contractor's logistics instructions and stay in contact. Let your contractor or agent know of your whereabouts so that they can contact you if there is a last-minute change of plans. Since Dutch Harbor and Kodiak are so heavily used by observers, there may be an NMFS employee to aid you and/or your contractor may have a permanent contact in port to help with logistics.

Embarking/Disembarking Through Dutch Harbor

Observers flying into the airport who have Carolyn Griffin as their Dutch Harbor contact person will be met by her or her assistant. Otherwise, ask your contractor about transportation in Dutch. Room reservations are usually made in advance, often at the Unisea Inn or Royal Dutch Inn. You will need to keep yourself informed of changes in vessel schedules, so make sure that you periodically check the hotel desk for messages and keep in touch with your contact person, especially on your day of embarkation. When returning to Dutch Harbor, call your contractor or contact person as soon as you can.

Useful Phone Numbers for Dutch Harbor:

Carolyn Griffin
P.O. Box 308
Dutch Harbor, Ak. 99692
(907) 581-1529 (home phone)
(907) 581-1239 (Ken Griffin)

Marianna Langley
P.O. Box 322
Dutch Harbor, Ak. 99692
(907) 581-1453 (home phone)

Unisea Inn: (907) 581-1325
Royal Dutch Inn: (907) 581-1636

ARRIVAL ABOARD THE SHIP

Living Conditions Aboard Vessels

Conditions vary widely depending on the ship type and size, company and skipper's policies, and the fishing success. Women observers may need to be quartered with men for lack of alternatives. Quarters are apt to be cramped. Sleeping bags will be provided by the observer program. Catcher/processor vessels will have cooks and routine meals available. Shoreside delivery vessels may have a designated "cook" and a meal may be prepared on the way to the fishing grounds, but once fishing has begun, the galley will probably just be open for "help yourself" food. If the fishing pace is hectic, an observer may find themself caught up in a no-sleep and "survive on coffee, candy and pop" routine until the return trip to port. Similarly, showers and laundry facilities (or laundry service by a steward) will be available on larger vessels. Smaller vessels may or may not have showers and laundry is done by hand or waits until port.

On catcher/processors there will be someone designated as medic who will treat minor illnesses and injuries connected with life at sea. On shoreside delivery vessels there will probably be a first aid or EMT's (Emergency Medical Technician's) kit aboard and the most able person to deal with an emergency will surface or, by default, the skipper must take responsibility. When serious injuries or illnesses occur, it is up to the captain to decide when (or if) to return to port. Interim treatment and the decision to interrupt fishing can be aided by calling the Coast Guard and relaying symptoms to a medic or doctor.

Seasickness sometimes hampers an observer at the beginning of a cruise, but give it time - most seasick victims recover after a few days; in any case, it may take five days or more to arrange for the vessel to drop the observer off at the nearest port, and this is done only for extreme cases.

In the event of a real emergency, such as an injury or illness requiring hospitalization, contact the Coast Guard via voice radio and they will attempt a rescue and/or advise you on how to proceed. The Coast Guard will also notify the Observer Program office and keep them advised.

SAFETY ABOARD VESSELS

Fishing vessels have many potentially dangerous areas. Extreme care should be taken to avoid injury. In addition to the personal suffering that would result, the observer program could be drastically hampered. The following points must be adhered to while on the vessel:

(1) The first day aboard, note where the lifeboats, life preservers, and other safety devices are kept. Memorize the exit route from your cabin, the factory, the galley, and other locations where you spend a fair amount of time. Keep your survival suit where you can get at it in a hurry.

(2) During your first talk with the captain, ask him to explain to you what to do in the event of a major emergency such as a fire aboard the ship, a serious collision with another vessel, or other conditions which might require abandoning the ship.

(3) Observers are required to wear a hard hat, life vest or other flotation and steel-toed rubber boots when on the trawl deck for any reason. (If life vests are worn under your rain jacket, they will stay cleaner.)

(4) The observer should be cautious whenever wading through fish since fish spines (especially rockfish) can penetrate rubber boots and cause painful wounds to the feet.

(5) Apparel with loose strings or tabs should be avoided, as they might become caught in the equipment or belts.

(6) Observers should not run aboard the vessels. Slipping, tripping, and falling are the most common sources of observer injury. These accidents often happen when an observer is in a hurry. Specifically, the observer should watch out for slick spots where the deck is wet or frozen, the half-foot combing rising from the bottom of metal latch doors and passageways, and the low overheads in vessel stairwells and watertight doors.

(7) The observer should not stay outside on the aft deck during rough seas. An observer has been swept forward over the winches by waves sweeping up the stern ramp. When the observer is outside, he/she should remain in full view of a second party at all times.

(8) Cables that break under strain frequently kill sailors. Whenever a cable is subjected to tension, stand in a place where a backlash will not hit you. If your sampling station is on deck, do not work while a trawl is being set or retrieved, interrupt your work to go to a safe place during the process. When nets are being hoisted off the deck, stand well clear. Heavy nets have fallen near observers when the suspending cables parted.

(9) When working near the exit chutes in the factory floor, where bycatch and factory offal wash out, the observer should be extremely cautious not to slip and fall in the wash of bilge water.

(10) Observers are cautioned not to pry loose any fish caught in the chinks of slat or rubber conveyors, since this may result in getting a finger or hand mangled in the machinery.

(11) Factory processing areas are crowded with machinery, electrical lines, and conveyor belts. It is often difficult to get to the area where an observer needs to sample because of the maze of equipment. Climbing over, under and around heading, filleting, and skinning machines on oily and wet floors especially at sea in rough weather is extremly hazardous. Observers must watch carefully where they step and where they grab for handholds.

(12) The observer should notify or have the skipper notify the U.S. Coast Guard should an injury or illness occur to him/her which requires immediate hospitalization.

(13) Treat all minor cuts, especially those on hands, with antiseptic to avoid infection from fish slime. Poisoning from fish slime is called cellulitus and is a form of staph infection. Should a staph infection be left untreated and allowed to develop, your lymphatic system becomes involved and the threat to your health becomes much more far-reaching than simply a pair of inoperative hands. Wash hands thoroughly after sampling in a solution of very hot water and an antiseptic such as betadine or providone iodine (1-2 oz.per qt. of water). Disinfectants such as Clorox, Lysol or Purex tend to sap your skin's natural chemicals and prolonged use may make you even more vulnerable to fish poisoning.

(14) Take extra precautions against infection, such as new gloves, when collecting specimens from marine mammals. As these animals have similar biological systems to our own, organisms which infect them can infect us. "Seal finger" is a fungal infection of the hands which can easily be contracted.

(15) Ask ship personnel which water sources are safe to drink. Some ships have lines containing water for washing and not drinking.

Safety in At-Sea Transfers

Observers will normally board and disembark their vessel at dock, but a transfer at sea may be necessary in certain circumstances. Transfers between vessels are potentially hazardous, especially in rough weather. The observer must assume responsibility for deciding whether or not transfer based upon their own evaluation of the transfer conditions.

There are no hard and fast rules for allowable safety limits during transfers. Conditions such as vessel size, swells versus waves, current and impending weather, good lighting, and mode of transfer affect the decision as to whether or not to transfer. Observers must use their best judgement. Be cautious--not foolhardy. Do not be forced into transferring against your better judgement by an anxious or impatient captain. Whenever possible be preceded or accompanied by a crewman. Always go with an experienced crewman if you are transferring in a small boat or raft. If boarding a small skiff or inflatable boat, see that the engine has been started and warmed up, and that there are oars stowed as a backup. As general guidelines, do not transfer at dusk, in darkness, or in any other low visibility conditions. Transfers involving a small boat or raft should never be carried out at night. Observers should not transfer when the sea state is two meters or more.
Other points to remember when transferring:

1. Observers will wear life jackets at all times on skiffs or other small-sized vessels and while transferring.

2. Observers will not encumber themselves with baggage when transferring vessels; balance is important. Both hands must be free during transfers.

3. All baggage will be secured with lines and transferred via rope lines or cargo nets. Observer baskets have been lost overboard because they were thrown between ships without lines attached.

4. Given a choice between using a Jacob's rope ladder or a gangway (accommodation walkway), to board a ship, in most cases use the Jacob's ladder since the use of a rigid gangway in rough seas can be extremely hazardous to the observer and to the transfer boat.

5. If a cargo net, transfer basket, or cage is used to transfer observer or baggage, make sure that a line is attached to the conveyance from both vessels for greater control and to reduce swaying. The observer should maintain a crouched (knees bent) position as opposed to sitting or standing with straightened legs, to avoid back injury. Be sure to wear your hardhat in addition to your lifevest when using this mode of transfer. Keep your arms, particularly elbows and fingers, inside the conveyance when transferring

FIRST DAYS ON BOARD

As quickly as possible, the observer should adapt to the new surroundings, meet people, and make preparations for work. Soon after boarding you should have a meeting with the captain. Cooperation from the captain, mates and crew is essential in many instances in order to obtain the unbiased samples the observer needs for his work. It is important at this meeting to set the tone for a friendly but business-like working relationship. Give the captain a copy of your letter of introduction and use it to briefly explain what you'll be doing and your needs. Observers on vessels making short trips should try to take care of the introductory details before leaving dock or on the way to the fishing grounds. If the captain is receptive, take this opportunity to mention the following points:

1. Tell the captain that you want to routinely see the ship's fishing logs.

2. Inquire as to how to send the weekly catch messages.

3. Ask to be informed, in advance, of changes in the fishing schedule so that you may adjust your schedule accordingly.

4. Ask to be notified if any marine mammals are found in the catches. If possible, sightings of marine mammals would also warrant notifying the observer.

5. Again, depending upon the captain's receptiveness and available time, you may opt to give him any forms that will need to be filled out such as the "Agreement to Share Data

with ADF&G".

6. Ask the captain any questions you may have about emergency procedures after having done your own survey of equipment and instructions.

During the first few days aboard the vessel you will want to familiarize yourself with the activities of the ship and continue your orientation by noting the following:

1. Watch the retrieval and dumping, sorting, and processing operations and decide what would be the best location for your sampling station.

2. Watch how the codends are opened and how thick and fast the fish are dumped; if crab, halibut, salmon, or other species are presorted on deck; and whether different hauls are mixed in the tanks.

3. Notice where the catch is sorted by species and size and generally how the fish are handled, including the system of conveyor belts, tables and chutes being used.

4. Consider the location of your sampling station. Remember, it is determined by sampling requirements, considerations of personal safety, convenience (avoid having to haul baskets of fish long distances and up or down stairs) and minimum interference in fish processing. Basically, you need a place where you can gather your samples, have a few baskets of fish around you and a place to hang or put your scale. Adequate lighting will be necessary and you'll need to locate the nearest hose for cleaning yourself and your area.

5. When fish are available, familiarize yourself with the species being caught, start writing species descriptions and practice using the keys. Practice sexing the target species and/or other species that will have to be sexed in your work.

6. Work out routines for sorting, weighing, and counting fish.

7. Get started with the most obvious method for making estimations of catch and sample weight. Then after your work is underway, consider variations or other methods which may improve upon your initial efforts or be contingency plans.

OBSERVER OBJECTIVES

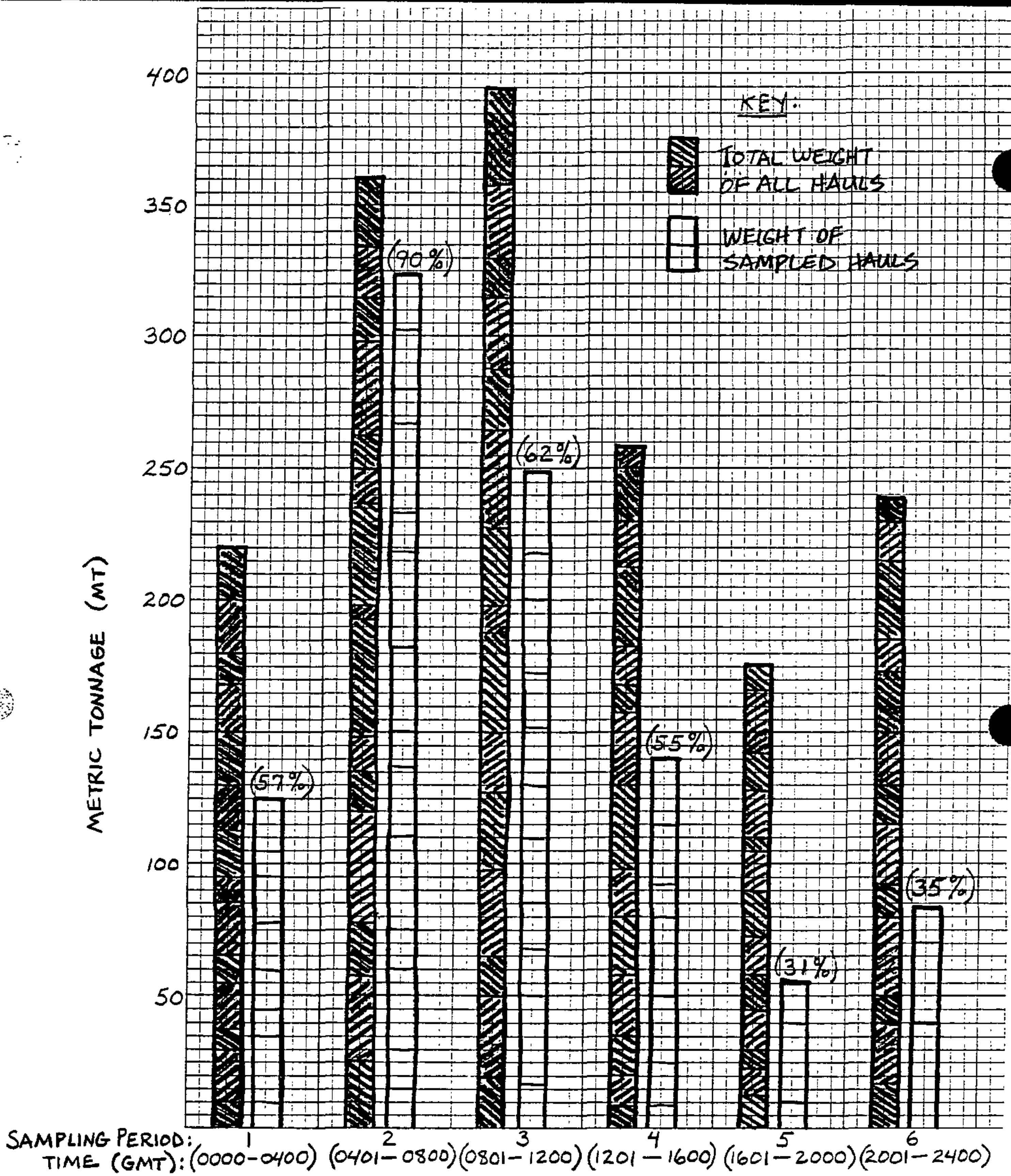
The main work objectives of observers are to record any incidental take of marine mammals, make independent estimates of catch size, determine the catch composition, figure out the incidence of specified prohibited species in the catch, collect biological data on the prohibited, target and other species and monitor for compliance to fishery regulations. Secondary objectives include marine mammal observations, gathering factory production information, recording gear design and vessel layout, etc.

Since ship design and procedures vary from ship to ship, it is the responsibility of the observer to devise sampling techniques which will obtain the needed data. In the following sections, several basic methods of sampling will be outlined. In most cases the observer will be able to use one of those methods or an adaptation of one or more of them.

When conducting biological sampling, the two most important things to remember are to take representative, unbiased samples, and to do so with a maximum amount of accuracy. We stress the taking of representative samples of all data collections. Accuracy is important in all aspects of the work, including: the physical sampling, recording the data on plastic sheets, transposing the data on the plastic sheets to the final paper copy, and correctly calculating totals and extrapolations for the weekly catch reports. The need for representative, unbiased sampling and accuracy cannot be over stressed.

OBSERVER WORK SCHEDULE AND WORKLOAD

Not only must an observer strive to obtain representative samples of a certain haul or during a given sampling period, but the observer should also select sampling periods so that the catch sampled is representative of the daily and weekly catch. Fish will usually lie or school close to the bottom during daylight hours. Consequently, during the day they are more easily located with sonar and catches will be greater than at night when the fish rise up in the water column and scatter to feed. Since many vessels will fish and process catch around the clock, the observer should rotate his/her schedule to allow for sampling at different times of the day within each week aboard. Changes in gear, fishing methods, depths and areas of fishing can result in very different catches. Therefore, care should be exercised so that all or most of the observation and sampling is not done during the same time period. The majority of an observer's efforts should correlate with the time periods or tows that land the majority of catch. For example, if 20% of the daily catch is brought aboard from 8 a.m. to 12 noon, 20% of the total sampling should be done during this period. Similarly, if only a small tonnage is brought aboard between 1 a.m. and 5 a.m., the observer may decide to sample that time period only once every two to three days. Many observers sample enough (greater than 60% of the tonnage landed), that these concerns are met as a matter of course. Those that are sampling 50% or less of the tonnage landed will have to monitor their work more closely.



GRAPH USED TO INSURE THAT HAULS FROM VARIOUS TIME PERIODS WERE SAMPLED PROPORTIONALLY ACCORDING TO TONNAGE CAUGHT.

The bar graph is offered as a suggested way of keeping track that the tonnage you sample by time period is proportional to the total tonnage that is brought aboard during those time periods. This is a cumulative graph showing tonnage landed on a large vessel over a two week period. The day has been divided into six equal periods of four hours each, and the haul tonnage has been assigned according to the time the haul was retrieved. The shaded bars indicate the tonnage landed during that period and the open bars stand for the tonnage of the sampled hauls (not the tonnage sampled). The percentage of the sampled hauls (by weight), for each time period is given in the parentheses at the top of the bars. The graph can be updated periodically by adding to the bars and recalculating the percentages. In this example, the observer needs to adjust the sampling pattern so that more hauls are sampled from periods 5 and 6 and somewhat less from period 2. The graph is only a suggestion--you may find a running tally for each time period more convenient.

Once a given tow has been selected for sampling, the appearance of the catch should not be a factor in deciding whether or not to sample it. For example, the observer may decide to sample the next haul--he should not change his mind after it comes on board. This way the observer will not intentionally select for small hauls or large hauls, hauls with large numbers of rockfish, or with many salmon, crab, or halibut, etc.

The frequency of sampling will vary according to the type of vessel, the number of hauls per day, catch size and composition. The following workloads are meant to be guidelines for minimum sampling. On some days however, an observer may sample only one haul because the ship moved to another area and did not fish any more that day or because the observer was ill or it was their first sampling day and they were still orienting themselves to their job. Specific directions on taking different kinds of samples are given in the appropriate section.

SAMPLING DUTIES FOR DOMESTIC FISHERIES OBSERVERS

Every Haul, Delivery, or Set:

Obtain haul, delivery or set data (Form 1US, 2US, or 2MUS)

Sampled Hauls, Deliveries or Sets: (numbered items presented in order of priority

1. Record any incidental take of marine mammals (form 10US).

2. Sample for species composition of catch (Form 3US), 2-3 times daily if the ship is making 4 to 6 hauls per day; if the ship averages more hauls per day, sample more hauls; if the ship averages fewer hauls per day, you may sample fewer hauls but increase your sampling weight if possible. In your sampling, do not leave out any species or species group, such as sampling only for prohibited species. Try to sample the whole catch for king crab, Tanner crab, halibut and salmon if possible. You may have different sample weights for different species, therefore you may also sample the whole haul for obvious species like shark and large skate or species of interest like sablefish.

3. Estimate haul weight (Form 1US, 2US and 2MUS) from as many hauls as possible, but aim for at least 3 per day--estimates should be made of some hauls that were not sampled as well as of sampled hauls. If you use your catch estimate as the "Official

Total Catch," you will have to estimate every haul.

Biological data from prohibited species:

4. Sex and identify to species, all the salmon, king and Tanner crab in your sample if possible, or take a random subsample for sexing (form 3US).

5. Take length measurements of all halibut, salmon, king and Tanner crab in your sample (form 7US). Subsample, if necessary, when incidence rates are high. A subsample should be of at least 20 fish or crab.

6. Determine the viability of all halibut, king and Tanner crab in your sample if possible; or take a random subsample; or sample specifically for viability at another time (form 3US). (The choices for viability sampling are presented in order of preference.)

7. Collect scales from salmon in your samples for species confirmation and aging (form 9US).

8. Check salmon for missing adipose fins, and other fish and crab for tags. If you collect a tag be sure to record all pertinent data as requested in the "Tagged Fish and Crab" section of this manual.

Every Day:

9. Take length measurements of 150 randomly selected fish per day (form 7US). Lengths should be taken of the target species unless you are also collecting otoliths of a sampling species other than the target species. Remember that the otolith collection must be a subset of the length frequency collection. If it is not possible to measure 150 fish per day, try to do at least 70 per day. You may have to forego sexing the fish.

10. Otolith/scale collection - If given this assignment, choose a sampling species according to the directions given later in this manual (form 9US).

    Other special projects - if assigned any other special project, such as stomach sampling, conduct work according to directions given.

Per Cruise: (not in order of priority)

Evaluate the accuracy of the vessel's catch weight estimations and report on their method of estimating.
Describe the fish processing products. Record the product recovery rates they use.
List what species are discarded.
Make pertinant diagrams: fishing gear, factory, or weather deck.
Detail incidences of net discarding.
Calculate catch report messages and either phone them in at end of trip (short trips), or transmit them weekly via telex, rapidfax, or phone (trips over one week in length).
Complete report including itinerary sheet, diagram(s), and map of areas fished. Give complete answers to information asked for in report questions, plus anything else you feel would be helpful to staff members or future observers.

GENERAL INSTRUCTIONS FOR DATA FORMS

In gathering the necessary data, observers occasionally have to be inventive to overcome sampling problems, but once the data are ready to be transferred from the plastic on-deck sampling forms to the paper keypunch forms, all creativity must cease. Data from hundreds of cruises a year have to be processed, analyzed, and summarized, and there is no way to footnote the data from a particular cruise after they are fed into the computer. Thus, certain data columns always have to be filled in and they have to be filled in a certain way, with leading zeros in some places but not others, zeros filled in behind printed decimal points, and decimal points added by observers in other cases. Refer to the specific directions and examples for each form. If you do need to make a note to alert us to make a decision on some of the data, place the comment on a portion of the form which is not keypunched.

The forms should be neat - all the numbers should be precisely printed in conventional arabic numbers so that they are readily legible. Sloppy forms multiply the number of keypunch mistakes and sometimes require guesswork to interpret. Use a sharpened pencil, not a pen, to fill out all forms so that erasures can be neat if changes have to be made. Brackets and arrows (refer to example forms) can be used to indicate that the numbers in a column are to be repeated. Ditto marks should not be used to repeat a number.

Much of forms 1US, 2US and 2MUS should be filled out from the ship's fishing logs. Observers should take care to record the correct information and avoid making copying errors. All sampling data require the vessel position data on these forms, so if these are missing, other data cannot be used.

A captain may request copies of your catch composition or length frequency forms. Carbon paper is provided so that the forms can be made out in duplicate. Copies are to be made at the observer's convenience, but before leaving the ship. Vessel captains have no right to demand that any form be completed at a given time. However, if the captain is waiting for your species composition data, so that he can fill in a calculated estimate of the weight of discards or bycatch, then it may be to your advantage to provide the captain with copies of your form 3's so that you can get a final ship's estimate of catch size and complete your species composition extrapolations. (Note: It is permissible for the captain to use your sampling data to help him fill out the ships' fishing logs.)

CRUISE NUMBERS AND VESSEL CODES

The cruise number and vessel code help to identify each set of data from a particular sampling period on a particular vessel. The cruise number is assigned according to the day each observer begins sampling. Your cruise number will change:

1. If you transfer to another ship, on which you sample, you begin a new cruise, and will hence have a different cruise number.

2. If you should happen to be aboard a vessel from December to January of a new year, treat the data beginning on January 1 as a separate cruise, because you will be given a

new cruise number even if you did not transfer vessels at that time.

Cruise numbers will be assigned during your trip, and you will find out what they are upon your return. In the meantime, keep separate sets of data for each cruise and mark your name and the ship's name on the first page of each set of forms.

There is a unique vessel code for each ship. The first letter indicates the nationality, and the last three characters designate the particular ship. You will be given the vessel codes of your ships upon your return.

PAGE NUMBERING

On the top of each sheet of each form is a phrase "page ___ of ___." This helps to keep the forms in order and alerts us to a missing sheet. Each set of forms, for each cruise, should have pages numbered separately and consecutively. Enter the first number as you do the daily forms and fill in the second number after the cruise is complete. For example, if you used 58 Form 3's on a cruise, then the first sheet will be page 1 of 58 and the last sheet will be page 58 of 58. Form 9's are further subdivided by species so that you may have a page 1 of 10 for king salmon scales, a page 1 of 3 for coho salmon scales and a page 1 of 32 for pollock otoliths.

CALCULATION GUIDELINES: THE ROUNDING RULE

<u>For in-class work only</u>:

The calculated result should be carried out to one more decimal place than your least accurate measurement; and, round as you go.

Example: 380.6 x 1.22 = 464.33 and 464.33 x 0.16 = 74.293

(In the first equation, 380.6 is the least accurate figure. It is recorded to the tenth's or one place to the right of the decimal. Therefore the product or 464.33 is recorded to "one more place than the least accurate measurement", or to the hundredth's--two places to the right of the decimal. In the second step, the answer from the first part of the problem is used in a subsequent equation, and the rounding rule applies again, except in this case both numbers in the equation are recorded to the hundredth's, so the answer is carried out to the thousandth's or three places to the right of the decimal.)

<u>In all your data</u>:

≥ 5 is rounded up, < 5 is rounded down.

Example: rounded to two decimal places: .52499 = .52

(When rounding, look <u>only</u> at the first digit to the right of the place you are rounding off at. In the example above, since we are rounding off at the hundredth's, we would only look at the

"4" and thus leave the "2" as it is. We would not look at the "9" and change the "4" to a "5" *and continue to round the "2" to a "3" thus getting an answer of ".53".)*

CONFIDENTIALITY OF OBSERVER DATA

The fishermen may be concerned that the information you are collecting can be obtained by anyone who may be interested in finding out where a particular boat caught fish. If this is the case, reassure them that the information you are collecting is handled under strict rules of confidentiality and that you (the observer) are bound by the confidentiality rules as well. If you are asked by vessel personnel about another vessel you were on, explain that just as you can't talk about this vessel after you get off it, so you can't tell them about a previously observed vessel.

Observers must know that all data collected are the property of the U.S. government. No observer can retain or copy any data or reports following their return unless granted express permission of the National Marine Fisheries Service. This includes information used as part of a school project, thesis paper, articles for publication, or interview with news media. The main reason for this restriction is due to the Privacy Act, which protects the privacy rights of the vessel owners. NMFS also reserves the right to review for accuracy the draft for any article or publication concerning your observer experiences. Any questions concerning this or requests for permission should be directed to Russell Nelson.

FICTITIOUS DATA

FORM 2US–HAUL FORM FOR U.S. TRAWLER

1. Leading zeros in columns 12, 14, 34–41 on.
2. Skip line after each day.
3. On days with no hauls, enter date, noon position in 25–33 and haul no. = 0. Note reason.
4. Trailing zeros are required in columns 56–72.

Depth (columns 50 and 55)
M = meters
F = fathoms

Cruise no. (1–4)	Vessel code (5–9)	Year (10–11)
114	A121	87

Hauls sampled	Date Mo. (12–13)	Date Day (14–15)	Haul no. (16–18)	Merge (19)	Gear type (20–21)	Gear performance (22)	Processing mode (23)	Location code (24)	Location (N) latitude (25–28)	E/W (29)	Location (I) longitude (30–33)	Fishing time (GMT) Nets on bottom (34–37)	Fishing time (GMT) Nets off bottom (38–41)	Fishing duration (min) (42–45)	Avg. fishing depth (46–49)	M/F (50)	Avg. bottom depth (51–54)	M/F (55)	Avg. speed (knot) (56–57)	Retained catch (round wt.) (mt.) (58–62)	Official total catch (mt.) (63–67)	Observers total catch (mt.) (68–72)	ADF+G stat. area (73–78)
✓	09	10	101		1	1	1	R	5838	W	7624	2345	0525		130	F	130	F	3.5	15.80	16.00	18.50	765830
	↓	↓	102		↓	1	↓	↓	5837	↓	7630	0610	0920		135	↓	135	↓	3.5	7.94	8.25		↓
✓			103			2			5837		7607	1015	1435		140		150		3.2	19.90	20.00	18.00	
✓			104			1			5838		7647	1530	1850		140		145		3.2	10.50	12.00	13.50	
		10	105			1		R	5838		7654	1935	2330		138	F	138	F	3.5	17.92	18.62		765830
		11	0					N	5832		7620	No Fishing – Rough Seas											765830
✓		12	106			1		R	5826		7553	2000	0000		240	F	260	F	3.4	8.50	11.75	11.00	755800
		↓	107			1			5824		7525	0145	0745		240	↓	260	↓	3.6	5.62	7.28		↓
✓			108			1			5826		7511	0830	1100		235		250		3.6	6.30	8.22	8.50	
			109			2			5826		7546	1200	1300		220		245		3.0	10.20	13.21	15.00	755800
✓		12	110			4			5814		7710	1800	2350		250		265		3.2	5.34	6.12	7.00	775800
✓		13	111			1			5812		7706			180	240		240		3.6	15.08	17.35	18.00	775800
✓		↓	112			1			5812		7709			120	210		210		3.5	16.00	19.20	19.00	↓
✓			113			1			5810		7704	1215	1340		216		250		3.5	5.25	7.80	6.00	775800
		13	114			2			5735		7550	1730	2240		205		265		3.5	4.62	5.64		755730
✓		14	115			1			5732		7548	0055	0855		180		190		3.4	8.50	11.20	15.00	755730
		↓	116			1			5731		7547	0735	1442		185		195		3.5	6.90	7.86	8.00	↓
✓	↓		117		↓	1	↓	↓	5731	↓	7542	1735	1930		162	↓	172	↓	3.2	20.13	22.16	20.00	755730
✓	09	14	118		1	1	1	R	5728	W	7546	2105	2355		168	F	178	F	3.2	16.72	18.30	20.00	755700

Alaska time — Local

should be filled in every time!

Must have these 2 buggers for every haul

FORM 2US--HAUL FORM FOR U.S. TRAWLER

This form summarizes stern trawler fishing effort and total catch by haul. If you are working aboard a mothership or a catcher/processor which takes deliveries of codends from other catchers as well, fill out the form 2MUS-Haul Form for U.S. Mothership instead of the form 2US (instructions follow those for 2US). Obtain the data for these forms from the ship's logs (if logbook data is recorded according to instructions below), from vessel personnel, and from direct observation. Check carefully to see that no errors are made in copying the data to the forms and that the data are reasonable. Points to note:

1. Collect Form 2US data for the entire period you are aboard. Make certain that you have all of the hauls recorded for the days you begin and end sampling. (Port Moller cod fishery observers--if possible, collect these data for the entire period, but if this is not possible, make sure that you have the data for all hauls taken in area 512, or for any other period that you are able to sample.)

2. The identifying cruise number and vessel code will be assigned after you return and will be different for each vessel you are on. Keep the data for each cruise separate.

3. Place a check mark in the far left column to indicate which hauls you sampled.

4. A given haul number should be used only once - no duplicates. The haul numbers must be in numerical sequence. Make sure that the haul numbers do not exceed 3 digits. (If the haul number recorded in the fishing log is 1657, for instance, then drop the first digit and call the haul 657. This will enable you to more easily compare your data with the ship's.) All hauls must be recorded unless there was a gear malfunction resulting in a zero catch. A haul number must be assigned to every haul. If you reach number 999, the next haul should be "1", not "0." Haul number "0" means a nonfishing day.

5. Leave the "merge" column blank (col. 19).

6. Enter the gear type:

   1 - bottom trawl -Common otter trawl corresponding closely to the bottom trawl diagram provided to you. This type of net is designed to drag on or close to the bottom, and may be equipped with chafing gear, rollers, or bobbins.)

   2 - pelagic trawl - (Trawl designed to fish off-bottom. Wings may be of very large mesh or composed of lines. The net seldom has chafing gear, rollers, or bobbins, and is designed to minimize drag.)

   Leave this column blank temporarily if the gear doesn't fit either category.

7. Enter the gear performance code:

   1 - no problem
   2 - problem--crab pot was in the haul
   3 - problem--net hung up on some bottom obstacle (vessel had to back down)
   4 - problem--net ripped
   5 - problem--other problem, put a note of explanation on a non-keypunched part of the form 2US

8. Enter the processing mode: (Indicates where the utilized fish from that haul are processed)

   1 - Most of the processing is done on board the catcher vessel (a catcher/processor). The products are placed in a freezer hold and the trip usually lasts more than a few days.

   2 - The catch is delivered to a mothership at sea for processing.

   3 - Utilized catch is delivered to a shorebased processing plant. The trip usually lasts no more than 3 to 4 days and in the meantime the catch is kept on ice.

9. For the location code, enter R if the location in columns 25-33 is a retrieval position, D-~~if it is the position of the delivery to a mothership,~~ and N if it is a noon position on a nonfishing day.

10. If there were no hauls on a given day (due to bad weather, mechanical breakdowns, traveling etc.) enter the Alaska Local Time (ALT) noon position in columns 25-33 and enter 0 in the haul number column. In columns 34-72, comment on the reason there was no fishing. Enter the ADF&G statistical area corresponding to the noon position in columns 73 - 78. All days at sea must be accounted for in this manner.

11. The location entered should be the <u>haul retrieval position</u> - the location of the ship when a particular haul is begun to be retrieved, i.e. when the winches begin bringing in the cable. (For a mothership the location entered is a delivery postion, on form 2MUS.) Check the latitude and longitude for all trawl retrieval positions and noon positions to make sure that they are reasonable - i.e., 58•63' does not exist; double check positions that indicate large movements if you have not been aware of any. The first digit of longitude (1) is understood, so record only the following digits. Each haul must have a position. On nonfishing days, record ALT noon position in these columns.

12. The time system used (on this and all other forms) should be Alaska Local Time and dates. From the last Sunday in April through the summer to the last Sunday in October, entries should be made according to daylight savings time. Time recorded should be in the 24-hour system.

13. A haul is assigned to a day according to the time the net is begun to be retrieved from the fishing level (nets off bottom time), which is not necessarily the same day the net

was set or the day that you sample. Thus, hauls retrieved before 0000 hours are attributed to the previous day, and hauls retrieved on or after 0000 hours are assigned to the next day.

14. When net retrieval is begun, the time is recorded under "nets off bottom". ("Bottom" may refer to the fishing level rather than the actual ocean floor.) "Nets on bottom" refers to the time that the net first reaches the fishing level and the winches stop paying out cable.

15. All 2400-hour notations should be changed to 0000 hours. If this occurs in the "nets off bottom" time, the date should be changed accordingly.

16. Double check haul times to see if they are reasonable times for your vessel. An overlap in haul times for two hauls is an obvious error.

17. Record both the "nets on/off bottom" times (cols. 34-41) and the fishing duration in minutes (cols. 42-45). You will use the sum of the duration entries to report fishing effort in your weekly catch messages. On/off bottom times provide us with more detailed information however, so when the form 2US data is compiled on the database the duration will be calculated from the difference in the on/off bottom times. [Note: If the **actual** fishing duration is substantially different than what would be obtained by calculation from the on/off bottom times, record only the duration and off bottom time. This may occur if the net is raised and lowered several times during the haul. If this is the case, minutes duration would be more accurate than on/off bottom times. Note the reason for the unusual entry at the top of the form.]

18. The average fishing depth (cols 46-49) and average bottom depth (cols 51-54) can be recorded in either fathoms (more likely) or meters, depending on the depth recording instruments that the vessel has. Try to obtain both fishing and bottom depths as that will indicate whether the net was fishing on or off the bottom. Make sure you indicate the units (fathoms or meters) for every depth that you record (cols 50 + 55).

19. Record the average trawl speed in columns 56-57.

20. Retained catch: this is the amount of catch (in metric tons, not pounds or short tons--see Table of Equivalents) that is retained aboard the ship. This figure should always be filled in for unsampled as well as sampled hauls, and must be recorded to two decimal places.On catcher processors, generally the retained catch is just the round weight of the fish that are actually utilized for products. The retained catch may thus be the ship's estimates of the products (converted to round weight using product recovery figures, and converted from pounds to metric tons). Daily production totals may have to be divided based on deck estimate proportions or observer extrapolations from sample data could be used if production figures are not available. Use your judgement as to how to obtain the most accurate data. Give a complete description in your report of how these figures were obtained.

    On vessels that deliver catch to shoreside processing plants, there may be some discard of prohibited species, small fish, and nonutilized species at sea, but the main discard of fish may occur at the processing plant. Your job will be to estimate the amount that is actually discarded by the catcher boat and hence, by subtraction, the amount that is delivered to the processing plant, not what is eventually retained by the processing plant. If discard is occurring at sea, the best way to determine how much, may be to estimate the amount of utilizable species in the haul using the observer sampling data for the haul or the day, and a rough estimate of amount of the undersized target species that were discarded.

21. Official total catch: this will be the official catch weight for the haul, and should be used in all calculations involving haul weight on Forms 3US and radio message worksheets. This should be the best estimate of total catch (all species included), and in most cases it should be based on the ship's estimate of retained catch (round weight), adjusted for the nonutilized species (using the observer's sample data). Instructions for adjusting for non-utilized species are in the following section.

22. Observer's estimate: record your estimate of the hauls that you observe. This will usually be a codend or bin-depth estimate (instructions and information on making estimates of catch weight follow). Record the weight estimate to two decimal places.

23. Enter the 6-digit ADF&G statistical area that the haul retrieval position places each haul in. Refer to the special supplement on the ADF&G statistical areas for your determination of the correct area.

24. Leading zeros should be in the dates (cols 12 & 14) and the times (cols 34-41) only, as needed.

25. Skip a line after each day.

26. Any notes, or comments (other than notes for nonfishing days) should be placed in a part of the form that is not keypunched.

FORM 2MUS--HAUL FORM FOR U.S. MOTHERSHIP

Form 2MUS is used by observers on processing-only vessels and catcher/processors which take "outside" tows. If you are working aboard a catcher/processor and have started filling out 2US forms when your ship takes a catcher boat delivery, leave your 2US forms as they are and simply switch to the 2MUS forms **from that point on**. Do not fill out both forms alternately. The remainder of your haul forms should be the form 2MUS. Note especially item 5 below. This form is essentially the same as the 2US with the addition of columns for the name of the catcher boat making each delivery. Only the differences from form 2US are described here.

1. The location code in column 24 should be either "D", indicating a delivery position, "R" for a retrieval position if a catcher/processor is fishing for itself (in addition to taking outside tows), or "N" for noon position on a day when there is no fishing and/or no deliveries.

2. The location entered should correspond to the location code type. For example, at the time of delivery, i.e. when the codend being transferred is landed on the processor vessel, the position of the processor is recorded and coded with a "D". The ADF&G statistical area should also correspond with the latitude and longitude entered in the location columns.

3. Information on fishing times and/or fishing duration, fishing and bottom depth, average towing speed, and gear type and performance has to be obtained from the catcher boat skipper. This may be accomplished by talking to the skipper on the VHF radio after the delivery is complete, that is, when they are no longer busy coordinating the delivery maneuvers. If the skipper is not cooperative in providing the above information, try at least to get his estimate of fishing duration.

4. The catcher boat name will have to be abbreviated if the name exceeds 15 characters. There is or will be a specific abbreviation for each boat name. Request the correct abbreviation information at the end of a catch report if you need it. If the name is less than 15 characters, simply enter the full name.

5. If a catcher/processor also fishes for itself, enter the word "self" in columns 73 - 93 for those hauls.

Cruise no.					Vessel code				Year	
1	2	3	4	5	6	7	8	9	10	11

FORM 2MUS-HAUL FORM FOR U.S. MOTHERSHIP

1. Leading zeros in columns 12, 14, 34-41 only.
2. Skip line after each day.
3. On days with no hauls, enter date, noon position in 25-33 *and haul no. = 0. Note reason.*
4. Trailing zeros are required in columns 56-72.

Page______ of______

Depth (columns 50 and 55)
M = meters
F = fathoms

List of catcher boats

full catcher boat name	abbreviated name

Hauls sampled	Date Mo.	Date Day	Haul no.	Gear type	Gear performance	Processing mode	Location code	Location (N) latitude	Location E/W	Location (1) longitude	Fishing time (GMT) Nets on bottom	Fishing time (GMT) Nets off bottom	Fishing duration (min)	Avg. fishing depth	M/F	Avg. bottom depth	M/F	Avg. speed (knot)	Retained catch (round wt.) (mt.)	Official total catch (mt.)	Observers total catch (mt.)	ADF&G stat. area	Abbreviated catcher boat name
	12 13	14 15	16 17 18	20 21	22	23	24	25 26 27 28	29	30 31 32 33	34 35 36 37	38 39 40 41	42-45	46-49	50	51-54	55	56 57	58 59 60 61 62	63 64 65 66 67	68 69 70 71 72	73-78	79 - 93

CATCH RATES

FISHING LOGS AND ESTIMATION OF CATCH RATES

A skipper will keep several types of records or logs. A skipper may keep a fishing log for himself or his company and there are logs required by NMFS and ADF&G for fishery management. Your normal procedure is to obtain information on the fishing effort from these ship's logs, from vessel personnel, and by direct observation and accurately record it on your Haul Form 2US. All of the tows made while you are aboard must be recorded on your haul form whether you sampled them or not.

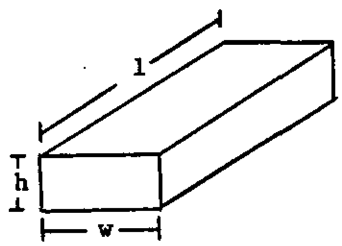
The observer must cross-check all data for accuracy. The correct haul/date correlation, retrieval position, duration, and total catch weight are especially important items--without this information the observer's sampling data cannot be used. After a week's worth of data, or for each page, check the "Nets off bottom" time of the last tow of each day. The tow cannot span midnight and be the last tow. Check any change in <u>degrees</u> of latitude and longitude. Unless the minutes indicate the position is close to the next degree, changes of degree would mean long distances traveled or a recording error. Use the ADF&G statistical area numbering system to check the ADF&G area number against the latitude and longitude. Look at each whole page of form 2US for "holes" where data may be missing.

The skipper will make a deck or "hail weight" estimate of each catch by direct observation of the volume of fish in the net or in the fish bins. This is entered in the far right column of their Daily Cumulative Production Logbook for NMFS and may be utilized by an observer for "Official Total Catch" on form 2US **only if** it is the **best** estimate of catch weight. As an observer, you will also make deck estimates using similar methods. Some ships may maintain accurate records of production information by haul which can be used for the "Retained Catch" figure and combined with information on discarded fish for "Official Total Catch". The observer must evaluate these sources of information and choose or derive the **best** estimates of catch weight to enter on form 2US as "Official Total Catch." Remember, total catch on Form 2US should be the weight of everything that is caught--whether it is utilized or not.

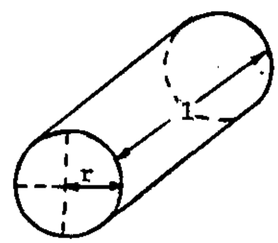
<u>Skipper's Deck Estimates</u>: The skipper or mate on watch will make a deck estimate by looking at the codend and count the number of bands full of fish. The codend of the net has reinforcing and hauling bands around it at regular intervals. The amount of fish between each band can be added as a consistent unit of weight. The person making an eyeball estimate will take into account the number of full bands plus the adjustments for the last band which often contains a bit more fish and the first band(s) which is deflated as the fish are not compressed and slide forward. Also, like any mesh bag, when the net is very full the mesh will expand and bulge and there will be more tonnage per band. The appearance of the net coupled with the net maker's specifications and past experience with delivery weights or the number of cases put up per haul can make "estimates by eye" very accurate. On the other hand, skipper's deck estimates can be wildly optimistic and/or pessimistic if he is casual about it.

Observer estimation of the total catch is important, so you should do your best to get good data. When observer estimates are made, record them in columns 68 - 72 on form 2US even if this estimate is also utilized as the "Official Total Catch". Observers should estimate the weight of several hauls per day, those that are sampled and some that are not sampled. If the observer's catch estimates are being used as the official total catch because they are the most accurate, the observer should try to estimate all of the catches brought in while the observer is aboard. Some techniques for estimating haul weights are as follows.

Observer Estimates of Codends: As scientists, observers must have data to verify their estimations. Codend measurements are taken to determine volume (m^3) and volume is multiplied by weight per volume t/m^3 (density) to derive an estimate of the catch weight. The first step in the estimation of the volume of fish in the codend is to decide which geometric shape a particular codend most closely resembles: a rectangular solid, a cylinder, an ellipsoidal solid, a semi-ellipsoidal solid, or perhaps a combination of two of these shapes. Determine the needed dimensions for volume calculation of the chosen solid. Then measure the codend of fish or use known dimensions to gauge the net size using, for instance, pre-measured deck lengths; height to your shoulder, nose or whatever; or other standards of reference. When a net of fish has more of a long cone shape, it will be necessary to measure the volume of fish in several banded sections and add them together instead of treating the whole codend as a single unit. Calculate the volume in cubic meters using the appropriate formula, then multiply the volume times the density, obtained as explained below, to obtain the metric tonnage of the catches.

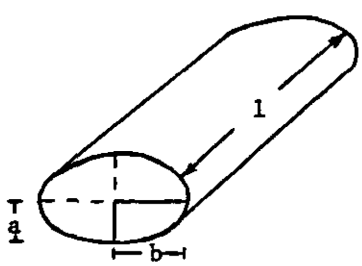


Rectangular solid
Volume = height x width x length
V = hwl

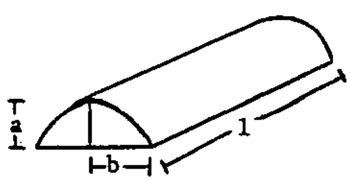


Cylinder
Volume = π x radius^2 x length
V = $\pi r^2 l$

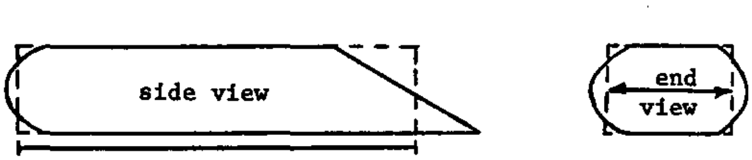
(π = 3.1415)



Ellipsoidal solid
Volume = π x short radius x long radius x length
V = π abl



Semi-ellipsoidal solid
Volume = $\frac{1}{2}\pi$ abl
V = $\frac{1}{2}\pi$ abl



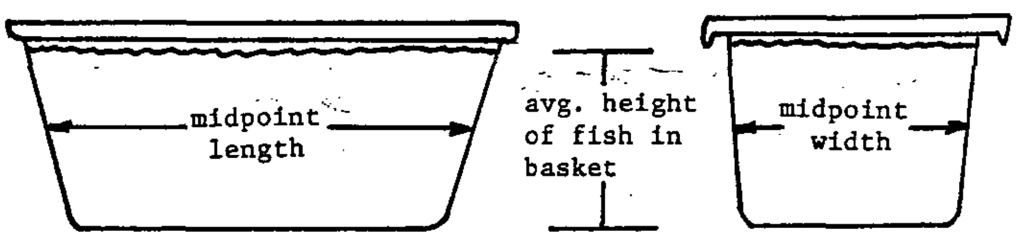
(Allowances can be made for irregular shapes or partially filled portions of the net by the way in which the measurements are taken.)

The deck crew will often have orders or for their own reasons will want to empty the net as quickly as possible. They may be reluctant to allow an observer time to make the needed measurements. Prepare for this possibility by making sure the skipper is aware of your needs and by being ready to get your measurements as quickly as possible. Be ready to step on deck as soon as the winch cables are relaxed and know which measurements you need to take. Having one of the deck crew help you regularly will help everyone. The two of you will soon learn to work quickly as a team; measuring will be easier for you and you will finish faster so they can get on with their work. On a big net of fifty tons or more, single handed measurements might take ten minutes. With help you should be able to shave several minutes off that time. If the deck crew are reluctant to follow your reasoning, explain your plan to the skipper and ask his cooperation.

Codend volume (in cubic meters) is multiplied by a weight per cubic meter ratio, (termed "density") to obtain a catch weight estimate for that haul. Density is the ratio of mass, or weight, to volume. One cubic meter of fresh water by definition weighs one metric ton. It's **density** then is 1 ÷ 1, or 1.00. The density of seawater is 1.026. The density of fish in a fish bin, (their weight per cubic meter of volume) should be close to 1.00, (they commonly range from .87 - .98). The fish in a codend are often very tightly compacted and thus their density would be greater than the density of fish dumped loosely into a bin or basket. It has been theorized that densities of fish in tightly compacted codends approach 1.00 and may even be greater than 1.00 but no studies have been done to substantiate this. Therefore, we ask that observers sample for density as explained below and do not make unsubstantiated assumptions.

Density is variable and should be derived from random basket samples for each sampled haul. Average density values for the day or area should be calculated and used for catch weight estimates of unsampled hauls. A minimum of four baskets should be used to calculate density. First obtain the volume of fish in the sampling baskets, (or some other small container which is larger than a basket but not larger than a cubic meter), such that fish weight and volume can be accurately determined. The basket sides are sloped slightly, so use the midpoint width and length measurements. Remember that the midpoint is half the distance from the bottom to the level **of fish** in the basket (or other container) not necessarily to the top of the basket. It is important to fill all the baskets to the same level. It is also important to examine the way that the fish are packed in your basket or small container and make sure that it approximately duplicates the way that the fish are packed in the fish bin or codend. For instance, if you have very large fish in your basket, such as Pacific cod or turbot, they may not be laying flat on top of each other as they would in a large fish bin. The density of the fish in the basket will be less than the density of fish in the bin because there are more spaces or air pockets between the fish in the basket. It may be appropriate to lay or settle the fish into the container but do not compact or smash the fish in an attempt to duplicate the force in the codend. Your resulting density value would be too subjective. To calculate the volume of the basket, use the following equation:

Midpoint length x height of fish x midpoint width = total volume

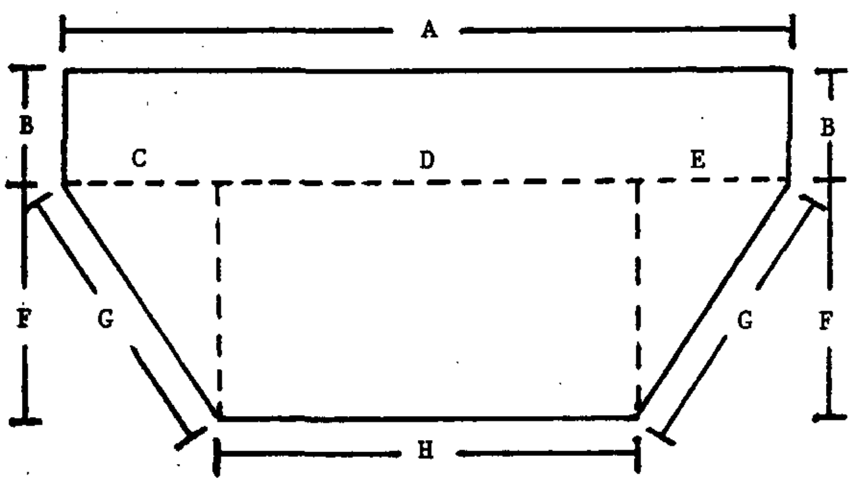


After the volume of an average basket is calculated, you need to obtain the average weight of four or more baskets. Be careful to take a random sample of the catch and to fill all your baskets consistently to the same level. Then simply divide the average weight of a basket by the average volume of a basket to calculate the density value for that haul. Using the volume of the fish in the codend or live tank and the density of those fish, you can calculate a total catch weight estimate. Remember:

Volume of fish (m^3) x density (mt/m^3) = weight of fish (mt)

On some ships, it may be possible to estimate the catch size by the volume of fish in a live tank or fish holding bin. Tank or bin volume is preferred over codend volume because of the consistency of the shape but often cannot be used. The tanks may be enclosed such that the depth of fish cannot be determined; the tank may hold fish **and** an indeterminate amount of water; the tank may be too difficult a shape to measure; or tows may be mixed by dumping them in together.

Observer Estimates by Bin Volume: Measure the fish bin into which the fish will be emptied to obtain the volume in cubic meters. If the fish bin is shaped like a rectangle or square, it would be relatively easy to calculate the volume. Simply multiply the floor area (length x width) by the height of fish. However, many fish bins are irregularly shaped, in which case the floor area of the bin must be broken into sections which can be easily measured. The example below shows how one fish bin was broken into shapes easily calculated or measured to obtain floor area.



Useful Formulas You May Need

Area of a circle = πr^2 Circumference = $2\pi r$ (π = 3.1415)
Area of a square or rectangle = length x width (In diagram above: A x B)
Area of a triangle = ½ base x height (In diagram above: ½ E x F)
For bin floors with a conical shaped depression: Volume of a right angle cone = $1/3\pi r^2 h$

The height of fish in the bin is the third dimension needed to determine volume. If the bin is sided with common width boards of known dimension, use the height of each board to estimate the height of fish in the bin. If the bin is of other composition, ask if you can use some paint to make a height scale at a couple of places on the sides. To determine an average height of fish, it is best to measure the height of fish at four or more points around the inside of a bin. Be aware of overhead structures which may reduce the volume capacity of a bin when it is filled above a certain point. When working with enclosed tanks, some observers have successfully used a "dip stick" which they had made, to measure fish depth through the hatches from the trawl deck. Height of fish scales painted on the sides of the tank might also be read from the trawl deck. The area of the fish bin (a constant) multiplied by the height of fish from that catch equals the volume. Volume times density equals the catch weight.

There is no need to be surreptitious about your estimates of catch weight or composition. In some cases, captains have improved their record keeping by learning from the observer. On the other hand, do not argue with the captain about catch estimations. His logbook hail (deck) weights do not have to equal or even approximate yours and we do not expect them to. Catch weight estimation is a difficult task and the accuracy is often dependent on the circumstances.

RETAINED AND TOTAL CATCH DATA FROM PRODUCTION FIGURES

Catcher/processor vessels are required to report retained product information and the amounts of discarded species in addition to the haul data and deck estimates in the Daily Cumulative Production Logbook for NMFS. A count of the number of units of each product produced by the factory for each haul or each day will be reported to the bridge. A unit of product would be a tray of fish packed for freezing or a bag of fish meal.

Number of Product Units x Average Unit Weight = Total Weight of Product

A product recovery rate (prr) or a conversion factor can then be applied to the product tonnage to estimate the round weight of catch going into that product line. A recovery rate represents the proportion of the organism that is used in any given product. Recovery rates are expressed as a percent or as a ratio. Headed and gutted cod may have a recovery ratio of .62 to l, or 62% recovery, while fish frozen whole would have a recovery ratio of 1.00 to l, or 100% recovery. The product weight divided by the product recovery ratio equals the fresh weight of the fish used to make the product. [Note: A conversion factor is the reciprocal of the recovery ratio and is **multiplied by** the product weight to obtain the round or fresh weight of the fish). A conversion factor is always greater than 1. To convert a conversion factor to a recovery rate, or vice versa, divide the number l by one of them to obtain the other.]

Product Weight ÷ Recovery Rate = Whole Weight of fish used to make the product

Product Weight x Conversion Factor = Whole or Fresh Weight of fish used to make the product

The retained product information in the ship's logbook could be useful to observers except that the information is entered **by production day**. Observers will need product information **by haul** to estimate the round weight (also termed: whole or fresh weight) of the retained catch for each haul. Except in the case of surimi or fish meal production, the observer may be able to obtain production data by haul by requesting it. If catches are not mixed together when dumped into the live tank, production tallies by haul may be made. Observe the handling of fish through the processing line(s). If fish from different tows are kept separate, watch the clean-up of one catch and the starting of the next. If product counts by haul are feasible, discuss your information request with the factory manager. Alternatively, the observer could find out which hauls are attributed to each "production day" and divide the day's production data by the proportion of each haul based on deck estimates. Example:

Hauls 14 - 17 (roughly) went into production on a day when 30 tons of surimi was put up. Surimi has an average product recovery ratio of .22.

30 ÷ .22 = 136.4 t round wt. of pollock went into production.

Haul No.	Deck Est.	% of Day's Catch	Retained Catch/Haul
14	45 t	30%	40.92 t
15	30 this gives you this	20%	27.28
16	55	37%	50.47
17	20	13%	17.73
	150 t	100%	136.4 t

Retained catch weight can now be entered on form 2US. Remember, *retained catch*, converted to round weight, must be entered on form 2US for every haul. On shoreside delivery vessels, observers use delivery weight instead of the day's production round weight to estimate the retained catch by haul.

An accurate <u>total catch weight</u> may be calculated using the retained catch weight and adjusting for the non-utilized, discarded fish using the observer's sample data. Discards normally consist of prohibited species, bycatch species and undersized and damaged target fish. If you count and/or weigh all of a discarded species in a haul, as is often the case with prohibited species, simply add the total weight of the non-utilized species to the round weight of retained catch for that haul.

round weight of retained fish + weight of discarded fish = total catch

When the observer cannot weigh all of the discarded fish in the whole haul, the proportion of the retained fish in the unsorted catch sample to the weight of retained fish in the haul can be used to extrapolate the weight of the total catch:

$$\frac{\text{Sample wt. of retained and discarded fish} \times \text{Round wt. of retained fish in total catch}}{\text{Weight of retained fish in sample}} = \text{Total Catch}$$

To obtain total catch for hauls which you did not sample, calculate an adjustment factor for the day (see example below) and multiply the retained catch for the unsampled haul times the adjustment factor for that day. If you observed the haul but did not sample it, and feel that the adjustment factor for that day would not give an accurate estimate of the total catch, then use your judgement as to how to obtain the best estimate of total catch.

$$\frac{\text{sum of calculated total catch weights for the sampled hauls for the day}}{\text{sum of the retained catch estimates for the sampled hauls for the day}} = \text{adjustment factor for the day}$$

adjustment factor for the day x retained catch est. for a nonsampled haul = total catch est. for that haul

(Example--see 9/10 on example form 2US:

$$\frac{16.00 + 20.00 + 12.00}{15.80 + 19.90 + 10.50} = \frac{48.00}{46.20} = 1.0390$$

1.0390 x 7.94 = 8.25
and
1.0390 x 17.92 = 18.62

In summary remember, official total catch must also be filled in for every haul (record it to two decimal places). This is the weight that you will use in calculating catch report extrapolations. Basing total catch on back-calculations of retained catch plus the observer's estimates of the weight of discarded species **may** be the most accurate figure. Failing this, if the vessel officers can provide good estimates of total catch (all species included), then convert these estimates from pounds to metric tons and use them as the official catch weight **or** use your estimate of total catch if you feel it is most accurate. Note at the top of the form the origin of the official total catch estimate. (The first sheet is sufficient unless it changes.) Give a complete description in your report of how these figures were obtained.

Occasionally an observer will be on a ship when a haul comes in containing mud or boulders which makes up a large percentage of the weight/volume of the catch. NMFS is only interested in the catch of organisms so do not include the weight of the mud, logs, oil drums or other non-living component in your catch estimation, and avoid including it in your species composition data.

FORM 3US—SPECIES COMPOSITION

Leading zeros in columns 12 and 14 only. Skip line between sample sizes when space permits.

Worksheet Example 1

Species:						
No. weighed:						
Wt. of above:						
Avg. weight:						

Other calc.; comments: Tanner crab were subsampled for species, sex, and length data (all were counted and weighed).

Cruise no.					Vessel code				Year		Mo.		Day		Haul no.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		1	1	4	A	1	2	1	8	7	0	9	1	0	1	0	1

ST = Sampling Type:
B = basket
P = partial whole haul
W = whole haul
O = other
V = viability only

Check Type: W P B
Halibut ☑ ☐ ☐
Salmon ☑ ☐ ☐
King crab ☑ ☐ ☐
Tanner crab ☑ ☐ ☐

* W's, P's, O's, B's then V's

Species name	Sex (19)	Species code (20–22)	ST (23)	Number (24–29)	Weight (in kg. w/ decimal pt.) (30–40)	Sample weight (in kg. w/ decimal pt.) (41–51)	Viability: Number excellent (52–54)	Viability: Number poor (55–57)	Viability: Number dead (58–60)
(Keypunch check)	X	999	X	910	350.62	Haul wt: 16000.0	22	23	44
POP		301	W	1	.45	16000.0			
Redbanded rf		308	(	11	5.0				
Darkblotched rf		311	|	2	1.3				
Rougheye rf		307	|	1	3.2				
Shortspine th. hd.		350	|	12	4.5				
Sablefish		203	|	31	72.6				
Arrowtooth fl.		141	|	2	5.0				
Rex sole		105	|	6	1.45				
Alaska skate		88	|	1	4.1				
Dogfish shark		66	|	4	2.7				
Tanner crab unid	U	3	|	562	89.5				
Opilio Tanner	M	5	|	3	.43				3
Opilio Tanner	F	5	|	1	.17			1	
Bairdi Tanner	M	4	|	32	5.44		6	5	18
Bairdi Tanner	F	4	|	59	8.7		15	16	23
Pacific halibut	U	101	|	2	6.2		1	1	
King salmon	M	222	|	1	1.62				
King salmon	F	222	|	1	2.1				
King salmon	U	222	|	1	1.76				
King crab	U	2	|	0	0.0				
Pacific lamprey		79	↓	2	1.4	↓			
Squid		50	W	5	3.6	16000.0			
Pollock		201	B	170	129.4	129.4			

For viability use # wt., sample wt.

FORM 3US–SPECIES COMPOSITION

Leading zeros in columns 12 and 14 only. Skip line between sample sizes when space permits.

Worksheet Example 2

Species:						
No. weighed:						
Wt. of above:						
Avg. weight:						

Other calc.; comments:

Cruise no.				Vessel code				Year		Mo.		Day		Haul no.		
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1	1	4	A	1	2	1	8	7	0	9	1	0	1	0	3

ST = Sampling Type:
B = basket
P = partial whole haul
W = whole haul
O = other
V = viability only

Check Type:	W	P	B
Halibut	☑	☐	☐
Salmon	☑	☐	☐
King crab	☑	☐	☐
Tanner crab	☑	☐	☐

Species name	Sex (19)	Species code (20–22)	ST (23)	Number (24–29)	Weight (in kg. w/ decimal pt.) (30–40)	Sample weight (in kg. w/ decimal pt.) (41–51)	Viability: Number excellent (52–54)	Viability: Number poor (55–57)	Viability: Number dead (58–60)
(Keypunch check)	X	999	X	220	232.2	Haul wt: 20000.0			1
Sablefish		203	W	32	78.5	20000.0			
Arrowtooth fl		141		3	5.9				
Rex sole		105		7	1.4				
Dogfish shark		66		6	3.8				
Pacific halibut	U	101		1	5.0				1
Pacific salmon	U	220		0	0.0				
King crab	U	2		0	0.0				
Tanner crab	U	3	W	0	0.0	20000.0			
Pollock		201	B	151	117.2	137.6			
P. cod		202	B	20	20.4	137.6			

FORM 3US—SPECIES COMPOSITION Page *65* of *190*

Leading zeros in columns 12 and 14 only. Skip line between sample sizes when space permits.

Worksheet *Example 3*

Species:	*P. halibut*	*King salmon*			
No. weighed:	*9 act 2 est*	*3 act 1 est*			
Wt. of above:	*60.7*	*13.17*			
Avg. weight:	*6.74*	*4.39*			

Other calc.; comments: *Whole-haul sampled for salmon, steelhead, and halibut. Partial whole-haul sampled for Tanner + king crab (1/4 of haul, using bin depth). Took ten baskets for other species. Applied avg. wts. to observed (but not weighed) halibut and salmon.*

Cruise no.					Vessel code				Year		Mo.		Day		Haul no.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		1	1	4	A	1	2	1	8	7	0	9	1	0	1	0	4

ST = Sampling Type:
B = basket
P = partial whole haul
W = whole haul
O = other
V = viability only

Check Type:	W	P	B
Halibut	☑	☐	☐
Salmon	☑	☐	☐
King crab	☐	☑	☐
Tanner crab	☐	☑	☐

Species name	Sex	Species code	ST	Number	Weight (in kg. w/ decimal pt.)	Sample weight (in kg. w/ decimal pt.)	Viability: Number excellent	Viability: Number poor	Viability: Number dead
	19	20 21 22	23	24 25 26 27 28 29	30–40	41–51	52 53 54	55 56 57	58 59 60
(Keypunch check)	X	999	X	723	567.63	Haul wt: 12000.0	32	37	56
Pacific halibut	U	101	W	11	74.19	12000.0	5	4	
King salmon, F	F	222	↓	3	13.17	↓			
steelhead, M	M	226	↓	1	1.2	↓			
Salmon, unident., U	U	220	W	1	4.39	12000.0			
Opilio Tanner, M	M	5	P	8	1.4	3000.0		3	5
opilio Tanner, F	F	5	↓	8	1.65	↓	4	2	2
bairdi Tanner, M	M	4	↓	53	7.23	↓	8	16	29
bairdi Tanner, F	F	4	↓	47	10.6	↓	15	12	20
king crab unid., U	U	2	P	0	0.0	3000.0			
pollock		201	B	449	350.0	453.8			
red banded rockfish		301	↓	40	20.5	↓			
darkblotched rockfish		311	↓	5	2.5	↓			
sablefish		203	↓	2	5.2	↓			
squid		50	↓	72	51.8	↓			
Pacific cod		202	B	23	23.8	453.8			

SPECIES COMPOSITION OF THE CATCH

Determination of the species composition of the catch is one of the high priority duties of an observer. The essential features and data that must be obtained for determining species composition are as follows:

1. Samples of the catch must be representative of a particular haul.
2. The sample must have a known weight. This is referred to as a "sample weight". (It is sometimes obtained by actual measurement, and sometimes calculated.)
3. The sample is sorted according to species or species groups, and the total weight of each group is determined. The combined weight of all species groups must equal the sample weight.
4. The number of individuals in each species group is determined. Thus a weight must be entered for every group making up the sample and the number of individuals making up each weight must also be recorded.
5. When sampling for species composition, you must also sample for the incidence of halibut, salmon, king crab and Tanner crab.

RECORDING SPECIES COMPOSITION (INCLUDING PROHIBITED SPECIES) ON FORM 3US

The Form 3US allows observers to whole-haul or partial-whole haul sample for some species, such as sablefish or a rockfish species, while basket sampling for other species. A sample weight is recorded for each species seen. Prohibited species such as Tanner crab, king crab, or salmon are listed separately by species and sex. If large quantities of, for example, Tanner crab are seen, it is still possible to count a large number of the prohibited species group, apply an average weight, and record these as Tanner crab, unid., unknown sex. Refer to the detailed instructions below and the example forms.

1. Enter the identifying information: cruise no., vessel code, date, and haul no. (The cruise number and vessel code will normally be given to you during debriefing.)
2. Remember that the date of the sample should correspond to the information on Form 2US. The date should thus be the day the trawl began to be hauled in.
3. Group the species in your species composition samples by the sample size, starting with the largest sample size first. For example, if you whole-haul sampled for halibut and salmon, partial whole-haul sampled for king and Tanner crab, and basket sampled for the rest of the species, enter the halibut and salmon data first, the crab data next, and the basket sampled species last (as in Form 3 example 3).

4. List each species or species group by their common name and the corresponding code from the alphabetically arranged Species Code List in this manual. Look up a species under its group name--rockfish, sculpin, sole, etc. Most fish, especially the commercially important species, should be identified to species, if possible. See the section on Species Identification which preceeds the Code List. .

5. Each species may only be listed once for each haul. You cannot have two or more sample weights for any species.

6. All Tanner crab, king crab, or salmon should be listed separately by species and sex whenever possible. Pacific halibut should be listed with "U" for sex unknown. (Do not sex halibut, even the dead ones.) For **these species only**, record an "M", "F", or "U" in column 1. If large quantities of one of the crab or salmon species groups are seen, it is permissible to take a random subsample of the group and record all of the individuals in the subsample by species and sex. Either count or weigh all of the remaining members of the group and apply an average weight (from your subsample totals) to get the weight or number, and record these as (Tanner crab/king crab/salmon) unid. and unknown sex. Make sure that no individual is recorded twice on the forms (none of the subsample should be reported in the larger group of unidentified individuals). (See 3US example 1, Tanner crab for an illustration of how to record the data in this type of a subsample situation.)

7. In column 23, indicate the sampling type for each sample size. For species that you whole-haul sampled, use "W"; for species that you partial whole-haul sampled, use "P". If you have two types of partial haul samples in one haul, use "P" and "O". When the sum on the species weights equals the sample weight, designate the sample as "B".

8. Skip a line between species with different sample weights (see example 3).

9. The number of individuals and weight of each species group are then placed in the appropriate columns. Every number you enter must have a weight and every weight must have a number. All weights should have a well-defined decimal point as the decimal point itself will be keypunched and must be present even if the weights are not carried to a tenth or a hundredth of a kilogram (see the examples of Form 3US). Enter a trailing zero after the decimal point if you do not carry the weights to a tenth or a hundredth of a kilogram. Do not enter any weight to more than two decimal places. If something weighs much less than .01 kg, ignore it.

10. Enter the weight sampled for each species in columns 41-51, using a well-defined decimal point. If you whole-haul sampled for the species, the sample weight should be the same as the official total catch estimate (cols. 63-67 on the Form 2US). If you partial-haul sampled, the sample weight is a fraction of the official total catch estimate or the sample weight you calculated using difference in bin depth or other means. If you basket sampled, the sample weight should be the sum of the weights of the individual species that were basket sampled (marked with a "B" in column 23). The sample weight can equal but must never be greater than the official total catch.

Please note: if an observer is whole-haul or partial whole-haul sampling for some species, the observer should not include the weight of any of these in the basket sample weight if some are found in the basket samples. These of course should be entered with any others as a part of the whole or partial whole-haul sample.

11. A worksheet is included as part of the form. The observer should record there any raw data that might otherwise be lost because an extrapolated figure is entered on the keypunched portion of the form. The following are examples of the use of the worksheet:

    a) If the observer counted more individuals of a species than he/she was able to weigh, he should enter the actual weight of the individuals he was able to weigh, use this space to calculate the average weight, and enter the total extrapolated weight for all observed on the keypunch form (see how the halibut and salmon were handled on Form 3US example 3).

    b) Similar entries should be made for the reverse situation (to item a above) when you, for example, weigh large quantities of small Tanner crab, and must extrapolate a total number.

    c) Individuals whose weight is estimated can be entered on the worksheet as in example 3--enter the numbers and weights of the ones that were actually weighed and apply the average weight to the nonweighed individuals. If you feel the nonweighed individual is of a different size than those that were weighed, enter an estimate on the "wt of above" line just below the number estimated. Include the total number observed and the combined weight of the actual and estimated individuals on the keypunched form below.

    Note in the comments section the number of basket samples that were taken, the type of sampling you used, density values, and anything unusual about the catch or sampling.

12. Check to see whether or not each of the prohibited species groups was represented on the form. It is necessary to have some indication of how much catch was monitored for each of the prohibited species groups--halibut, king crab, Tanner crab, salmon/steelhead. **If no individuals of that species group were observed, then the observer should enter that group name, species code (use codes 2, 3, 101, 220), sample type, sample weight, 0 for the number, and 0.0 for the weight.** (See the 3US examples 1, 2, and 3.)

13. Under the heading "Viability", record the number of halibut and crab judged to be in each category. For the definition of "excellent", "poor", and "dead" conditions, please refer to the table in the section "Biological Data Collected from Prohibited Species." The sum of the numbers recorded in those three categories should be the total number of halibut or crab examined for viability but it doesn't have to match the numbers weighed (on the same line to the left of the viability).

    * Note: If the observer wishes to record viability of prohibited species from a haul that

was not sampled, the observer should use a separate sheet and record the identifying information including haul number, the species name, sex, species code, and viability data. A "V" (for viability only) should be recorded as the sample type in column 23.

14. To complete the keypunch check (line 999 at the top of each form), add all of the figures in the number column and enter the sum on line 999, columns 24-29. Add the weights and enter on line 999, columns 30-40. Enter the official haul weight in columns 41-51 of line 999. (Previous observers have found it useful to have this information present on this form for ease in filling out the 3US and radio report worksheet forms.) **Add the numbers in each viability category and enter in columns 52-60 of line 999.**

15. In the boxes just above the column heading labelled "Viability", check the sampling method for each of the prohibited species groups. This will enable the debriefers/data editors to see quickly what your sampling methods were and will serve as a check if you forget to enter 0 data for non-observed prohibited species groups.

METHODS OF SPECIES COMPOSITION SAMPLING

There are a number of different ways the above information can be obtained. The sampling methods you choose are dependent on the diversity and size of the catch, the shipboard setup and your time and energy. Basket sampling is the most common means of sampling when the catch is reasonably diverse. When one or two species predominate in the catch and there are very few other species, it may be possible to use a whole haul sampling scheme or a combination of whole and partial haul samples to determine composition. Observers have devised other, equally valid sampling methods for use in certain situations. The above mentioned methods will be discussed in detail; it is up to you to decide which methods provide the most accurate information in your particular situation, or to devise or adapt a sampling scheme which will work.

Basket Sampling

The sampling aim is to obtain baskets of fish from a particular haul's catch so that the relative amounts of species in the sample will reflect their proportion in the haul. In the course of your work you will be collecting baskets of fish for various purposes. However, when employing "basket sampling" for species composition, this means that your sample weight is limited to only the organisms gathered in baskets of fish taken at random from different parts of the haul. Basket sampling yields the smallest sample size, or weight, of any recommended method. Some things to watch for in taking the samples:

1. The heterogeneity of the catch in the net--i.e., some species, such as rockfish and crabs, tend to be found at the head end of the net while other species, such as flatfish, tend to concentrate at the bottom of the codend. Therefore, samples should be taken from different parts of the trawl.

2. As the fish are dumped into a bin, or as they pass onto a conveyor belt, the physics of fish flow may cause further sorting to take place-- sampling should compensate for this.

3. Note the points where species sorting or size selection by crew members or by machines takes place--samples must be taken before such sorting takes place.

Since observers must avoid unconscious selection for certain sizes or certain species when obtaining samples, various methods have been used to obtain random, representative samples. On some ships it may be possible to get samples directly from the cod end by getting assistance from a crewman on the deck to hold a basket into the flow of fish as they fall from the net into a hatch opening in the deck. Another good method is to hold the basket where unsorted fish are falling from the live tank to a conveyor belt, or from one conveyor belt to another. Yet another technique is to find or design a diverter board for the conveyor belt. This is a board hinged into the side of the conveyor belt trough capable of blocking the fish flow along the conveyor belt, thereby allowing the catch to spill off the conveyor belt into a basket. Sometimes slats of the bin can be raised, allowing fish to spill into a basket, but be careful, this could be a size selective method.

It commonly takes an hour or several hours for all of the fish to be emptied from the bins to the factory and sometimes you do not have many baskets available and/or the sampling space is limited. Therefore it is recommended that you collect only two or three baskets at a time and do this at intervals during the haul processing. This allows you to gather your samples effectively from different parts of the catch. The observer may choose to collect all of the fish in a section or several different small sections of the bin (make sure that <u>all</u> fish in the chosen areas are taken and that the fish are representative of the composition of the haul). As a guideline, when basket sampling for species composition, try to collect a minimum of 8 - 10 baskets of fish or <u>at least</u> 300 kg. At times, on domestic vessels, some of your basket samples may be smaller. Be sure to record in your logbook any difficulties you encounter.

Once the sample has been taken, there are two ways to handle the weighing of the species groups. The best method is to sort the sample by species, weigh each species group, count the number of individuals making up each group, and total the weights of each group to obtain a "total basket sample weight." The second method may be more practical when one species predominates in the sample. In this method, weigh the basket of unsorted fish, then sort the sample by species. Count the number of the predominant species, and count and weigh the remaining species groups. The weight of the dominant species group can then be obtained by subtracting the total weight of the various species groups from the total basket weight.

<u>Whole-Haul Sampling</u>

In some cases hauls are composed almost entirely of the target species and basket sampling would not provide a large enough sample size to get an accurate representation of the percentages of the other incidentally-caught (bycatch) species. This happens very frequently on vessels fishing for pollock. Whole haul sampling means that the entire unsorted catch passed by you at one point and you were able to see, and pull out, all bycatch organisms for counting and weighing later. Partial haul sampling is a variation of this where the observer samples a large portion of the catch and sorts it for bycatch. In a pure pollock fishery, catches will normally be whole or partial haul sampled which allows for a large, more representative sample but the danger is that accuracy may suffer. (Refer to "Partial Whole-Haul Sampling" on the following pages.)

When whole-haul sampling, the sample weight will be the official total catch weight from form 2US. When converting from pounds to metric tons, be sure to use the catch weight after it has been rounded to two decimals or the sample weight with more decimal places may exceed the total catch weight by a small amount. The analysis program will flag this as an error.

The observer must be present **at all times** to sort or supervise the sorting of bycatch when whole haul sampling. Ideally, the fish flow passing by the observer at one point would be **slow** and **shallow** to allow for the complete sorting of bycatch by the observer alone, but these circumstances do not always exist. You are expected to work within the constraints of each sampling situation and produce high quality sampling data. If processing is very slow, the observer may choose to sort during the dumping of a catch on deck or sample less than the whole haul, thus changing to a partial whole-haul sampling method.

Bycatch species (which include any prohibited species) that have been sorted out of the entire catch, must then be counted and weighed. Their numbers and weights are entered on the form 3US first with a sample type designation of "W". The observer should then randomly obtain a couple of baskets of the predominant species (or a minimum of thirty to fifty fish if they are large like cod), and count and weigh them. This will be entered as a basket sample type on the 3US form. This is a very common sampling method, and the recording of the data from this type of sampling is illustrated in the first example form 3US.

When two species (for example--pollock and Pacific cod) dominate the catch, sort out all of the bycatch, (in this example, everything that isn't pollock or Pacific cod) from the whole haul--identify, count, and weigh these. Take basket samples for pollock and Pacific cod (maybe 4-6 baskets full) and count and weigh them. Enter the bycatch data and the pollock/cod data under their respective sample types as before, largest sample type first, skipping a line between the two. The predominant species are not necessarily species the vessel was fishing for or "targeting" on. For example, when fishing for pollock, vessels will occasionally tow through clouds of jellyfish and when fishing on the ocean bottom for turbot, they will sometimes pick up lots of basket starfish. Refer to the second haul of the form 3US examples.

Partial Whole-Haul Sampling Methods

When your normal sampling procedure is to whole-haul sample, and you are faced with a haul containing large numbers of non-target species (bycatch), you may be forced to sample only a portion of the haul. The sampling procedure is the same as when whole-haul sampling but the observer must determine what the sample weight is. The sample weight is usually computed as a fraction or percentage of the whole-haul weight. For example, if the catch fills one and a half of two equal sized bins and you sample the half bin, your sample weight is one-third of the total catch weight.

Sample weight could be determined by measuring the difference in the height of fish in the bin at the beginning and end of the sampling period. Multiply the difference in the height measurements times the area and then multiply that volume by the density, to determine the sample weight.

Timing methods can be useful when all else fails. Take special precautions in using them to verify all assumptions and do not use broad generalities such as, "the factory processed fish at about eight tons per hour." Check the rate of the machinery you are using as a gauge **every time you sample.** Do not attempt timing methods when you must tally the rates of several machines or when the machinery does not run at a constant rate. The following example is from an observer aboard a foreign processing vessel.

> "Since the conveyor belt moved slowly and erratically, I had to devise a new method for estimation of my sample weight. For 3 or 4, 15-minute periods per haul I would time each decapitator. From this I could obtain the average hake per minute (h.p.m.). After weighing several baskets of hake, I could obtain the average weight of one hake for that haul. I would remain in the factory anywhere from 1 ½ hours to 3 ½ hours to monitor for incidence of prohibited species and obtain species composition. My calculations for a hypothetical sample would be as follows:
>
> (a) 120 minutes sampling time
> (b) 68 h.p.m.
> (c) .817 kg average weight of 1 hake
> 120 minutes x 68 hake/minute x .817 kg = 6666.72 kg which equals 6.67 mt of hake observed.
>
> I would then add the weights of the other species to this total to achieve my total sample weight. I feel confident in this method since I obtained an average h.p.m. for each haul. The processing time ranged from 58-125 h.p.m. To test this method I monitored two entire hauls of known quantity (hauls 21 & 58). The time it took to observe entire hauls was fairly closely correlated with the time it took to observe partial hauls." (Leslie Watson, Polish Cruise #17, Wlocznik).

Incline conveyor belts may carry a fairly uniform amount of fish per step (like the steps of an escalator) as long as the supply is constant and large or unusually shaped fish such as cod or skates are not prevalent. If an incline conveyor runs at a constant rate to or from your sampling area, it may utilized for a timing method using steps per minute and weight per step while you record the minutes sampled.

Tallying fish is the primary method for sampling aboard a longline vessel and may be employed in a trawler factory too. Tallying works best with large fish such as cod, halibut or turbot, or you can tally pollock if there are not too many of them passing you at any one time. When tally sampling, you are counting one or possibly two species passing you on a conveyor belt and collecting all other bycatch to be sorted, counted and weighed later. Just before, after or between tally periods, a random sample of the tallied species is gathered to determine average weight. The numbers and weight of the sample of tallied fish is recorded on the worksheet portion of the form and the average weight (**Be Careful:** average weight = weight ÷ number, **not** the other way around!) calculated and multiplied by the total number tallied. The number tallied and their calculated weight is entered on the keypunch portion of the form. The entries for the tallied species and the bycatch species are all recorded under the same sample type, "P" or "O".

DETERMINING INCIDENCE OF KING CRAB, TANNER CRAB, HALIBUT, AND SALMON

Catch landed other than the target species is called incidental catch or bycatch. Among the species caught incidentally are those that are described as "prohibited species". The prohibited species are listed below by general regional area:

Bering Sea and Aleutians:	Gulf of Alaska:
Salmonids (includes steelhead)	Salmonids (includes steelhead)
Halibut	Halibut
King crab	King crab
Tanner crab	Tanner crab
~~Horsehair crab~~	~~Horsehair crab~~
~~Lyre crab~~	~~Lyre crab~~
~~Dungeness crab~~	~~Dungeness crab~~
~~Scallops~~	~~Scallops~~
~~Surf clams~~	~~Surf clams & clams~~
~~Snails~~	~~Snails~~
~~Shrimp~~	~~Shrimp~~
~~Corals~~	~~Corals~~
Herring *	Herring

* Herring in the Bering Sea is reported separately from the rest of the prohibited species and nonallocated species--refer to "Report Groups" in the "Radio Messages" section.

The prohibited species listed above that are of particular importance are Pacific halibut (Hippoglossus stenolepis), salmon (Oncorhynchus spp.), king crab (Paralithodes spp. and Lithodes spp.), and Tanner or snow crab (Chionoecetes spp.). As these are the target species of other fisheries, there is a great deal of interest concerning their number per ton of catch on domestic groundfish vessels. Determining the incidence of crab, halibut, and salmon is thus a high priority duty for observers. Since these species are normally relatively rare in the catch, a large sample weight, (whole or partial haul sampling) must usually be observed in order to obtain effective data. A small sample size, such as results from basket sampling, is not normally adequate except in those instances when the incidental catch of Tanner crab is high.

Sampling for the incidence of prohibited species is just a specialized subset of species composition sampling even though sampling for prohibited species is often referred to as a separate operation. Remember that when sampling a haul, do not leave out any species or species group such as sampling only for prohibited species. As you may have different sample weights for different species, you may sample the whole haul for obvious species like shark and large skate or species of interest like sablefish as well as for the prohibited species while having a smaller sample for the rest of the species. Also, the four prohibited species groups do not have to have the same sample weight.

Observers have experienced other types of problems in attempting to determine the incidence of prohibited species:

1) Presorting of the prohibited species by crew members on the trawl deck as the catch

is emptied into the live tank may cause a problem for you if you were counting on sampling them in the factory. You may make the best of this situation by whole-haul sampling for prohibited species on deck and take advantage of the crews sorting effort. However, you must work with them on deck to oversee the operation as their sorting efforts are likely to be haphazard. The skipper is likely to object to the delay caused by sorting on deck and this would be your opportunity to explain that it is all or nothing and thereby get the captain to order his deck crew not to presort.

If you whole-haul sample for prohibited species on deck, you will probably still gather your species composition sample from the factory level below. To do this you may feel the need to be in two places at once. You may find it necessary to subsample for the biological information on crab and halibut and bring any salmon you collect to the factory and complete your sampling of them later. You will have to partial haul or basket sample for species composition.

2) Occasionally a haul comes in with a high incidence of prohibited species. (i.e. >20 halibut, salmon or king crab and/or >70 Tanner crab.) You must decide whether it is possible to sort all of the prohibited species from the whole haul. If more than one prohibited species group is abundant, you could reduce your sample size to a partial whole-haul sample. If there is a high incidental catch of only one prohibited species group, you could partial whole-haul sample for one of the prohibited species groups and whole-haul sample for the others. Even then you may need to simply tally the numbers of the abundant prohibited species group and subsample for average weight and biological information.

Sometimes it is possible to sort a prohibited species out of a large sample with the help of the crew. However, if after sorting them out, it becomes apparent that the species may be too abundant to count; (i.e. many small crab) or weigh; (i.e. many large halibut), then either <u>count</u> or <u>weigh</u> <u>all</u> of the abundant prohibited species which has been set aside. Take a random subsample of them and count <u>and</u> weigh all of the individuals in the subsample. The subsample is then used to determine an average weight that will be used to estimate the number or weight of the remaining individuals. Remember that you must at least have an actual weight <u>or</u> actual count of <u>all</u> of the prohibited species that occur within your sample weight.

If you sort from the catch an enormous amount (>300) of say, Tanner crab, and cannot separate them all into species groups, you should take a **random** subsample of the unidentified Tanner crab and identify those in the subsample to species and sex groups. After doing this, figure out the percentage by number of <u>C. bairdi</u> Tanner crab and other Tanner crab in the subsample. This percentage can then be applied to the remainder of the unidentified Tanner crab to divide them into <u>C. bairdi</u> and other Tanner crab groups for your RM-3 catch message worksheets. The subsample should also be worked up for other biological information required.

3) Sometimes halibut are too large or too numerous to weigh. In that case, measure the fish, look up the weight in the length/weight table for halibut and record the sum of the weights on form 3US. If there are too many to weigh **or** measure, reduce your sample size or be sure to measure those from a **random** subsample (every third one or something), look up the weights, calculate an average and apply it to the number that were only counted.

4) Sometimes a vessel will accidentally pick up a crab pot that has been snagged by the trawling gear. This incident would be recorded as a gear performance code two on form 2US (see instructions for the form). Also, note that you **do not count any crab that may be in the**

pot as part of your sampling for the incidence of King and Tanner crab. You should note the incident in your logbook and include a description of the pot and identifying numbers, if any.

<u>Cod Tally Method</u>: In a flatfish or cod fishery, basket sampling is normally used to determine species composition because of the diversity of catch. Due to the bottom trawling, there are usually comparatively high numbers of crab and halibut caught also. This makes whole haul sampling impossible and yet basket sampling is usually too small a sample weight to yield representative data. When the other methods of partial haul sampling discussed above are not possible and cod are prevalent, cod may be tallied as an indicator species of the amount of catch being sorted for prohibited species.

The assumptions are that there are lots of cod in your random basket samples for species composition, and that the distribution of cod in the catch is not "patchy", i.e. they are mixed in throughout the catch. If so, then count the cod passing by as you sort out prohibited species to be worked up when you're done. Then:

(Number of cod tallied) x (Avg. wt. of cod) = Total wt. of cod in prohib. sample

Average weight should be obtained from 30 - 50 cod, randomly gathered, from species composition sample plus extras if needed.

$$\frac{\text{wt. of sp. comp. sample}}{\text{wt. of cod in sp. comp. sample}} = \frac{\text{wt. of prohib. sp. sample}}{\text{wt. of cod in prohib. sample}}$$

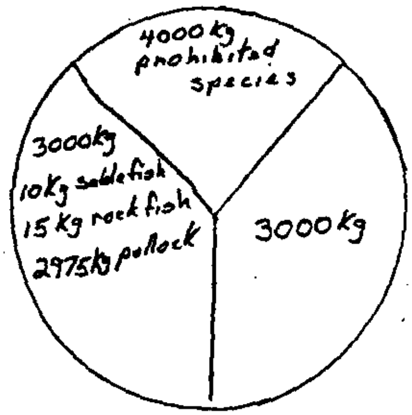
and therefore:

$$\frac{(\text{wt. of sp. comp. sample})(\text{wt. of cod in prohib. sample})}{\text{wt. of cod in sp. comp. sample}} = \text{wt. of prohib. sample}$$

Note: If prohibited species were presorted from the species composition sample, the weight of any prohibited species found during prohibited species sampling must be added to their sample weight.

**** Insert Interrelationship of Different Sample Sizes ****

INCLUSION OF PRESORTED SPECIES IN LATER SAMPLING



Assume the following for a theoretical haul:
haul weight = 10 mt
4 mt of presorted prohibited species
20 kg of sablefish
30 kg of rockfish   *In the entire haul*
5950 kg of pollock

The observer <u>derives</u> a partial haul sample size of 3000 kg after the prohibited species have been removed and takes a 400 kg basket sample for the numbers and weights of pollock. (What is the difference between derived and non-derived sample weights?) The observer's extrapolations for catch messages and the computers extrapolation for the data forms would be as follows:

Whole Haul	*4000 kg x 1 mt / 1000 kg for prohibited species*	=	*4.000 mt*
Partial Haul	10 kg / 3000 kg x 10 mt for sable fish	=	.033 mt
Partial Haul	15 kg / 3000 kg x 10 mt for rockfish	=	.050 mt
Basket Sample	400 kg / 400 kg x 5.917 mt for pollock	=	<u>5.917 mt</u>
	total	=	10.00 mt

<u>NOTICE THE DIFFERENCE FROM WHAT THE DATA SHOULD BE!!!!!!</u>

The solution is to adjust the <u>derived</u> partial haul sample weight. You must determine what portion of the those prohibited species would have been in the portion of the haul you sampled, if they had not been removed.

One possible method involves using the partial haul sample weight and the official total catch:

$$\frac{\text{adjusted partial haul sample wt}}{\text{haul wt}} = \frac{\text{partial haul sample weight}}{(\text{haul wt - whole hauled species wt})}$$

Rearranged:

adjusted PH sample wt = haul wt * PH sample wt / (haul wt - WH species wt)

adjusted PH sample wt = 10,000 kg * 3000 kg / (10,000 kg - 4000 kg)

adjusted PH sample wt = 5000 kg

If you don't know the official total catch weight is, you may still be able to adjust your partial haul sample weight

First, what portion of the remaining species were sampled? (The following weights could be determined by any of our standard partial haul sampling methods - bin volume, codend volume, cod tally, or production figures.)

3000 kg / 6000 kg =.50 or 50%

Therefore, 50% of the presorted species would have theoretically been in your sample if they had not been removed.
50% x 4000 kg = 2000 kg of prohibited would have been in the sample.

Finally, sum the two parts of the partial haul sample (presorted and non-presorted).
3000 kg + 2000 kg = 5000 kg - adjusted sample weight

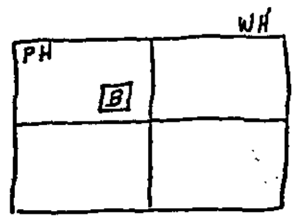
Using our adjusted partial haul sample weights:

Whole Haul	**4000 kg x 1 mt / 1000 kg for prohibited species**	**= 4.000 mt**
Partial Haul	**10 kg / 5000 kg x 10 mt for sable fish**	**= .020 mt**
Partial Haul	**15 kg / 5000 kg x 10 mt for rockfish**	**= .030 mt**
Basket Sample	**400 kg / 400 kg x 5.95 mt for pollock**	**= 5.950 mt**
	total	**= 10.00 mt**

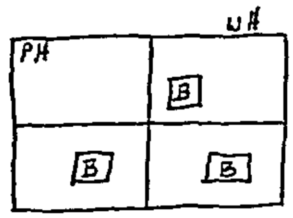
INTER-RELATIONSHIP OF DIFFERENT SAMPLE SIZES

During the following senarios assume that you are partial haul sapling for some species and basket sampling for others. The baskets samples are not just being used for numbers and weight of the major species in the partial haul sample.

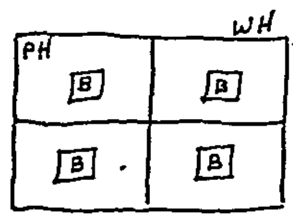
1) The baskets were taken during the partial haul sampling; the baskets are a subset of the partial haul sample and any partial haul species should be added to those collected during the partial haul sampling.



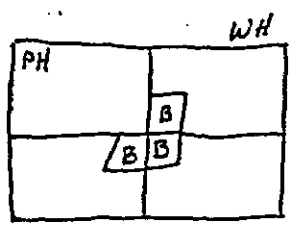
2) The baskets are taken from outside the partial haul sample; the basket sample weight and the partial haul species in the baskets could be added to partial haul sample or ignored.



3) One of the four baskets was taken during the partial haul sample and the other three were taken outside: the partial haul species in the basket taken during the partial haul sample should be removed and added to the rest from the partial haul sample (the basket sample weight is already included in the weight- why?) or the basket should somehow be identified. Later, the other three baskets can be added to partial haul sample or ignored. Another possibility would be to add 1/4 of the basket sample and 1/4 of the partial haul species found in the baskets to the partial haul sample.



4)The baskets were taken during the time you were partial haul sampling, but the baskets are not a subsample of the partial haul sample (example- bin volume weight was calculated in RSW tanks after baskets were taken); the basket weights and any partial haul species could be added to the partial haul sample or ignored.



SPECIES COMPOSITION (AND PROHIBITED SPECIES) SAMPLING OBJECTIVES AND PRIORITIES

Species composition samples should be representative and unbiased. The larger the sample weight the better. To accomplish these objectives you can choose from various methods of sampling: whole-haul, partial whole-haul, basket sampling, bin volume, difference in bin volume, timing methods, tally (counting) method, sections of a belt or bin, a combination of these methods and others. It is up to you to choose, adapt or devise a sampling method which provides the most accurate information for your particular situation. If you deviate, adapt, or combine methods, document this fully. Remember, you must have good sampling data to back up any assumptions that form a basis for the rest of your data collection. Your choice of a sampling method must fall under the natural constraints of your available time, energy, and work space as well as consideration of the size of the catch and its diversity. To guide your judgement in choosing a sampling method, please comply with the following additional constraints to ensure proper and accountable data collection:

1) You must be present to sort, or directly supervise the sorting, through the entire collection of **all** of every sample.

2) If you see or suspect that the sorting of your sample is not completely thorough, reduce your sample size and/or change your sampling situation until you can be sure that you are getting all the bycatch--allowing for human error. This usually occurs because (a) the fish that are passing by you are too deep or moving too quickly or (b) you do not have enough supervisory control over those assisting you to sort.

3) It is best to count and weigh all of a species sorted from your sample weight, but if you cannot, you must at least count them all and weigh some of them or vice versa. You cannot estimate both the number and the weight of any species.

4) Allocate your time appropriately. Sampling a catch should usually take two to three hours. If you are spending more than three hours per sample you won't be able to sample three times per day. Sampling twice per day may be all right if there are only three hauls per day, but if your ship is hauling four to six catches per day, you should reduce your sample size and increase the number of samples per day. A deciding factor is whether there is stratification or patchiness in the distribution of species within a haul. As this makes representative sampling more difficult, in these cases it is appropriate to devote more time sampling each haul. On the other hand, when there are obvious differences between tows and uneven species distribution is <u>not</u> a problem then it would be best to reduce the sample size and sample more catches.

5) Believe in the scientific method of random sampling and in the "long run" accuracy of it. As a result of reducing your sample size, you may find that a species whose occurrence is "patchy" is over-represented in some of your samples and under-represented in others. Over time and many samples, the level of occurrence will closely approximate the true value (assuming random samples). Remember that in many analyses your data will be merged with all other observer's data in that area, year, month and vessel type classification. **In general: It is better to produce accurate data using a small sample size than to have a much larger sample size with dubious data on bycatch species.**

MIXING OF HAULS

A special sampling problem exists when hauls are being unavoidably mixed and you must sample after mixing occurs. If this happens, there are at least three possible courses of action:

1) Look at the arrangement and capacities of the fish bins and consider the frequency and tonnage of the fish being delivered. If it is possible to do so, ask the captain or fishing master to keep the hauls separate. If several bins empty onto the conveyor belt from which you are sampling at one time, ask the factory manager if he could arrange for only one bin to be emptied at a time while you are sampling.

2) If the fish are thoroughly mixed, sample the combined hauls but divide the sample data proportionally by haul weight and enter the data as two separate samples.

3) If you observe differences in the species composition of the mixed hauls as they are being dumped, use your judgement to attribute bycatch to the appropriate haul. This could only be done if the mixed hauls were very different in composition, such as a pelagic haul of pollock and a bottom haul of turbot.

4) If you observe layering of fish after the mixing of hauls, you possibly could see the difference in new fish versus old fish in freshness and in state of rigor. Noticing this difference can allow you to sample either or both hauls and obtain discrete data.

BIOLOGICAL DATA COLLECTED FROM PROHIBITED SPECIES

In addition to the numbers and weights of halibut, salmon, Tanner crab, and king crab per metric ton of catch, certain data are required on these groups by species, and in most cases, by sex. The additional data collected will consist of:

1. sex - except for halibut

2. measurements - measure salmon, halibut and crab

3. viability - for halibut and crab only

In most cases, it will be possible to obtain the data outlined above from all of the individuals observed in the prohibited species sample. However, in other instances when there are too many of a given species group to process in a reasonable length of time, a random representative subsample may be taken. **If you must subsample, try to collect data from no *fewer than 20 halibut, 20 salmon, 20 king crab, and 70 Tanner crab per sample.*** These are guideline numbers for minimum subsamples. Certainly, if you had only 85 Tanner crab, you should collect information from all of them.

COLLECTING DATA FROM SALMON AND STEELHEAD

The following information should be collected from the salmon and steelhead obtained in the prohibited species incidence samples:

(a) Species identification--the six species which may be encountered are -- king, chum, sockeye, pink, coho, or steelhead.

(b) Sex--determine the sex of each salmon; only live salmon that have minimal scale loss should not be sexed, but listed as "unknown" sex. When the observer is not sure of the sex of a salmon or does not have enough time to sex it, the sex should also be listed as "unknown."

(c) Numbers of salmon/steelhead--determine numbers by species and sex groups.

(d) Weight--record the individual weights if scale samples are to be taken; if scale samples are not taken of all fish, obtain the total weight by species and sex group for those fish whose scales were not sampled.

(e) Length--the fork length of each individual should be recorded in the same manner as for sampling species, (see "Length Frequencies" in a following section). Lengths are recorded to the nearest whole centimeter.

(f) Scale samples--remove scale samples for ageing from all salmon in your sample. Follow the directions in "Scale Samples and Random Stratified Otolith Samples" in a following section. Do not collect scales from salmon that are not part of your prohibited species sample.

(g) Check for missing adipose fin--this may indicate that the salmon or steelhead was tagged with a coded wire in the snout. Follow the directions in the section on "Tagged Fish."

The observer should seldom have to subsample salmon. If time does not allow the observer to gather all of the above information from each fish, get at least numbers and weights by species from your random sample, (failing this, reduce your sample size!) then take a random subsample for sexed lengths (and watch for tags) but take scale samples from a selected subsample of each species identified in the catch.

COLLECTING DATA FROM KING AND TANNER CRAB

The following information should be collected from the king crab and Tanner crab obtained in the prohibited species incidence samples:

(a) Species identification--species which could be encountered are red, blue, brown, and Lithodes couesi king crab; Chionoecetes bairdi, C. opilio, C. hybrid, C. angulatus, and C. tanneri Tanner crabs.

(b) Sex--determine the sex of each crab. When the observer is not sure of the sex of a crab or does not have enough time to sex it, the sex should also be listed as "U" for unknown."

(c) Numbers of king/Tanner crab--determine numbers by species and sex groups.

(d) Weight--record the total weight by species and sex group.

(e) Viability--an estimate of the survival chance of each crab. This estimate is based upon an appraisal of the condition of the crab upon release to the sea. (Refer to following pages for a discussion on how to sample for the viability of crab.)

(f) Check for Tags--follow the directions in the "Tagged Fish" section.

(g) Length--measure the lengths of king crabs and widths of Tanner crab as described below. (King and Tanner crab are the only species of crab which should be measured.)

Observers will be provided with dividers to use in conjunction with a measurement scale on a plastic form. Measure the width of Tanner crab carapaces at their widest points, excluding spines, recording the measurements to the nearest 5 mm size group. Crabs 41 to 45 mm in size are recorded as 43 mm; crabs 46 to 50 mm are recorded as 48 mm. Thus, check your work to see that all records of crab measurements end in the digits three or eight. The carapace length of king crab should be measured. Measure from the right eye socket to the midpoint of the posterior margin of the carapace and record the length to the nearest 5 mm size group as with Tanner crab (refer to the illustration of "Length Measurements for Various Species" in the Appendix).

COLLECTING DATA FROM HALIBUT

The following information should be collected from halibut obtained from the prohibited species incidence sample:

(a) Numbers--of halibut.

(b) Weight--individual weights are not necessary, but you should obtain the total weight of the halibut in the incidence sample. Halibut that are too large to be weighed should be measured only, and the lengths can then be looked up in the halibut length-weight table in the Appendix to obtain the corresponding weights. (The total weights of halibut should include these table weights as well as scale weights.) When possible, however, halibut should be weighed instead of using the length-weight table.

(c) Lengths--except in the case where halibut are mistakenly discarded before you have a chance to measure them, you should be able to get lengths of all individuals. Lengths are recorded to the nearest whole centimeter.

(d) Viability--an appraisal of the condition of the halibut
[Note: Do not sex halibut, not even the dead ones. The data will not be used and so it would be a waste of your time.]

VIABILITY OF HALIBUT, KING CRAB AND TANNER CRAB

The observer's primary duty is to get accurate incidence data, lengths, and total weights, and these tasks may require that the halibut or crab be handled in a manner that would delay their release to the sea. If this is true, try to arrange your sampling scheme so that the data from the prohibited species is collected quickly. This is especially true of halibut and crab. (Most salmon do not have a favorable chance of survival after being caught in a trawl because of scale loss). The collection of viability data on halibut and crab can be done quickly and easily and should be carried out at the same time that you are collecting other biological data from these species. If you cannot work with the prohibited species immediately after they are sorted from the catch, then see if you can arrange for a salt water holding tank to put them in temporarily. (A blue basket lined with plastic and a saltwater hose running into it might work.)

If you are unable to get viability information as part of your ordinary sampling procedure, then try to sample specifically for viability of halibut and crab at least twice a week. Viability sampling should not take precedence over sampling for their incidence and obtaining the other biological information needed.

Using the tables on the following pages giving the definitions of "excellent," "poor," and "dead", note the number of halibut and crab in each category. Do not guess the condition of halibut or crab that you do not personally examine. If the sample of halibut or crab, that is checked for viability, is a subsample of the incidence of prohibited species sample, make certain that the subsample is a representative one.

SPECIES IDENTIFICATION

All commercially important fish and invertebrates should be identified to species. In the radio message section of this manual, under "Report Groups" for the Bering Sea and Gulf of Alaska, all the allocated categories, (those other than NON), can be considered commercially important and should be identified to species with four exceptions from the "Other Fish" category. From the Other Fish category, only sharks, eulachon and capelin need to be identified to species. All prohibited fish and crabs must also be identified to species. It is more important that observers spend their time working on proper identification of species of commercial interest, such as flatfish and rockfish, than to spend time on fish that no one targets on, such as eelpouts or sculpins.

To verify identifications, we ask each observer to fill out species description forms for the first sighting during a trip of any fish or invertebrate keyed out to species. There are separate forms for rockfish, flatfish and other or miscellaneous species.

On species composition forms, do not use categories such as "flatfish unidentified" or "rockfish unidentified" unless the fish has been mangled to the point that that is all that **can** be determined. If you have been unable to identify, for example, two species of rockfish, keep the data for the two species separate by labeling them "rockfish A" and "rockfish B" and carefully fill out a species description form in complete detail. If you are able to determine their identity later, (perhaps with a staff member's help during debriefing), then substitute the species name and code in place of "rockfish A" and "rockfish B" on your forms. If you do not get a positive ID on them later, then you must group them under "rockfish unidentified", (or "rockfish - unident.") on your forms, and combine their numbers and weights. Remember, a species code may only be listed once on any page (or day) of form 3(2).

Most of the species of the non-allocated report group (except for the prohibited species) have been listed simply by family in the Species Code List on the following pages. Example families are: eelpouts, poachers, greenlings, lumpsuckers, pricklebacks and rattails. (Note: sculpins have been grouped into four genera. If you are not sure which genus a sculpin belongs to or you do not have time to key it out, then use the "sculpin - unident." code.) If you **have** the interest or knowledge **and** the time, and you would like the information on these non-target fish listed by species in your data, fill out a species description form. When your identification is verified by a staff member, they will give you the appropriate species code.

OCCURRENCE OF MOLTING C. BAIRDI AND RED KING CRAB IN TRAWL FISHERIES

One of the concerns of those involved with the issues of controlling the bycatch of crab (both Tanner and king crabs) in trawl fisheries off Alaska, is the possibility that the trawl fisheries are conducted during times and in areas where crab molt. Molting crab may be more susceptible to mortality from the trawl as it is towed along the ocean bottom. There are two species of crab that are of the most concern right now. They are Chionoecetes bairdi Tanner crab and red king crab (Paralithodes camtschatica). We are asking you to collect this data on only these two species at this time. The objectives of this special observer project are to:

1. Identify and define the times and areas where molting crab are encountered by the flounder trawl fisheries.

2. Determine if the time and areas differ by sex.

3. Determine the percentage of molting C. bairdi Tanner crab and red king crab in the bycatches of these two species.

DESCRIPTION OF MOLTING

A recently molted crab will have a soft and pliable carapace. You will be able to bend it without breaking it. We would also like you to look for pre-molt crab and include them with the recently molted crab. (Consider them to have a "soft" shell also.) In pre-molt king and Tanner crab the membranes between the leg segments tend to swell and turn pink. With practice, many pre-molt crab can be identified at sight.

The "dactyl test" is definitive for identifying pre-molt crab. Break 1/2 inch off the end of a dactyl (pointed outermost segment of a walking leg). If a well-formed underlying dactyl tip is present then the crab is pre-molt.

INSTRUCTIONS

The molting crab work will consist of further classifying the crab examined daily for viability as to their shell condition (i.e. hard shelled or soft shelled). For all of the C. bairdi Tanner crab and red king crab examined and recorded on Form 4 to determine species composition, sex composition and viability, you will need to further identify the crab as being hard shelled or soft shelled. This information will be recorded on a separate set of Form 4's (you will also record and maintain a standard set of Form 4's following standard Form 4 instructions).

Data will be recorded by sex. For each haul from which you record C. bairdi Tanner crab and red king crab viability data, record the following information on the separate set of Form 4's for the crab molting study:

1. Cruise Number - Columns 1-3
2. Vessel Code - Columns 4-7
3. Date - Columns 8-13
4. Haul Number - Columns 15-16
5. Species Name
6. Species Code - Columns 19-21
7. Sex - Column 22
8. Number of individuals - Columns 23-25
9. Shell condition - Columns 26-34 RECORD THE LETTER "H" FOR CRAB IN THE HARD SHELLED CONDITION AND THE LETTER "S" FOR CRAB IN THE SOFT SHELLED CONDITION.

(Remember that the total number of each species by sex on your standard Form 4 viability must equal the number of crab recorded for the molting crab Form 4).

Form 4 – SPECIES COMPOSITION OF SALMON, KING CRAB, TANNER CRAB; VIABILITY OF HALIBUT, KING CRAB AND TANNER CRAB

Cruise No.			Vessel code				Date					
							Year		Mo.		Day	
1	2	3	4	5	6	7	8	9	10	11	12	13
2	3	1	Q	S	9	1	8	8	0	3	2	1

1. Record individuals from form 3(1) or a random subsample.
2. Leading zeros in columns 1,2,10 and 12 only as needed.
3. Sex: male = M; female = F; unknown = U.
4. Probability of predation; none (0 sea lions) = 1; moderate (1-3) = 2; high (≥4) = 3.
5. Skip a line after each haul/set sample.

Keypunchers: right-adjust all columns.

Set	Haul or sample number		Species Name	Species code	Sex	No. of indiv.	Total weight with decimal point	Halibut/crab condition: Number excellent	Number poor	Number dead	Probability of marine mammal predation on halibut
14	15	16		19 20 21	22	23 24 25	26–34	35 36 37	38 39 40	41 42 43	44
1	4	7	Red King Crab	13	M	6	H				
			" " "	13	M	1	S				
			" " "	13	F	4	H				
			C. bairdi	4	M	17	H				
			↓	↓	M	5	S				
	↓		↓	↓	F	23	H				
1	4	7	C. bairdi	4	F	6	S				

SPECIES CODE LIST

CODE	COMMON NAME	SCIENTIFIC NAME
106	ALASKA PLAICE	PLEURONECTES QUADRITUBERCULATUS
450	ALLIGATORFISH, (POACHER) - UNIDENT.	AGONIDAE
610	ANCHOVY, NORTHERN	ENGRAULIS MORDAX
55	ANEMONE, SEA - UNIDENT.	ACTINIARIA
620	ARGENTINE - UNIDENT.	ARGENTINIDAE
43	ASCIDIANS, SEA SQUIRT, TUNICATE	UROCHORDATA
204	ATKA MACKEREL	PLEUROGRAMMUS MONOPTERYGIUS
48	BARNACLES	CIRRIPEDIA
795	BARRACUDA, PACIFIC (CALIFORNIA)	SPHYRAENA ARGENTEA
770	BARRACUDINA - UNIDENT.	PARALEPIDIDAE
622	BARRELEYE or SPOOKFISH - UNIDENT.	OPISTHOPROCTIDAE
289	BIGSCALE, (MELAMPHID) - UNIDENT.	MELAMPHAEIDAE
998	BIRDS - UNIDENT.	AVES
618	BLACKSMELT - UNIDENT.	BATHYLAGIDAE
260	BLENNY - UNIDENT.	PHOLIDAE, STICHAEIDAE
302	BOCACCIO	SEBASTES PAUCISPINIS
27	BRACHIOPOD, LAMPSHELL	BRACHYOPODA
54	BRISTLEWORM, LEECH, POLYCHAETES	ANNELIDA
32	BRYOZOANS	
604	CAPELIN	MALLOTUS VILLOSUS
44	CHITON - UNIDENT.	AMPHINEURA
199	CHUB MACKEREL	SCOMBER JAPONICUS
29	CLAMS MUSSELS OYSTERS SCALLOPS	PELECYPODA
211	COD, ARCTIC (RACE)	BOREOGADUS SAIDA
203	COD, BLACK (SABLEFISH)	ANOPLOPOMA FIMBRIA
202	COD, PACIFIC	GADUS MACROCEPHALUS
208	COD, SAFFRON	ELEGINUS GRACILIS
214	CODLING - UNIDENT.	MORIDAE
32	CORALS	
1	CRAB - FAMILY, GENUS UNKNOWN	
6	CRAB, BLUE KING	PARALITHODES PLATYPUS
11	CRAB, BOX	LOPHOLITHODES FORAMINATUS
49	CRAB, CANCER	CANCER OREGONENSIS
16	CRAB, COUESI KING	LITHODES COUESI
39	CRAB, DECORATOR	OREGONIA GRACILIS
12	CRAB, DUNGENESS	CANCER MAGISTER
8	CRAB, GOLDEN KING	LITHODES AEQUISPINA
15	CRAB, HERMIT - UNIDENT.	PAGURIDAE
2	CRAB, KING CRAB - UNIDENT.	LITHODES & PARALITHODES
7	CRAB, KOREAN HORSEHAIR	ERIMACRUS ISENBECKII
37	CRAB, LYRE -- ROUNDED SPINED	HYAS COARCTATUS
9	CRAB, LYRE -- SHARP SPINED	HYAS LYRATUS
840	CRAB, LYRE - UNIDENT.	HYAS
17	CRAB, PARALOMIS MULTISPINA	PARALOMIS MULTISPINA
38	CRAB, PARALOMIS VERILLI	PARALOMIS VERILLI
74	CRAB, PEA	PINNIXA OCCIDENTALIS
13	CRAB, RED KING	PARALITHODES CAMTSCHATICA
31	CRAB, SCALED	PLACETRON WOSNESSENSKII

19	CRAB, TANNER, ANGULATUS	CHIONOECETES ANGULATUS
4	CRAB, TANNER, BAIRDI	CHIONOECETES BAIRDI
5	CRAB, TANNER, OPILIO	CHIONOECETES OPILIO
47	CRAB, TANNER, BAIRDI/OPILIO HYBRID	CHIONOECETES HYBRID
18	CRAB, TANNER, TANNERI	CHIONOECETES TANNERI
3	CRAB, TANNER - UNIDENT.	CHIONOECETES SP.
23	CRAB, TELMESSUS	TELMESSUS CHEIRGONUS
53	CRINOIDS - UNIDENT.	CRINOIDEA
248	CUSK-EEL - UNIDENT.	OPHIDIIDAE
660	CUTLASSFISH - UNIDENT.	TRICHIURIDAE
144	DAB, LONGHEAD (SANDDAB)	LIMANDA PROBOSCIDEA
679	DAGGERTOOTH	ANOTOPTERUS PHARAO
799	DRAGONFISH - UNIDENT.	MELANOSTOMIIDAE
690	DREAMER - UNIDENT.	ONEIRODIDAE
250	EELPOUT - UNIDENT.	ZOARCIDAE
91	EGG CASE, SKATE - UNIDENT.	
34	EGGS, SNAIL	GASTROPODA
601	EULACHON, (CANDLEFISH)	THALEICHTHYS PACIFICUS
901	FISH - UNIDENT.	OSTEICHTHYES
100	FLATFISH - UNIDENT.	
210	FLATNOSE, PACIFIC (CODLING)	ANTIMORA MICROLEPIS
146	FLOUNDER, ARCTIC	LIOPSETTA GLACIALIS
141	FLOUNDER, ARROWTOOTH	ATHERESTHES STOMIAS
145	FLOUNDER, BERING	HIPPOGLOSSOIDES ROBUSTUS
147	FLOUNDER, KAMCHATKA	ATHERESTHES EVERMANNI
142	FLOUNDER, STARRY	PLATICHTHYS STELLATUS
660	FROSTFISH, (CUTLASSFISH)-UNIDENT.	TRICHIURIDAE
390	GREENLING - UNIDENT.	HEXAGRAMMIDAE
80	GRENADIER, (RATTAIL) - UNIDENT.	MACROURIDAE
430	GUNNEL - UNIDENT.	PHOLIDAE
77	HAGFISH - UNIDENT.	MYXINIDAE
660	HAIRTAILS, (CUTLASSFISH)-UNIDENT.	TRICHIURIDAE
206	HAKE, PACIFIC	MERLUCCIUS PRODUCTUS
102	HALIBUT, GREENLAND (TURBOT)	REINHARDTIUS HIPPOGLOSSOIDES
101	HALIBUT, PACIFIC	HIPPOGLOSSUS STENOLEPIS
767	HATCHETFISH - UNIDENT.	STERNOPTYCHIDAE
611	HERRING, PACIFIC	CLUPEA HARENGUS PALLASI
902	INVERTEBRATE - UNIDENT.	
418	IRISH LORD - UNIDENT.	HEMILEPIDOTUS, SP.
33	ISOPOD	ISOPODA
207	JACK MACKEREL	TRACHURUS SYMMETRICUS
35	JELLYFISH - UNIDENT.	SCYPHOZOA
2	KING CRAB - UNIDENT.	LITHODES AND PARALITHODES SP.
608	KING-OF-THE-SALMON, (RIBBONFISH)	TRACHIPTERUS ALTIVELIS
700	LAMPFISH - UNIDENT.	MYCTOPHIDAE
75	LAMPREY - UNIDENT.	PETROMYZONTIDAE
785	LANCETFISH, LONGNOSE	ALEPISAURUS FEROX
700	LANTERNFISH - UNIDENT.	MYCTOPHIDAE
54	LEECH, BRISTLEWORM, POLYCHAETES	ANNELIDA
45	LIMPET - UNIDENT.	
603	LINGCOD	OPHIODON ELONGATUS
14	LITHODID - UNIDENT. (RACE)	LITHODID CRAB UNIDENT.

809	LOOSEJAW, SHINING	ARISTOSTOMIAS SCINTILLANS
525	LUMPSUCKER - UNIDENT.	CYCLOPTERIDAE
204	MACKEREL, ATKA	PLEUROGRAMMUS MONOPTERYGIUS
199	MACKEREL, CHUB (PACIFIC)	SCOMBER JAPONICUS
207	MACKEREL, JACK	TRACHURUS SYMMETRICUS
774	MANEFISH	CARISTIUS MACROPUS
776	MEDUSAFISH	ICICHTHYS LOCKINGTONI
289	MELAMPHID - UNIDENT.	MELAMPHAEIDAE
710	MIDSHIPMAN, PLAINFIN	PORICHTHYS NOTATUS
900	MISC. - UNIDENT.	(ROCKS, MUD, GARBAGE, ETC)
29	MUSSELS, CLAMS, OYSTERS, SCALLOPS	PELECYPODA
25	NUDIBRANCH	NUDIBRANCHIATA
715	OARFISH	REGALECUS GLESNE
810	OCEAN SUNFISH	MOLA
60	OCTOPUS - UNIDENT.	OCTOPODA
61	OCTOPUS, PELAGIC	VAMPYROMORPHA
297	OPAH	LAMPRIS GUTTATUS (L. REGIOUS)
295	OREO, OXEYE	ALLOCYTTUS FOLLETTI
29	OYSTERS, CLAMS, MUSSELS, SCALLOPS	PELECYPODA
301	PACIFIC OCEAN PERCH	SEBASTES ALUTUS
762	PAPERBONES, SCALEY (WEARYFISH) - UNIDENT.	NOTOSUDIDAE
681	PEARLEYES - UNIDENT.	SCOPELARCHIDAE
450	POACHER - UNIDENT.	AGONIDAE
201	POLLOCK, WALLEYE	THERAGRA CHALCOGRAMMA
54	POLYCHAETE, BRISTLEWORM, LEECH	ANNELIDA
765	POMFRET - UNIDENT.	BRAMIDAE
790	POMPANO, PACIFIC	PEPRILUS SIMILLIMUS
750	PRICKLEBACK - UNIDENT.	STICHAEIDAE
205	PROWFISH	ZAPRORA SILENUS
280	RAGFISH	ICOSTEUS AENIGMATICUS
99	RATFISH, SPOTTED	HYDROLAGUS COLLIEI
80	RATTAIL, (GRENADIER) - UNIDENT.	MACROURIDAE
90	RAY, (SKATE) - UNIDENT.	RAJIFORMES
563	RIBBONFISH - UNIDENT.	TRACHIPTERIDAE
300	ROCKFISH - UNIDENT.	SCORPAENIDAE
334	ROCKFISH, AURORA	SEBASTES AURORA
337	ROCKFISH, BANK	SEBASTES RUFUS
306	ROCKFISH, BLACK	SEBASTES MELANOPS
319	ROCKFISH, BLACKGILL	SEBASTES MELANOSTOMUS
316	ROCKFISH, BLUE	SEBASTES MYSTINUS
302	ROCKFISH, BOCACCIO	SEBASTES PAUCISPINIS
332	ROCKFISH, BROWN	SEBASTES AURICULATUS
314	ROCKFISH, CANARY	SEBASTES PINNIGER
325	ROCKFISH, CHILIPEPPER	SEBASTES GOODEI
327	ROCKFISH, COPPER	SEBASTES CAURINUS
311	ROCKFISH, DARK BLOTCHED	SEBASTES CRAMERI
330	ROCKFISH, DUSKY	SEBASTES CILIATUS
339	ROCKFISH, GREENSPOTTED	SEBASTES CHLOROSTICTUS
313	ROCKFISH, GREENSTRIPED	SEBASTES ELONGATUS
323	ROCKFISH, HARLEQUIN	SEBASTES VARIEGATUS
350	ROCKFISH, IDIOT FISH	SEBASTOLOBUS ALASCANUS
352	ROCKFISH, LONGSPINE THORNYHEAD	SEBASTOLOBUS ALTIVELIS

303	ROCKFISH, NORTHERN	SEBASTES POLYSPINIS
301	ROCKFISH, PACIFIC OCEAN PERCH	SEBASTES ALUTUS
335	ROCKFISH, PYGMY	SEBASTES WILSONI
343	ROCKFISH, QUILLBACK	SEBASTES MALIGER
322	ROCKFISH, RASPHEAD	SEBASTES RUBERRIMUS
308	ROCKFISH, RED BANDED	SEBASTES BABCOCKI
324	ROCKFISH, REDSTRIPE	SEBASTES PRORIGER
309	ROCKFISH, ROSETHORN	SEBASTES HELVOMACULATUS
312	ROCKFISH, ROSY	SEBASTES ROSACEUS
307	ROCKFISH, ROUGHEYE	SEBASTES ALEUTIANUS
304	ROCKFISH, SHARPCHIN	SEBASTES ZACENTRUS
318	ROCKFISH, SHORTBELLY	SEBASTES JORDANI
326	ROCKFISH, SHORTRAKER	SEBASTES BOREALIS
350	ROCKFISH, SHORTSPINE THORNYHEAD	SEBASTOLOBUS ALASCANUS
310	ROCKFISH, SILVERGRAY	SEBASTES BREVISPINIS
315	ROCKFISH, SPLITNOSE	SEBASTES DIPLOPROA
328	ROCKFISH, STRIPETAIL	SEBASTES SAXICOLA
329	ROCKFISH, TIGER	SEBASTES NIGROCINCTUS
331	ROCKFISH, VERMILION	SEBASTES MINIATUS
305	ROCKFISH, WIDOW	SEBASTES ENTOMELAS
322	ROCKFISH, YELLOWEYE	SEBASTES RUBERRIMUS
320	ROCKFISH, YELLOWMOUTH	SEBASTES REEDI
321	ROCKFISH, YELLOWTAIL	SEBASTES FLAVIDUS
240	RONQUIL - UNIDENT.	BATHYMASTERIDAE
200	ROUNDFISH - UNIDENT.	
203	SABLEFISH, (BLACK COD)	ANOPLOPOMA FIMBRIA
220	SALMON - UNIDENT.	ONCORHYNCHUS, SP.
221	SALMON, CHUM (DOG)	ONCORHYNCHUS KETA
222	SALMON, KING (CHINOOK)	ONCORHYNCHUS TSHAWYTSCHA
225	SALMON, PINK (HUMPBACK)	ONCORHYNCHUS GORBUSCHA
224	SALMON, RED (SOCKEYE)	ONCORHYNCHUS NERKA
223	SALMON, SILVER (COHO)	ONCORHYNCHUS KISUTCH
40	SAND DOLLARS	ECHINOIDEA
670	SAND LANCE, PACIFIC	AMMODYTES HEXAPTERUS
136	SANDDAB - UNIDENT.	BOTHIDAE
144	SANDDAB, LONGHEAD	LIMANDA PROBOSCIDEA
137	SANDDAB, PACIFIC	CITHARICHTHYS SORDIDUS
239	SANDFISH	TRICHODON
614	SARDINE, PACIFIC	SARDINOPS SAGAX CAERULENS
607	SAURY, PACIFIC	COLOLABIS SAIRA
660	SCABBARDFISH,(CUTLASSFISH)-UNIDENT.	TRICHIURIDAE
29	SCALLOPS, CLAMS, MUSSELS, OYSTERS	PELECYPODA
400	SCULPIN - UNIDENT.	COTTIDAE
431	SCULPIN, GYMNOCANTHUS - UNIDENT.	GYMNOCANTHUS, SP.
418	SCULPIN, IRISH LORD - UNIDENT.	HEMILEPIDOTUS, SP.
440	SCULPIN, MYOXOCEPHALUS SP.	MYOXOCEPHALUS SP.
433	SCULPIN, TRIGLOPS - UNIDENT.	TRIGLOPS SP.

Note: Many other genera and species of sculpins are present. Group these others under sculpin unidentified.

55	SEA ANEMONE - UNIDENT.	ACTINIARIA
41	SEA CUCUMBER - UNIDENT.	HOLOTHURIOIDEA
689	SEA DEVIL - UNIDENT.	CERATIIDAE
54	SEA MOUSE, BRISTLEWORM, LEECH	ANNELIDA

43	SEA ONIONS - UNIDENT.	UROCHORDATA
58	SEA PEN, SEA WHIP - UNIDENT.	PENNATULA
43	SEA POTATO - UNIDENT.	UROCHORDATA
25	SEA SLUG, - UNIDENT.	NUDIBRANCHIATA
56	SEA SPIDER - UNIDENT.	PYCNOGANIDA
43	SEA SQUIRTS, ONIONS, POTATOES, TUNICATES	UROCHORDATA
40	SEA URCHINS	ECHINOIDEA
58	SEA WHIP, SEA PEN - UNIDENT.	PENNATULA
54	SEA WORMS (POLYCHAETES)	ANNELIDA
550	SEABASS - UNIDENT.	SCIAENIDAE
240	SEARCHER, (RONQUIL) - UNIDENT.	BATHYMASTERIDAE
900	SEAWEED	MISC. ITEMS
606	SHAD, AMERICAN	ALOSA SAPIDISSIMA
750	SHANNY, (PRICKLEBACK) - UNIDENT.	STICHAEIDAE
65	SHARK - UNIDENT.	SQUALIFORMES
69	SHARK, BLUE	PRIONACE GLAUCA
68	SHARK, BROWN CAT	APRISTURUS BRUNNEUS
62	SHARK, PACIFIC SLEEPER	SOMNIOSUS PACIFICUS
67	SHARK, SALMON	LAMNA DITROPIS
78	SHARK, SIXGILL	HEXANCHUS GRISEUS
64	SHARK, SOUPFIN	GALEORHINUS ZYOPTERUS
66	SHARK, SPINY DOGFISH	SQUALUS ACANTHIAS
63	SHARK, THRESHER	ALOPIAS VULPINUS
70	SHRIMP - UNIDENT.	
90	SKATE - UNIDENT.	RAJIFORMES
212	SKILFISH	ERILEPIS ZONIFER
625	SLICKHEAD, THREADFIN	TALISMANIA BIFURCATA
602	SMELT - UNIDENT.	OSMERIDAE
604	SMELT, CAPELIN	MALLOTUS VILLOSUS
601	SMELT, EULACHON (CANDLEFISH)	THALEICHTHYS PACIFICUS
619	SMOOTHTONGUE, NORTHERN	LEUROGLOSSUS STILBIUS SCHMIDTI
30	SNAIL - UNIDENT.	GASTROPODA
34	SNAIL, EGGS	GASTROPODA
36	SNAIL, SHELL, EMPTY	
500	SNAILFISH - UNIDENT.	LIPARIDIDAE
559	SNIPE EEL - UNIDENT.	NEMICHTHYIDAE
109	SOLE, BUTTER	ISOPSETTA ISOLEPIS
118	SOLE, C-O	PLEURONICHTHYS COENOSUS
117	SOLE, CURLFIN	PLEURONICHTHYS DECURRENS
110	SOLE, DEEPSEA	EMBASSICHTHYS BATHYBIUS
107	SOLE, DOVER	MICROSTOMUS PACIFICUS
108	SOLE, ENGLISH	PAROPHRYS VETULUS
103	SOLE, FLATHEAD	HIPPOGLOSSOIDES ELASSODON
116	SOLE, HYBRID	INOPSETTA ISCHYRA
108	SOLE, LEMON	PAROPHRYS VETULUS
112	SOLE, PETRALE	EOPSETTA JORDANI
105	SOLE, REX	GLYPTOCEPHALUS ZACHIRUS
104	SOLE, ROCK	LEPIDOPSETTA BILINEATA
114	SOLE, ROUGHSCALE	CLIDODERMA ASPERRIMUM
115	SOLE, SAND	PSETTICHTHYS MELANOSTICTUS
111	SOLE, SLENDER	LYOPSETTA EXILIS
140	SOLE, YELLOWFIN	LIMANDA ASPERA

26	SPONGE - UNIDENT.	PORIFERA
622	SPOOKFISH - UNIDENT.	OPISTHOPROCTIDAE
270	SQUARETAIL, SMALLEYE	TETRAGONURUS CUVIERI
50	SQUID - UNIDENT.	DECAPODA
51	SQUID, GIANT	MOROTEUTHIS ROBUSTA
20	STARFISH - UNIDENT.	ASTEROIDEA
21	STARFISH, BASKET	GORGONOCEPHALUS
22	STARFISH, BRITTLE	OPHIUROIDEA
24	STARFISH, SUNSTAR	SOLASTER SP.
226	STEELHEAD	SALMO GAIRDNERI
230	STURGEON - UNIDENT.	ACIPENSERIDAE
3	TANNER CRAB - UNIDENT.	CHIONOECETES SP.
209	TOMCOD, PACIFIC	MICROGADUS PROXIMUS
113	TONGUEFISH, CALIFORNIA	SYMPHURUS ATRICAUDA
227	TROUT, CUTTHROAT (SEA RUN)	SALMO CLARKI
807	TUBESHOULDER - UNIDENT.	SEARSIIDAE
43	TUNICATES, ASCIDIANS, SEA SQUIRTS	UROCHORDATA
143	TURBOT - UNIDENT.	
102	TURBOT, GREENLAND (HALIBUT)	REINHARDTIUS HIPPOGLOSSOIDES
805	VIPERFISH - UNIDENT.	CHAULIODONTIDAE
757	WARBONNET, DECORATED	CHIROLOPHIS DECORATUS
762	WEARYFISH, (PAPERBONES) - UNIDENT.	NOTOSUDIDAE
779	WOLFFISH - UNIDENT.	ANARHICHADIDAE
780	WOLF-EEL	ANARRHICHTHYS OCELLATUS
760	WRYMOUTH, GIANT	DELOLEPIS GIGANTEA
783	WRYMOUTH, DWARF	LYCONECTES ALEUTENSIS
999	Z SUMMATION LINE	CODE FOR FORM 3US ONLY

<u>Definition of Halibut Condition</u>

<u>Trawl Catches</u>

(1) <u>Excellent</u>: No sign of stress
- (a) Injuries, if any, are minor
- (b) Muscle tone or physical activity is strong
- (c) Gills are red (not pink) and fish is capable of closing gill cover (operculum) tightly

(2) <u>Poor</u>: Alive but showing signs of stress
- (a) Moderate injuries may be present
- (b) Muscle tone or physical activity is weak
- (c) Gills are red (not pink) and fish is capable of closing gill cover (operculum)

(3) <u>Dead</u>: No sign of life or, if alive, likely to die from severe injuries or suffocation
- (a) Vital organs may be damaged
- (b) No sign of muscle tone or physical activity
- (c) Severe bleeding may occur
- (d) Gills may be pink and fish is not able to close gill cover

<u>Longline Catches</u>

(1) <u>Excellent</u>: No sign of stress
- (a) Hook injuries are minor and located in the jaw or cheek
- (b) No sign of severe bleeding; gills are red (not pink)
- (c) No sign of sand fleas

(2) <u>Poor</u>: Alive but showing signs of stress
- (a) Hook injuries may be severe, but vital organs are not injured
- (b) Moderate bleeding may be observed, but gills are still red (not pink)
- (c) No sign of sand fleas

(3) <u>Dead</u>: No sign of life or, if alive, likely to die from severe injuries
- (a) Vital organs may be damaged
- (b) Sand Fleas may be present (they usually first attack the eyes)
- (c) Severe bleeding may occur, gills may be pink
- (d) No sign of muscle tone

Definition of King Crab and Tanner Crab Condition

Trawl and Longline Catches

(1) Excellent: No sign of stress or dismemberment

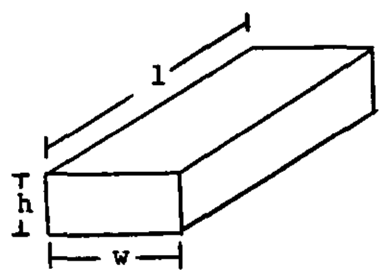
(2) Poor: Alive but showing signs of stress--a few limbs may be missing; minor mouthpart movement may be the only sign of life

(3) Dead: No sign of life, or if alive, likely to die from major carapace fracture or dismemberments

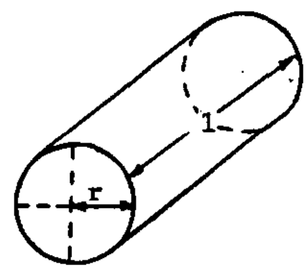
<u>Useful Formulas You May Need</u>

Number of Product Units x Average Unit Weight = Total Weight of Product
Product Weight ÷ Recovery Rate = Whole Weight of fish used to make the product
Product Weight x Conversion Factor = Whole or Fresh Weight of fish used for product

Area of a circle = πr^2 Circumference = $2\pi r$ (π = 3.1415)
Area of a square or rectangle = length x width
Area of a triangle = ½ base x height
Volume of a right angle cone = $1/3\pi r^2 h$

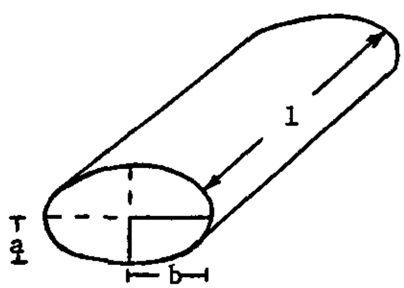


Rectangular solid
Volume = height x width x length
V = hwl

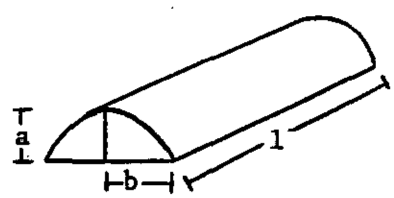


Cylinder
Volume = π x radius^2 x length
V = $\pi r^2 l$

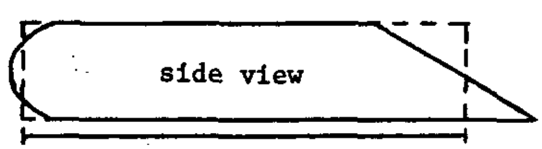
(π = 3.1415)

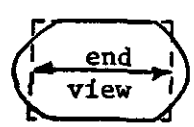


Ellipsoidal solid
Volume = π x short radius x long radius x length
V = πabl



Semi-ellipsoidal solid
Volume = ½ πabl
V = ½ πabl





(Allowances can be made for irregular shapes or partially filled portions of the net by the way in which the measurements are taken.)

TABLE OF EQUIVALENTS

1 inch = 2.540 centimeters
1 foot = .3048 meters
1 foot = .1667 fathoms
1 fathom = 6 feet = 1.829 meters

1 centimeter = .3937 inches
1 meter = 3.2808 feet
1 meter = 100 cm = 0.5468 fathoms

1 statute mile = 5280 feet = 1.609 kilometers = 0.86899 nautical miles
= 880 fathoms
1 nautical mile = 1.15078 statute miles = 1 minute of latitude
= 1.852 kilometers = 1012.6859 fathoms = 1852 meters
1 fathom = 0.0009875 nautical miles = 0.0011364 statute miles

1 pound = 0.4536 kg
1 kg = 2.2046 lb.

total catch wt. in lbs ÷ 2.2046 = total catch wt. in kilograms ÷ 1000 = MT

1 metric ton = 1000 kg = 2204.6 lbs = 0.9842 long tons = 1.1023 short tons
1 short ton = 907.1847 kg = 2000 lbs = 0.8929 long tons = 0.9072 metric tons
1 long ton (British) = 1016.0469 kg = 2240 lbs = 1.1060 metric tons
= 1.12 short tons

CONVERTING POUNDS TO METRIC TONS

LBS	MT	LBS	MT
1000	0.4536	14000	6.3504
2000	0.9072	15000	6.8040
3000	1.3608	16000	7.2576
4000	1.8144	17000	7.7111
5000	2.2680	18000	8.1647
6000	2.7216	19000	8.6183
7000	3.1752	20000	9.0719
8000	3.6288	21000	9.5255
9000	4.0824	22000	9.9791
10000	4.5360	23000	10.4327
11000	4.9896	24000	10.8863
12000	5.4432	25000	11.3399
13000	5.8968	26000	11.7935

Relationship of Pacific Halibut Lengths to Weight (Live Weight)

Length (cm)	Kilograms	Length (cm)	Kilograms	Length (cm)	Kilograms
10	.007	55	1.821	100	12.635
11	.010	56	1.930	101	13.049
12	.013	57	2.045	102	13.472
13	.017	58	2.163	103	13.905
14	.022	59	2.286	104	14.347
15	.027	60	2.414	105	14.799
16	.033	61	2.547	106	15.260
17	.040	62	2.685	107	15.731
18	.049	63	2.828	108	16.213
19	.058	64	2.976	109	16.705
20	.069	65	3.129	110	17.206
21	.080	66	3.288	111	17.718
22	.094	67	3.452	112	18.240
23	.108	68	3.621	113	18.773
24	.124	69	3.801	114	19.317
25	.141	70	3.978	115	19.871
26	.161	71	4.165	116	20.437
27	.182	72	4.358	117	21.013
28	.205	73	4.558	118	21.600
29	.229	74	4.763	119	22.200
30	.255	75	4.975	120	22.810
31	.284	76	5.193	121	23.431
32	.315	77	5.417	122	24.065
33	.348	78	5.649	123	24.710
34	.383	79	5.887	124	25.366
35	.421	80	6.132	125	26.035
36	.461	81	6.384	126	26.716
37	.504	82	6.642	127	27.409
38	.550	83	6.909	128	28.115
39	.598	84	7.182	129	28.832
40	.649	85	7.463	130	29.563
41	.715	86	7.751	131	30.306
42	.760	87	8.046	132	31.062
43	.820	88	8.350	133	31.831
44	.884	89	8.661	134	32.613
45	.950	90	8.981	135	33.408
46	1.021	91	9.307	136	34.216
47	1.095	92	9.644	137	35.038
48	1.172	93	9.987	138	35.874
49	1.253	94	10.340	139	36.723
50	1.337	95	10.700	140	37.586
51	1.426	96	11.070	141	38.463
52	1.519	97	11.447	142	39.354
53	1.615	98	11.834	143	40.259
54	1.716	99	12.230	144	41.178
				145	42.111

Relationship of Pacific Halibut Lengths to Weight (Live Weights)

Length (cm)	Kilograms	Length (cm)	Kilograms	Length (cm)	Kilograms
146	43.060	188	97.388	230	187.745
147	44.023	189	99.109	231	190.402
148	45.000	190	101.095	232	193.085
149	45.993	191	102.829	233	195.795
150	47.001	192	104.576	234	198.531
151	48.024	193	106.359	235	201.293
152	49.062	194	108.155	236	204.081
153	50.115	195	109.972	237	206.897
154	51.184	196	111.810	238	209.739
155	52.269	197	113.668	239	212.607
156	53.370	198	116.003	240	215.503
157	54.486	199	117.450	241	218.426
158	55.618	200	119.373	242	221.376
159	56.767	201	121.318	243	224.354
160	57.932	202	123.284	244	227.359
161	59.113	203	125.273	245	230.392
162	60.311	204	127.283	246	233.452
163	61.526	205	129.316	247	236.541
164	62.757	206	131.371	248	239.658
165	64.005	207	133.448	249	242.803
166	65.271	208	135.548	250	245.977
167	66.553	209	137.671		
168	67.830	210	139.817		
169	69.170	211	141.985		
170	70.505	212	144.177		
171	71.858	213	146.392		
172	73.229	214	148.631		
173	74.617	215	150.893		
174	76.024	216	153.179		
175	77.448	217	155.489		
176	78.891	218	157.822		
177	80.353	219	160.180		
178	81.833	220	162.562		
179	83.332	221	164.968		
180	84.850	222	167.399		
181	86.387	223	169.854		
182	87.943	224	172.334		
183	89.518	225	174.840		
184	91.113	226	177.370		
185	92.727	227	179.925		
186	94.360	228	182.506		
187	96.014	229	185.112		

Example

Cruise No.	Vessel Code	Date Year	Date Mo.	Date Day
1 2 3 4 5	6 7 8 9	10 11	12 13	14 15
114	A121	87	09	10

FORM 7 US—LENGTH FREQUENCY OF MEASURED SPECIES

(Includes halibut, salmon, and crab measurements)

M = male
F = female
U = unknown sex
Size groups: Fish by 1 cm.
Crabs by 5 mm
(1–5 = 3; 6–0 = 8)

NOTE:
1. Leading zeros in columns 12 and 14 only—as needed.
2. For motherships—leave columns 17-19 blank. For longliners—enter set no. in column 17.
3. Start a new row each time when entering data from a different sex, species, or haul.
4. Skip lines between species when space permits.
5. Start each day's measurements on a new side.

Species Name	Species Code	Set/haul No.	Sex	Keypunch Check	Size Groups	Freq.	Size Groups	Freq.	Size Groups	Freq.	Size Groups	Freq.	Size Groups	Freq.	Size Groups	Freq.	Size Groups	Freq.
	16-18	19 20 21	22	23-27	30-32	33-35	36-38	39-41	42-44	45-47	48-50	51-53	54-56	57-59	60-62	63-65	66-68	69-71
Pollock	201	101	M	261	32	1	33	2	34	5	35	2	36	2	37	2	39	1
			M	129	40	1	42	1	44	1								
			F	300	33	4	34	9	35	12	37	4	38	1	43	2	45	3
Pollock	201		F	48	47	1												
Opilio Tanner	5		M	247	73	1	83	1	88	1								
Opilio Tanner	5		F	79	78	1												
Bairdi Tanner	4		M	466	48	1	53	1	58	3	63	4	68	6	73	6	78	4
			M	394	83	2	88	3	103	1	113	1						
			F	468	43	1	48	2	58	1	63	6	68	8	73	10	78	9
Bairdi Tanner	4		F	595	83	7	88	4	93	7	98	1	103	2	108	1		
Pacific halibut	101		U	130	54	1	74	1										
King salmon, M	222		M	39	38	1												
King salmon, F	222		F	44	43	1												
King salmon, U	222	101	U	41	40	1												
Pacific halibut	101	103	U	77	76	1												
Pacific halibut	101	104	U	544	48	1	56	2	58	1	78	2	80	1	88	1	127	1
King salmon	222	104	F	130	38	1	42	1	47	1								

GPO 989-455

FORM 7US--LENGTH FREQUENCY OF MEASURED SPECIES

Form 7US is used for recording the lengths of prohibited species from your samples and the lengths of your sampling species. **Caution: Only actually measured lengths, not estimated lengths, should be recorded on this form.**

1. Fill in the date; start each day's measurements on a new side of the two sided form. (**Do** use both sides of the page!).

2. Under species name, record the specific common name and the related species code from the same alphabetical code list as used for Form 3.

3. On trawlers, record the haul number in columns 19-21.

4. Record all those observed for each species by sex, coded "M" for male, "F" for female, and, if no sex is determined or the immaturity of the species makes sex identification impossible, code "U" for unknown.

5. The size group is the length measurement to the nearest whole centimeter for fish and to the nearest 5 millimeters for crab (1-5 mm = 3; 6-0 mm = 8). Record the size groupings in the shaded columns.

6. The frequency is the number observed in each size group. **Include a size group only if there is a frequency of one or more.** Record sequential data horizontally across the form. **List lengths from the smallest to the largest within a species/haul/sex designation.**

7. Start a new row each time there is a change in sex, haul number, or species, or when there are more than seven sizes in a group.

8. In the "keypunch check" columns 23 - 27, simply add all of the numbers in the row (size group and frequencies together) and enter the sum. Be sure to check your work by adding it again to verify your sum.

9. Note that more than one species can be recorded per page as long as each species is identified by name and code. **Skip a line between species unless it means going to a new page.**

10. Note that more than one haul can be recorded per sheet as long as the hauls all ended on the date written at the top of the page. Start each day's measurements on a new side and use both sides of the form.

11. Leading zeros should appear in the month, and day only (columns 12 and 14 only, as needed). No leading zeros in species code, haul number, size, or frequency.

12. To indicate the repetition of a number or letter, such as species code, haul, or sex, draw brackets and arrows as shown in example form. Do not use ditto marks in keypunch columns.

LENGTH FREQUENCIES

LENGTH FREQUENCIES OF PROHIBITED SPECIES

All observers should take length frequencies of all salmon and halibut and crab found in the prohibited species incidence sample. Remember that when there are too many prohibited species to process in a reasonable length of time, take a random subsample of at least 20 halibut, 20 salmon, 20 king crab and 70 Tanner crab. A subsample of the salmon and crab groups should be a random sample of the species groups as found in the catch. Do not select a single salmon or crab species for subsampling. Taking length data from the prohibited species in your samples is a higher priority than length frequency measurements of a sampling species.

Length frequencies are recorded by species and, except for halibut, by sex. Do not use, for instance, the general code 2 for "king crab unidentified". **Do not sex halibut**, but do sex salmon unless they are vigorous **and** have minimal scale loss (see "Sexing Fish" in the Appendix).

In the previous section, "Biological Data Collected from Prohibited Species" are instructions for subsampling, a full listing of the data to gather for each group, and instructions on measuring king and Tanner crab. Detailed instructions on taking scale samples for salmon follow in the section on scale sampling and Form 9.

SELECTION OF SAMPLING SPECIES

The selection of your sampling species for length frequency measurements of about 150 fish per day depends on several considerations:

1. Your assigned special project.
2. The target species of your vessel.
3. The area you are fishing in.
4. The ships fishing schedule and other considerations.

If you are not assigned an age structure (usually otoliths) collection as a special project, your sampling species for length frequencies is the target species of the vessel. If you are assigned to take age structures, your sampling species for length frequencies will be the same species you take age structures from, before and/or after your special project collection is done, within a cruise. There are additional considerations when your sampling species is not plentiful. Refer to the next section.

Assignments of an age structure collection will be generally for "a roundfish species", which would usually be pollock or Pacific cod, or "a flatfish species", which would be yellowfin sole or one of the species listed in the following table. At times, a particular species such as a rockfish species, sablefish, or Greenland turbot may be assigned as a sampling species. Roundfish otoliths (and P. cod scales) are stored in a media of 95% pure ethyl alcohol and fresh water while flatfish otoliths are in a glycerol/thymol solution. For this reason it is difficult to switch from a roundfish to a flatfish species collection. Age structure assignments may be for a certain month, i.e. "the first month" or "second month", of your time at sea. The purpose of this is to spread out the effort of observers over time so this request can be adjusted to conform with the dates of a cruise which is in the second month of your trip. Age structure collections are "by cruise" and so should be completed on one boat. Length frequency and all other data is also divided by cruise and so a new sampling species for length frequencies could be chosen when you begin a new cruise.

Table A is a list by area of the flatfish species other than yellowfin sole to choose from for a sampling species. Use this list when asked to collect data from a secondary flatfish.

Table A: Secondary Flatfish List

BERING SEA AND ALEUTIANS

Area 511
- Rock Sole
- Flathead Sole
- Alaska Plaice

Area 513 & 517
- Rock Sole
- Alaska Plaice
- Flathead Sole

Area 514
- Rock Sole
- Alaska Plaice
- Flathead Sole

Area 515
- Rock Sole
- Flathead Sole
- Arrowtooth Flounder
- Greenland Turbot

Area 521
- Greenland Turbot
- Arrowtooth Flounder
- Flathead Sole
- Rock Sole

Area 522
- Greenland Turbot
- Arrowtooth Flounder
- Flathead Sole
- Rock Sole

Area 530
- Greenland Turbot

Area 540
- Greenland Turbot
- Arrowtooth Flounder

GULF OF ALASKA

All Areas
- Rock Sole
- Arrowtooth Flounder
- Flathead Sole

SPECIAL PROJECTS, SAMPLING SPECIES AND LENGTH FREQUENCIES

Many observers will be assigned a special project. Some observers will be asked to collect age structures from either a roundfish or a flatfish species. Others will be assigned to collect age structures from a particular species. While still others may be assigned a special project involving the collection of stomach samples, taking product recovery samples or other projects. Regardless of a special project assignment, all observers on catcher/processors should be able to collect 150 lengths from a selected sampling species each day. Observers on longline, pot, or shoreside delivery vessels may not be able to take as many lengths.

If your special project assignment involves the collection of age structures, then the species that you choose or are assigned for your collection will be the same species that you collect 150 lengths from daily for that cruise. If you do not have an age structure collection as your special project, then you would collect 150 lengths on a daily basis, from the target species of your vessel.

If you are assigned to collect age structures from an unspecified group of species such as flatfish or rockfish, then choose a species (one) from the group for that area which occurs most abundantly in the catch, (refer to the preceding Table A). This will make it easier for you to get 150 randomly collected lengths each day.

If an assigned species is not plentiful, there may not be enough in the sample for species composition for a good length frequency sample and you may have to use other methods to get additional fish of that species. In this case, the observer could collect all the individuals of that species from the conveyor belt over a period of time or use some other method to obtain randomly selected fish from a larger sample weight. Be sure to collect the additional fish required in an unbiased manner. If you cannot get 150 fish in a day of the sampling species, take lengths and age structures from those you did collect and, additionally, take approximately 150 lengths of the target species each day.

Try to keep the same sampling species throughout your cruise, regardless of the area you are fishing. If you should change fishing strategies, move to a vastly different fishing area or change ships, then you may choose a new sampling species. However, if you cannot continue the collection of age structures from a sampling species, don't keep a collection of fewer than 50 age structures. Dump it and start a new one. For instance, suppose that you started your sampling species age structure collection in area 513 when the ship was targeting on pollock. After only a few days, the ship moved to area 511 and began yellowfin sole operations. first examine a few catches to see if you could gather 100 - 150 pollock over the course of a day to continue your pollock collection. Also, the skipper might just be searching around and may return to better pollock catches. If this is not the case, you should examine your collection. If you have filled fewer than 50 vials with pollock otoliths, then dump the vials and start over with Pacific cod, a **roundfish** species, which would be present with YFS as bycatch. If you have filled more than 50 vials, then keep the pollock collection and start a new collection of cod otoliths (and scales in the case of cod).

LENGTH FREQUENCY SAMPLING METHOD

The length and age data from observer samples will be used to determine the relative abundance of each year class of target and selected bycatch species. Length frequency data provides information on abundance of fish of each size category while otoliths are read to determine the corresponding age. The age/length relationship may be quite different for each sex of a species.

Length frequencies should be collected each day from each sampling species selected. The day's length measurements may all be taken during **one** sample period **or** they may be taken from **each** sample period to ensure the measurements are representative when sizes are varying. It is important, however, that any given sample is not selected on the basis of size.

Length frequencies are usually taken from fish that were collected in a random, non-size selective manner during your species composition sampling. Sex all the fish you have set aside for length measurements (refer to "Sexing Fish" in the Appendix). If you wanted to sample 200 fish for length frequencies and the sample you set aside only has 192 fish, don't bother collecting another eight fish. It is too easy to bias your sample by "picking" them out in an inappropriate manner. Group the fish into baskets by sex. If you are unable to sex some fish, (usually the small ones), separate them into a third group to measure. Their lengths will also need to be recorded and their sex written in as "U" (unidentified).

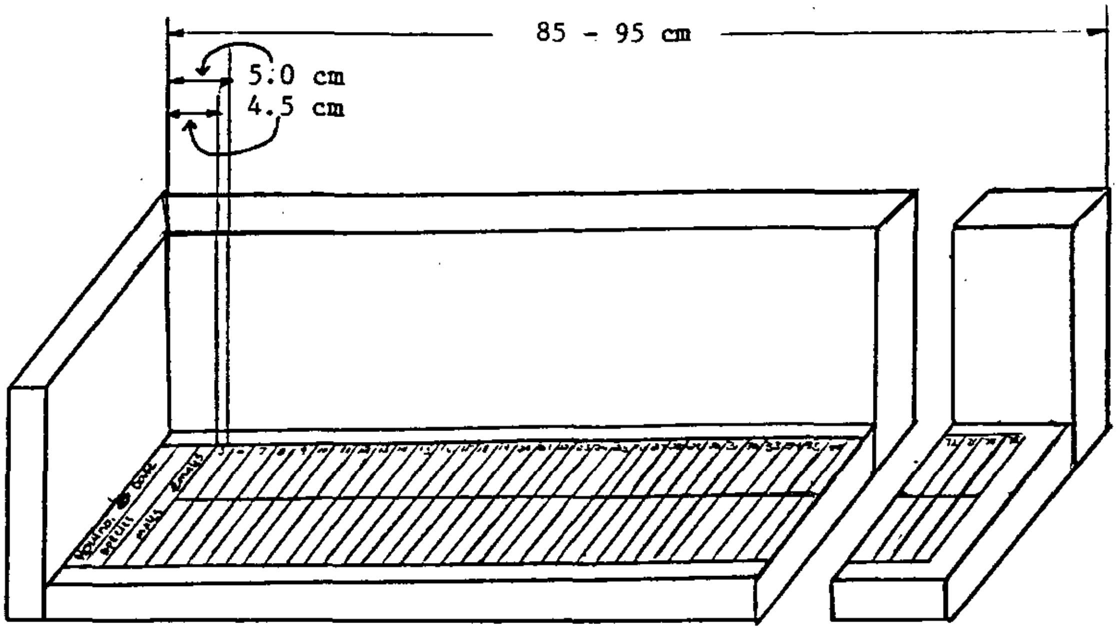
Next, set up a plastic strip on a measuring board, recording on it the haul number, date, and species. Observers on processors and trawlers must keep length frequency data for each tow separate. Record data for different hauls on different plastic strips. The plastic measuring strip is a long, narrow piece of white plastic divided into one centimeter spacings. The strip is attached to a 3-sided, wood measuring board (bottom, end, and back boards) by thumbtacks. For species of fish whose length range is less than 75 cm, the strip should be positioned on the measuring board so that the first spacing line is at 4.5 cm from the board across the end and the **center** of the 5 cm space is at exactly 5.0 cm from the end board. Mark each 10th centimeter strip unit to read 10, 20, 30...etc. For large fish, species whose length range commonly exceeds 75 cm, the measuring strip may be offset as shown in the illustration on the following page. To increase the length of a strip by ten centimeters for instance, offset the strip so that the first spacing line is at 14.5 cm from the end board and the center of the first centimeter space is at 15 cm. The tenth centimeter units of the strip may then need to be renumbered accordingly.

Take one of the baskets of sexed fish. Note that one side or half of the plastic strip is designated for males, and the other half for females. Position each fish on the measuring strip with jaws closed, snout against the end, dorsal surface against the back, and the fish body flat and straight. Spread the caudal fin with your hand to help determine the fork or midpoint of the fin's posterior margin. Fork length measurements should always be taken of fork-tailed sampling species, even if the tails are ragged and the exact location of the fork has to be estimated. This is often the case when measuring hake. Measurement of round-tailed species (most flatfish) should be of the total length from the snout to the midpoint of the tail. (See "Length Measurements for various species" in the Appendix.)

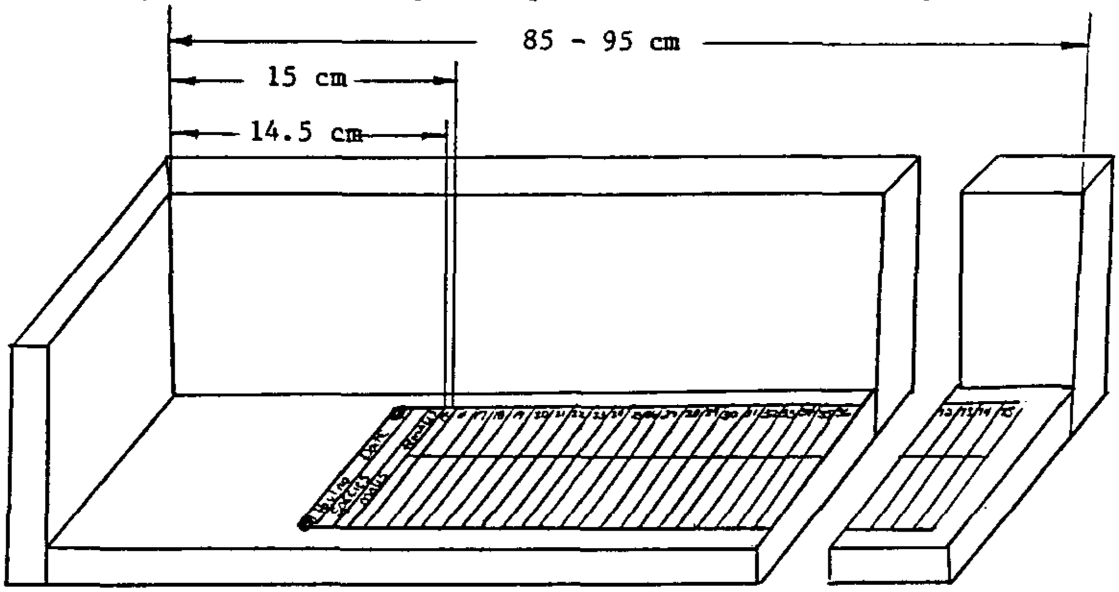
With a pencil, place a stroke on the appropriate half of the plastic strip in the centimeter space where the fork or midpoint of the tail falls. If the fork or midpoint of the tail lies right on a line, reposition the fish and check it again. If it's still on the line, record the length in the smaller (shorter), adjacent centimeter length space. After recording a length on the strip, some of these fish may be used or set aside for otolith or scale samples. (Refer to "Scale Samples and Random Stratified Otolith Samples" in the following section.)

When starting to measure another basket of sexed fish, verify their sex and check to be sure you are recording their lengths on the appropriate half of the strip. At the end of sampling, the number of pencil strokes per sex and centimeter length spacing will give the size group's frequency by sex.

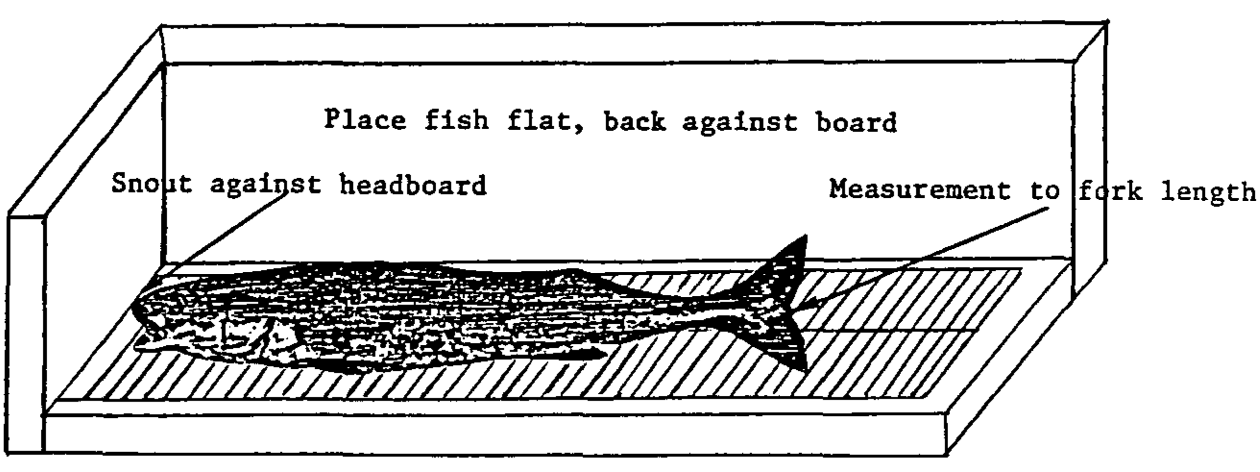
Length Frequency Measuring Board and Measurement



Measuring board with strip set up to measure most fish species.



Measuring board with strip offset in order to measure larger fish.



Measurement of a-roundfish on measuring board.

AREA 521 **FORM 9US - BIOLOGICAL SAMPLING FORM**

Cruise no. (1 2 3 4 5)	Vessel code (6 7 8 9)	Date: Year (10 11)	Date: Mo. (12 13)	Date: Day (14 15)	Species name	Species code (16-18)	Specimen type (20-21)	Sampling system (22-23)
114	A121	87	09	10	Walleye pollock	201	1	1

Total no. of specimens ______

Catalogue date ______

	Set/haul number (25 26 27)	Specimen number (28 29 30)	Sex (31)	Length (cm) (32 33 34)	Weight (kg) (35 36 37 38 39)	Form 7 (41)	Maturity stage (42 43)	Notes (44 45)	Age (47 48 49)	REMARKS
1	101	65	M	32	.80	Y				
2		66		40	.95					
3		67		35	.93					
4		68		34	.85					
5		69		34	.89					
6		70		42	.96					
7		71		44	.96					
8		72		33	.80					
9		73		35	.86					
10		74	M	34	.83					
11		75	F	34	.90					
12		76		35	.93					
13		77		33	.80					
14		78		43	.95					
15		79		34	.91					
16		80		45	1.05					
17		81		47	1.20					
18		82		43	.95					
19		83		34	.82					
20	101	84	F	38	.88	Y				
21					.					
22					.					
23					.					
24					.					
25					.					
26					.					
27					.					
28					.					
29					.					
30					.					
31					.					
32					.					
33					.					
34					.					
35					.					
36					.					
37					.					

FORM 9US INSTRUCTIONS

Form 9 is used for recording biological information concerning individual fish or invertebrates. It will most often be used in recording the sex, length, and weight of fish whose age structures (scales, otoliths, or fin rays) are collected for future age determination. It is the record of associated data that must accompany scales of salmon caught incidentally as well as the age structure collections of a sampling species which you may have been assigned.

1. Form 9US data sheets are filed separately by species and cruise. To make sure that you don't record coho salmon on the reverse side of a chinook salmon sheet for instance, keep separate groups of pages for each species. Start with page 1 for each new species.

2. At the top of the form, write the number of the three-digit subarea corresponding to the catches on the sheet. Check the subarea you recorded for the haul/set on either 1US or 2US. If the vessel changes subareas during the day, you will need to use a different sheet to record data from the new subarea. (You may use the back of the previous form.)

3. Fill in the cruise number and vessel code (when known), date, species common name, and the species code corresponding to the common name. Start each day's measurements (or subarea if it changes during the day) on a new side.

4. Leading zeros should appear in the month and day only (columns 12 and 14 only, as needed).

5. Record the specimen type that is being collected:

   1--otoliths
   2--scales
   3--fin rays
   4--otoliths and scales
   5--otoliths and fin rays
   6--scales and fin rays
   7--otoliths, scales, and fin rays

6. Record the sampling system that was used: (you will be told which sampling system to use before you go out)

   1--stratified random--This is the most common system for collecting age structures in this program. Usually the fish are obtained from your length frequency samples and a tally sheet is used to ensure that age structures are obtained from no more than 5 fish per cm sex group.

   2--random--In this system, although the fish may be from your length frequency sample, no stratification is made by size and sex. Instead, you may be instructed to take age structures from every eighth, tenth, fifteenth (or other) fish to ensure that the fish selected are a random collection from the population at large. Salmon scale samples are an example of this because scale samples are taken from all of the salmon or a random subsample of all of the salmon.

3--systematic--Fish are chosen from the length frequency sample in a random fashion (as in 2 above), but the haul/set to be sampled is selected in a "systematic" fashion. For example,the haul closest to the cumulative 200, 400, 600 metric ton catch may be chosen to be sampled.

7. Ignore "Total no. of specimens" and "Catalogue date," as this information will be filled in by others after you return.

8. On trawlers record the haul number in columns 25-27; on longline or pot vessels record the set number in those columns.

9. Note that data from several hauls/sets can be recorded per sheet as long as the hauls were begun to be retrieved or the set retrieval was completed on the date written on the top of the page and they were all taken from hauls/sets in the same area. Go to a new side only when all 37 lines are filled, when you are starting a new day, or a haul/set is in a different subarea.

10. The specimen number is the identifying number on the otolith vial, scale envelope, or other container with the specimen. There should not be any duplicate specimen numbers within a species. The specimen numbers should be listed in sequential number, which should be the case if the sampling directions were followed. (We want to avoid having specimen containers filled at random.) Salmon scale samples are numbered sequentially by species and are recorded on separate groups of pages.

11. If you board another ship during the same trip, you can continue with the same sequence of otolith numbers (or other specimen numbers), but keep the Form 9US's separate for the two different cruises.

12. It is best if the specimens are removed by sex group and recorded separately by sex on the form.

13. Record the sex of the fish using "M", "F", and "U" notation; not O and O. (M = male; F = female; U = unidentified)

14. Record the length of the fish to the nearest cm--no decimal places.

15. The weight is to be filled out to two decimal places.

16. If you recorded the length of the fish on the Form 7US forms (which should almost always be the case unless you picked this particular fish from someplace other than your length frequency sample), record a "Y" for "Yes" in column 41.

17. If you are requested to record maturity stage, record this in columns 42-43. Use the appropriate maturity scale for this species.

18. The columns to the right of maturity stage (columns 44 and above) are for the age readers to complete. If your project specifically directs you to write something; or if you note something extraordinary about the individual fish that you think people should be made aware of, write your comments small enough to allow the age readers to also record remarks, if necessary.

19. If for some reason, some preservative other that ethyl alcohol was used (such as rubbing alcohol), note the preservative at the top of the first page of each set of Form 9US's.

20. As with other forms, you will be recording your name and the ship name at the top of each set of forms. For the Form 9US this means that you should do this at the top of the first sheet for each species.

SCALE SAMPLES AND RANDOM STRATIFIED OTOLITH SAMPLES

RANDOM STRATIFIED OTOLITH SAMPLES

Otoliths, or fish ear bones, are collected from a stratified sample of the catch for age determination later. These are read in a similar manner as tree rings to determine age. The fish you take age structures from are your biological sampling species and are a subsample of those in your length frequency sample, thus, the use of the name "random stratified" which is a subsample, stratified by length, from the random length frequency sample of fish.

A maximum of five pairs of otoliths per sex for each centimeter length group are to be taken for this type of collection (5 males and 5 females of each centimeter group). Do not be concerned if after filling your vials you do not have a complete set of five pairs of otoliths per sex for each centimeter length group that you observed. It is expected that you will have only a scattering of one or two samples from fish whose lengths are at the extremes of the size range you see. The object of this collection is not to complete the 5/cm/sex categories on the tally sheet or to fill all the vials. The object is to obtain age structures from most of the commonly observed length groups in the length frequency collection so that age and length information can be used to evaluate the status of the fish populations.

Otoliths are always collected while taking length-frequency measurements by sex from the sampling species. A running tally of your otolith collection on your plastic form 9 helps you keep track of what sizes and sex of fish are needed for your collection. Thus a cumulative tally should be maintained for the sampling species, for each collection. (Usually an observer makes only one collection and a collection must be completed within one cruise.) After taking the length measurement, if the fish is of a size and sex needed, weigh the fish with the 2.0 kg or 5.0 kg scale. Record weight, sex, and length on the plastic otolith sheet after the vial number in which the otoliths (or otoliths and scales in the case of cod or sablefish) will be placed. The otolith vials are to be filled in numerical order and the sexes should be grouped.

Remove the pair of otoliths from each fish. Clean the otoliths by rubbing them between your fingers in water, or on a wet sponge or cloth, to remove slime and tissue and place them in the vial. There is one set of two otoliths per vial. Add the appropriate fluid if any, fill the vial half full, and cap it. Most roundfish otoliths are stored in a 50% ethyl alcohol--50% fresh water solution. Flatfish otoliths are stored in the glycerol solution as provided. Check the instructions for your sampling species in the table "Otolith and Scale Collection for Select Species" in the Appendix. At the end of the measuring period, the plastic Form 9 should be completed with species name, haul or set number, otolith number, and all corresponding sex, length, and weight data. Try not to collect more than 20 age structures per day (10 males and 10 females). We would like the collection to be made over the duration of the cruise, not in one or two days.

It is very important to have a clear understanding of the scheme used to identify the otoliths being collected. A mistake in the numbering sequence or procedure used to relate the otoliths to associated biological data can make a collection useless. If it is necessary to take more otoliths of the same species on a second ship, continue with the same numbering sequence but start the second collection over with a new otolith tally sheet because it will be a new collection. If you have collected less than 50 age structures from a sampling species and you must disembark and start a new cruise, you should dump the age structures that have already been collected and start over on the new ship. (Note: You may be instructed to take two separate sets of otoliths--simply start your tally sheet over the second month.)

OTOLITH REMOVAL

The otoliths are located ventrally and to either side of the brain tissue, about one eye diameter behind the eye in most fishes (refer to the diagram in the Appendix). There are three common methods of cutting into a fish's head to remove this pair of otoliths. On a roundfish, a horizontal cut, in an anterior to posterior direction which cuts off the top of the head can be done to expose the otolith cavity. This cavity can also be reached by going into the back of the mouth with a pair of forceps or scalpel and piercing up through the roof of the mouth. When beginning though, the easiest method to use in locating and removing otoliths is to make a vertical cut down through the top of the head to the location of the otolith pocket. This point is located by this simple rule of thumb: On the side of the fish's head, if you were to make an extension, (hypothetically), of the lateral line and of the curve of the preopercular bone, determine the point at which these two lines would meet. Cut down to that point. Though it may not be pleasant, firmly grasp the fish by putting thumb and forefinger into the eye sockets. Bear down on the knife with even pressure as you cut through the bone of the head. Pay attention to the amount of pressure you are required to apply to make this cut. As soon as the cutting gets easier, let up on the knife or you will slice through the otoliths. Put down the knife and break the head open. If you have cut to the correct point, the otolith cavities, (one on each side of the brain), will break open and expose the white, calcareous otoliths. They are then easily picked out with forceps and should be wiped clean before storage.

Some fish with bony skulls and small otoliths such as sablefish and some rockfish may pose problems at first. You may want to use a small hacksaw instead of a knife. Care should be taken not to break or crack the otoliths, but if an otolith is broken, and the fish is of an uncommon size, include all pieces in the vial. Otherwise simply discard the otoliths because you will probably see fish of that sex and size again.

Start with the lowest number of the vial number sequence when starting your collection and fill consecutively numbered vials. Attempt to take some otoliths each sampling day if the species seems readily available. If possible, you should not collect more than 20 otoliths per day (10 males and 10 females). When a sample species is seldom seen in quantity, however, you may want to take advantage of hauls containing many specimens and collect more otoliths/scales on those days.

On special collection projects use the same otolith number to identify and label the additional structures taken (such as scales, vertebrae, fin rays, etc.). The numbers on those structures will then correspond to the sex, length, and weight information for that fish on Form 9. There is no need to fill out an additional Form 9 unless instructed to do so.

SCALE SAMPLES

Salmon: For certain species of fish, the scale is the preferred structure for determining age; on some species, otoliths are used. Scale samples should be taken from all salmonids in the incidence of prohibited species samples, or from a few of each species of salmon present in your sample. (See instructions for subsampling under Biological Data Collected from Prohibited Species, and its' salmon data section.) Do not collect scales from salmon that are not part of your samples for prohibited species unless they are tagged salmon.

As there is a high chance of obtaining regenerated scales from salmon, try to pluck samples from both sides of the fish to increase the chance of getting readable scales. A minimum of five, good, readable scales from each fish must be collected. Place salmon scale samples dry, in small paper envelopes. Try to smear or spread-out the scales inside the envelope so that they will not stick together in one large clump. On each pre-printed envelope, fill in the requested information. If you should run out of envelopes, make some with paper and tape. Number the salmon scale samples sequentially, within each species group. Record their data on Form 9US on separate groups of pages by species. Each cruise should start with *salmon scale number one for each species of salmon. Directions for collecting scales:*

1. Rinse the fish off and/or lightly wipe the area to be sampled with a wet sponge, paper towel, or cloth. This is to minimize contamination of the sample with scales of other fish and to remove slime which can cause scales to rot.

2. Examine the fish and select zone A, B, or other. Record the zone on the envelope. "A" is the preferred zone, "B" is next in preference. Refer to the figures in the Appendix (Location of Preferred Scale Sampling Zones"). When there are no scales available in either zones A or B (on either side of the fish) then another area may be used.

3. Pluck salmon scales out with forceps so as to minimize the amount of accompanying mucus. For cod or sablefish, use a clean, thin-edged instrument (knife, scalpel, forceps), scrape within the zone in an anterior direction (toward the head).

4. Wipe off, inside the envelope or vial, 15 to 20 scales that adhere to the instrument. (Collect a minimum of five scales.) Be certain the envelope is properly labeled or the vial is marked and all pertinent information is recorded on the plastic sheets.

5. Remove excess scales from instrument before sampling the next fish.

Cod and Sablefish: From Pacific cod and sablefish, scales as well as otoliths should be taken from a sample stratified by length and sex as explained in "Random Stratified Otolith Samples." Cod and sablefish scales should be put into the vials of alcohol with the otoliths instead of into scale envelopes. The primary reason for this is to prevent the scales from sticking together so they can be mounted easily for reading. Thus it is important to insert the scales into the alcohol solution or at least cover them with solution before they dry rather than add the alcohol later after they have stuck to the vial and each other.

It is recognized that strict adherence to the methods will sometimes be impossible or impractical. Keep a record of the deviations from instructions so that the effect can be evaluated.

FORM 10US - MARINE MAMMAL INCIDENTAL CATCH DATA

This form is for the recording of marine mammals taken incidentally, whether or not any were actually caught, and for the recording of any attempts to deter marine mammals from predating on the catch. As in the incidence of other prohibited species, population managers need to be able to calculate the number caught per unit of effort, so this form must be filled out even if no marine mammals were seen. It is also important to make sure that you are checking a representative sampling of the catch for marine mammals.

On stern trawlers, or on processing vessels receiving unsorted codends, decide in advance whether or not you are going to check the catch for marine mammals. Observers usually watch the dumping of codends that they plan to sample for species composition and prohibited species, so they would know whether or not a marine mammal was in the catch. Therefore, as a minimum, an entry should be made for every haul the observer samples for groundfish. In addition, some observers have to estimate the haul size for every codend that is brought on board, in order to get a reliable total catch size estimate. In most cases the observer should be able to watch those hauls being dumped so that additional entries can be made on Form 10US. Marine mammals, such as sea lions, tend to congregate around codends being brought in, so watch for any signs of deterrence (such as the use of "seal bombs") at that time. It is possible deterrence might also be used if the codend is brought up to make a turn, or while the codend is being set. If you have never seen or heard anything which makes you suspect that deterrence is ever used, you will not be expected to watch for signs of deterrence at every possible time it might be used.

Observers aboard longline vessels should also record data on Form 10US. Although it is less likely in this fishery that marine mammals will become entangled in the gear (it has happened), the use of deterrence to protect the catch is more likely in this fishery than in trawl fisheries. Record whether or not any deterrence has been used for each set that you observed. Record the details of the use of deterrence in your logbook--what form of deterrence was used, how effective it was, and whether the marine mammals appeared to be injured from it.

1. Fishery no. (col. 1-2). Leave this code blank for the time being. (The fishery will be determined from the gear type, the area, and the depth fished (from 2US or 1US)).

2. Fill in the cruise number (when known), vessel code and year in the heading; start a new sheet for each new cruise.

3. Record the date and haul, delivery, or set number for each catch for which you know whether or not marine mammals were deterred or taken.

4. Write the common name of the marine mammal species involved. Write "None" if no marine mammals were taken or subjected to deterrence. If you are not sure of the identification, use the broader classification, such as unidentified pinniped or unidentified dolphin/porpoise. If more than one species of marine mammal was involved in the haul, set, or delivery, enter the second species on a separate line.

5. Record the corresponding code for the marine mammal species you recorded in #4 above.

6. Number of Marine Mammals: (Columns 23-39)

Except for the deterred category, a marine mammal recorded in any one of these categories should not appear in any of the other categories (i.e. the categories are mutually exclusive). It is possible that an animal that was earlier deterred (or at least subjected to deterrence) might later become entrapped or be lethally removed.

a. Deterred: those animals not entrapped that were subjected to harassment such as seal bombs.

b. Released or escaped alive (uninjured): those animals that are entrapped, but released alive or escape with no apparent injury (no bleeding, swam or dove strongly within a few seconds) and no fishing gear was attached to the animal.

c. Released or escaped alive (injured): Those animals that are entrapped, but are released alive or escape with apparent injury (bleeding, obvious trauma, unusually sluggish movement upon release) and/or with fishing gear attached to the animal.

d. Freshly dead (entangled or entrapped): Any <u>dead</u> animal brought onboard or released from the gear that is not obviously decomposed or gunshot. (The observers should not worry about <u>how</u> freshly dead the animal is.)

e. Unknown condition: Those animals that are entangled or entrapped, but are lost or discarded before the observer is able to judge the animals' condition.

f. Decomposed: The animal was entrapped, but it was obviously dead before contacting the fishing gear. Note smell, discoloration, bloating, or external trauma resulting from scavengers.

g. Lethal removal (not entangled or entrapped): An animal that is killed (e.g. shot or clubbed) to prevent serious damage or loss of gear, catch or human life, but is not in direct contact with fishing gear.

h. Lethal removal (entangled or entrapped): An animal that is killed (e.g. shot or clubbed) to prevent serious damage or loss of gear, catch or human life, and is in direct contact with fishing gear.

7. The back of Form 10US has space for remarks about entries on the front. Give the observed features you used to identify the animals to species or species group. If the animal was subjected to a form of deterrent, document on the back the particular circumstances, what deterrent was used, whether or not the animal was deterred, and whether or not the animal seemed to be injured. If the animal was released or escaped alive after being entangled or entrapped, document what happened, what part of the gear the animal was in, and what type of injury or symptoms the animal was displaying (if any) upon release. If the animal is dead and you are able to measure or collect canine teeth or other specimens from it, fill out a biological specimen sheet. Record on the back of Form 10US whether or not you filled out the sheet and document any additional circumstances and observations. If the

animal was lethally removed, make sure that you document the entire circumstances on these sheets or in your logbook as well as recording any biological data on a specimen form. Record what you can about the circumstances concerning animals of unknown condition.

8. In addition, ask the captain to have reported to you all marine mammals that are taken in catches while you are aboard. If you are informed about a marine mammal in a catch which you did not intend to sample, do not enter these data on the front side of Form 10US. Measure the animals and collect snouts or other specimens if possible and appropriate, fill out the marine mammal specimen form, and record all observations and circumstances on the back of Form 10US. Indicate that these animals are not recorded on the front and give the reason why.

Common and Scientific Names and
Corresponding Codes for Marine Mammals
(NE indicates no equivalent)

Code	Common Name	Scientific Name
CU	Northern fur seal	Callorhinus ursinus
EJ	Northern (Steller) sea lion	Eumetopias jubatus
ZC	California sea lion	Zalophus californianus
UO	Unidentified otariid (fur seals and sea lions with visible ears)	
OR	Walrus	Odobenus rosmarus
PV	Harbor seal	Phoca vitulina
PL	Spotted seal; larga seal	Phoca largha
PH	Ringed seal	Phoca hispida
PF	Ribbon seal	Phoca fasciata
EB	Bearded seal	Erignathus barbatus
MA	Northern elephant seal	Mirounga angustirostris
US	Unidentified phocid (hair or true seals without visible, external ears)	
UP	Unidentified pinniped (the order which includes both otariids and phocids)	
EL	Sea otter	Enhydra lutris
PD	Dall's porpoise	Phocoenoides dalli: dalli type
PT	Dall's porpoise	Phocoenoides dalli: truei type
PB	Dall's porpoise	Phocoenoides dalli: black type
PX	Dall's porpoise	Phocoenoides dalli: type unknown
PP	Harbor porpoise	Phocoena phocoena
DD	Common dolphin	Delphinus delphis
LO	Pacific whiteside dolphin	Lagenorhynchus obliquidens
LB	Northern right whale dolphin	Lissodelphis borealis
SC	Striped dolphin	Stenella coeruleoalba
TT	Bottlenose dolphin	Tursiops truncatus
SB	Rough toothed dolphin	Steno bredanensis

GG	Risso's dolphin	<u>Grampus</u> <u>griseus</u>
SL	Spinner dolphin	<u>Stenella</u> <u>longirostris</u>
SA	Spotted dolphin (Central Pacific)	<u>Stenella</u> <u>attenuata</u>
SG	Spotted dolphin (Eastern Pacific)	<u>Stenella</u> <u>attenuata</u>
LH	Frasier's dolphin	<u>Lagenodelphis</u> <u>hosei</u>
UD	Unidentified dolphin/porpoise	NE
GM	Shortfin pilot whale	<u>Globicelphala</u> <u>macrorhynchus</u>
FA	Pygmy killer whale	<u>Feresa</u> <u>attenuata</u>
PC	False killer whale	<u>Pseudorca</u> <u>crassidens</u>
OO	Killer whale	<u>Orcinus</u> <u>orca</u>
DL	Belukha; beluga	<u>Delphinapterus</u> <u>leucas</u>
UX	Unidentified small whale	NE
PM	Sperm whale	<u>Physeter</u> <u>macrocephalus</u>
BE	Baird's beaked whale	<u>Berardius</u> <u>bairdii</u>
ZX	Goosebeak whale	<u>Ziphius</u> <u>cavirostris</u>
MS	Bering Sea beaked whale	<u>Mesoplodon</u> <u>stejnegeri</u>
ER	Gray whale	<u>Eschrichtius</u> <u>robustus</u>
MN	Humpback whale	<u>Megaptera</u> <u>novaeangliae</u>
BA	Minke whale	<u>Balaenoptera</u> <u>acutorostrata</u>
BX	Bryde whale	<u>Balaenoptera</u> <u>edeni</u>
BB	Sei whale	<u>Balaenoptera</u> <u>borealis</u>
BP	Fin whale	<u>Balaenoptera</u> <u>physalus</u>
BL	Blue whale	<u>Balaenoptera</u> <u>musculus</u>
BG	Black right whale	<u>Balaena</u> <u>glacialis</u>
BM	Bowhead whale	<u>Balaena</u> <u>mysticetus</u>
MM	Narwhal	<u>Monodon</u> <u>monoceros</u>
UZ	Unidentified large whale	NE
UW	Unidentified whale	NE
UM	Polar bear	<u>Ursus</u> <u>maritimus</u>

Orth

PAGE ______ OF ______

Fishery no.		Cruise no.					Vessel code				Year	
1	2	3	4	5	6	7	8	9	10	11	12	13
				1	1	4	A	1	2	1	8	9

FORM 10US - MARINE MAMMAL INCIDENTAL CATCH DATA

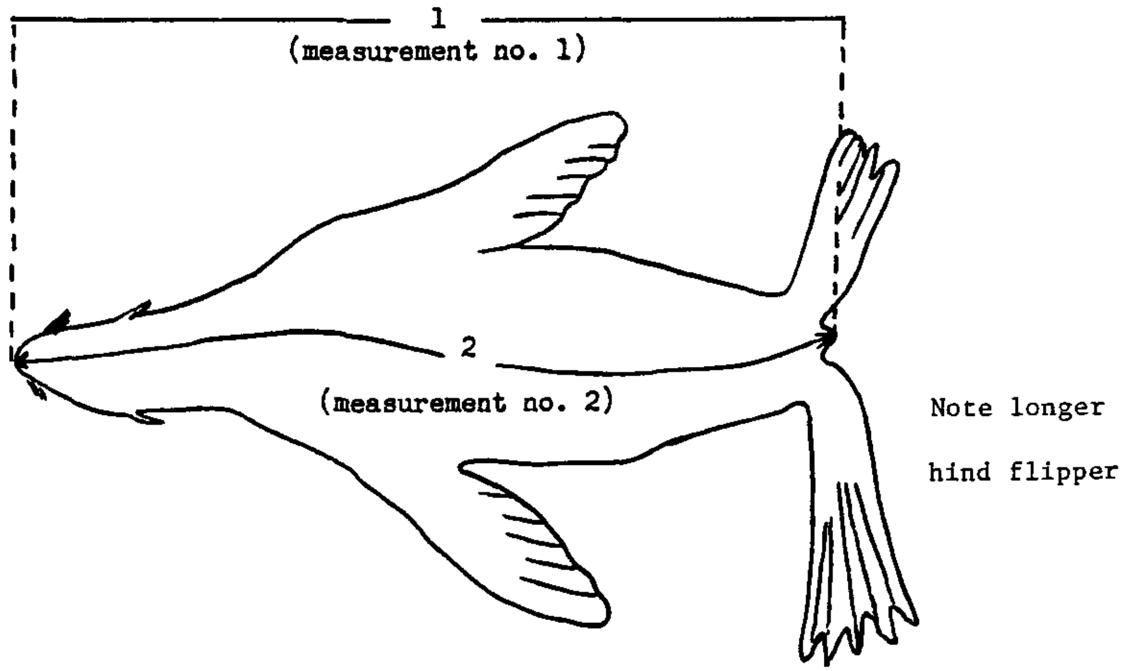
Date (MO/DAY)	Haul, delivery, or set number	Marine mammal species (if none observed, write in none)	Marine mammal species code	Number of marine mammals: Deterred	Released or escaped alive (uninjured)	Released or escaped alive (injured)	Freshly dead (entangled or entrapped)	Unknown condition	Decomposed	Lethal removal (not entangled or entrapped)	Lethal removal (entangled or entrapped)
14 15 16 17	18 19 20	(Trawler Example)	21 22	23 24 25	26 27	28 29	30 31	32 33	34 35	36 37	38 39
0910	101	None									
↓	103	Steller sea lion	EJ			1	1				
0910	105	None									
0912	107	↓									
	108										
↓	109	↓									
0912	110	None									
0913	111	Unidentified small whale	UX						1		
↓	112	None									
0913	113	↓									
0914	115										
	116										
↓	117	↓									
0914	118	None									
		(Longline Vessel Example)									
1020	1	None									
↓	3	Steller sea lion	EJ	7							
20	5	None									
21	6	↓									
↓	7	None									
21	9	Killer whale	OO	5							
↓ 23	10	None									
1024	11	None									

FORM 10B-US REMARKS ON MARINE MAMMALS SUBJECTED TO DETERRENCE OR TAKEN IN THE CATCH

Describe features used in identification; circumstances and effects of deterrents; particulars concerning entrapment or entanglement; types and extent of injuries; etc. Indicate whether or not observation was part of random sample (on front side of form). Record measurements, sex, specimens taken on marine mammal specimen form.

	Haul Set or Delivery Number	Data on Front? (Y/N)	Data on Specimen Form? (Y/N)	REMARKS
trawler example	103	Y	Y	There were two sea lions in this haul, (external ears, stocky large animals, light brown coats). The one that was freshly dead was near the tail end of the cod end. It was a female (vaginal opening next to anus) smaller in size (180 cm) and lighter in color than the live male. There were no obvious injuries. I took a standard length measurement of the female and removed her snout. The male, recognized only by its huge size and massive neck was near the wings of the net, its head tangled in the large mesh. A crewman cut the net, but as he was hesitant to get too close, a fragment of netting remained around the sea lion's neck. The animal charged around the deck, then dove down the stern ramp and swam away. No measurements were taken of the male.
	107	N	Y	A dead sea lion came up in an unsampled haul. It was a juvenile male (small size ~150 lbs, scrotum, and penile opening 20 cm from anus. I removed the snout and took both length measurements
	111	Y	N	The cetacean was in an advanced stage of decomposition. It was a toothed whale, but because of its state I was unable to note any other important features for use in determining species or sex, length 4.2 m
longline vessel example		Y	N	A group of 7 sea lions appeared soon after we began hauling in the set. They dove on the line about 20 feet ahead of the vessel, and we soon noticed the increase in numbers of empty hooks and sablefish heads. The captain ordered a crewmember to throw 2 seal bombs at them. The bombs were thrown about 4 mi[n] apart and exploded within 7 feet of the nearest sea lions. Five sea lions left immediately, but 2 continued to prey on the line.
		Y	N	A pod of 5 orcas appeared soon after the set began to be hauled in. There was one large male with a large dorsal fin that lopped over to the left side at the top - see drawing on Orca Sighting Form. The others were either females or juvenile males. They stationed themselves ~60 feet ahead of the vessel. Two seal bombs were thrown, but had no effect - they continued to prey on the line. After retrieving the set, the vessel went to shallow water to fish for cod.

LENGTH MEASUREMENTS OF SEALS AND SEA LIONS

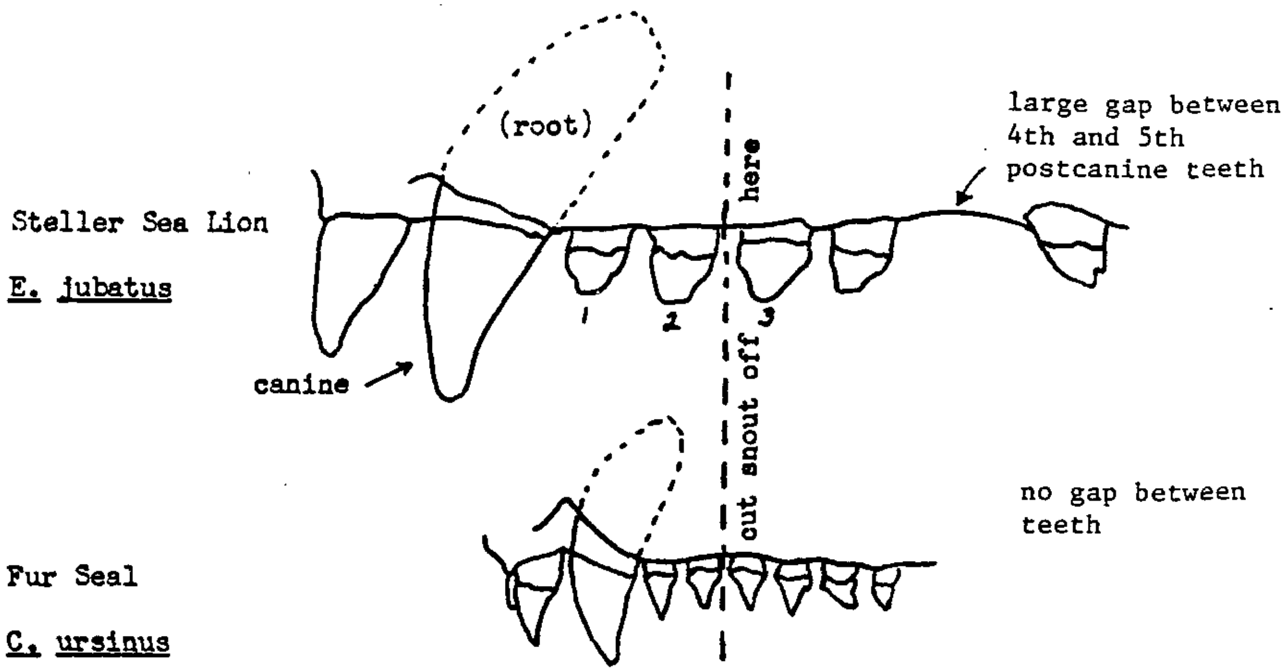


Upper half of diagram is of Steller Sea Lion, lower half is Northern Fur Seal.

Standard Length (measurement no. 1) is the straight-line distance from snout to tip of tail flesh on the unskinned body, belly up, ideally with the head and vertebral column on a straight line. If rigor has set in, then this measurement probably cannot be taken and measurement no. 2 should be taken.

Curvilinear Length (measurement no. 2) is taken when the seal cannot be stretched belly up, as when rigor sets in, or is too heavy to be moved. It is the shortest surface distance from snout to tip of tail flesh along back, belly, or side. Record the type of measurement taken. Seals are usually measured with a flexible tape.

COLLECTION OF SEA LION AND FUR SEAL TEETH



Outline of sea lion and fur seal teeth

The procedure in collecting a tooth from a seal or a sea lion is as follows:

1. Skin and cut off snout, taking care not to damage the root of the canine tooth.

2. To insure that the entire canine root is collected, the snout should be cut off between the 2nd and 3rd post canine teeth (see figure).

3. Method of preservation: (use a. or b.)
   a. Boil snout until tooth can be easily pulled and removed. Do not forcibly twist the tooth when removing - twisting will break the tooth.
   b. Boil snout until no more flesh remains on jaws - jaws can then be stored dry.

4. Do not preserve snout in formaldehyde.

FORMS 11(A) and 11(B) - MARINE MAMMAL SIGHTING AND EFFORT FORMS

These forms are designed to gain information about marine mammals sighted other than those brought up in the fishing gear. Most marine mammal sighting data are valuable, whether or not you were deliberately looking for mammals. Thus, if a crew member points out a mammal to you, or if you merely glance up from your work and see a mammal, write it down, and record the information on the form.

We are interested in all species of marine mammals that you might encounter and will provide an identification guide to assist you in making identifications. If you are unable to positively identify an animal, then please indicate so on the form. Records of unidentified marine mammals tend to lend credence to those records that include identification. Please make a complete description with copious notes and illustrations as necessary, to fully describe any new species of marine mammal sighted. Records of species which are not fully documented and have not been previously encountered, will probably not be verifiable at a later date.

Instructions for filling out Marine Mammal Sighting Form II(A)

(* = Do not fill in boxes preceded by an asterisk except as noted.)

1. NAME: In the upper left hand corner of the form, write the observer's and vessel's names.

2. DATE (7-12): Note proper sequence (yr./mo./day)

   TIME (13-16): Time of sighting is logged when the animal is first seen. All times are logged in GMT.

3. LATITUDE (18-23): To tenths of minutes, if possible.

4. LONGITUDE (24-30): To tenths of minutes, if possible. Place E or W in box 30, depending on which side of the 180th meridian the sighting occurs.

5. SPECIES: Write in both the common and scientific name of the animals. Do not enter a species name unless you are absolutely positive. If you are the least bit unsure of the animal's identity, enter as "unident. large whale", "unident. porpoise", etc. Remember that an erroneous identification is worse than none at all. If more than one species are sighted at the same time, note the association (if any) in the comments section and fill out a separate sighting form for each species.

Important things to look for and make notes on when attempting to make an identification are: (Make notes under "17. Comments" and circle the characteristics on back of the Sighting Form)

A. Shape and size of dorsal fin and its position on the body. If possible, also note size and shape of tail and flippers.

B. Length. Size is difficult to estimate at sea, so if it is convenient, compare unfamiliar animals with a species with which you are familiar. For example--"about size of female Stellar sea lion" or "slightly smaller than adult male killer whale."

C. General shape of body (slender or robust).

D. Shape and size of snout. Is it long or short (estimated length in inches)? Is there a definite break between snout and forehead? Is the forehead markedly bulbous?

E. Color pattern on fins and body (stripes, spots, patches, mottling).

F. Shape, location, and direction of spout. Is it single or double? Where is spout located on head? Does it lean forward or go straight up?

G. Scars and scratch marks

6. NUMBER SIGHTED (37-40): If unable to count the animals, estimate the number seen in terms of a range (e.g., 250 + or - 50). For Dall's porpoise, note if you see more roostertails than the actual number of animals that come to the boat. (There is evidence that schools may split up.)

7. BEHAVIOR: Record primary behavior observed. For example, the most frequently observed behaviors are as follows:
   - No specific behavior other than in the water
   - Following vessel
   - Bow riding
   - Porpoising
   - Attracted by fish nets
   - Feeding
   - Avoidance
   - Nonspecific contact/play
   - Roostertailing
   - Slow-rolling
   - Riding stern wake
   - Milling
   - Approach vessel-veer away
   - Slow roll-roostertail-slow roll

   (Additional notes on behavior can be made in the comments section.)

8. ANGLE FROM BOW (47-48): Consider the ship a 360 degree circle when recording sighting angle; dead ahead being 000 degrees and dead astern being 180 degrees.

9. INITIAL SIGHTING DISTANCE: Note it in nautical miles, yards, or meters, whichever you are most comfortable with. Convert to 10's of meters and place in boxes 50-52. Remember that boxes 47-52 are right justified (e.g., 100 meters = 10 in boxes 51-52).

10. VISIBILITY: Note in miles, if good weather, or in meters, if poor (e.g., fog).

11. WAVE HEIGHT: Record wave height in meters.

12. VIS CODE: Do not fill in (note asterisk).

13. WEATHER: Rain, fog, blue skies, overcast, etc. Also note wind strength.

14. SURFACE WATER TEMPERATURE (54-56): In degrees Centigrade. If below freezing, place a "-" in box 54. Temperature is placed in boxes 55-56.

15. PLATFORM CODE: Do not fill in (note asterisk).

16. TIME ZONE: Do not bother to fill this in (note asterisk).

17. IDENTIFICATION: This section is one of the most important parts of the observation. **Remember, if you identify the animal, say how you did it**, (e.g., Sperm whale - 35 ft., large square head, no snout, spout at end of head and leaning forward).

Everything that you observed about the animal and used to identify it should be entered. Be liberal with sketches! Use as much room as you need to get everything down (the back of the sheet, if necessary). In addition to details of the animal's appearance, note:

1. Kinds and numbers of other associated animals (fish, birds, squid, mammals, etc.) and their behavior.

2. Anything else you think might be of interest.

BEHAVIOR COMMENTS: Be generous with narrative of animal behavior. If there are several animals, are they in a tight school, a loose school, or scattered either singly or in small groups? Do the animals approach the vessel and ride the bow wave? Note their diving behavior. How many times do they blow when they come to the surface? Do they raise their tail flukes when they dive after their last blow? How long do they stay down between each series of blows? Do they leave "tracks" or swirls on the surface when they are submerged? Do they jump (breach) clear of the water? If so, do they jump in a smooth arc or do they sometimes belly-flop, somersault, or spin?

Note how close the animal approached the vessel.
Were the marine mammals attracted to the ship by the net retrieval? Were they feeding off discarded fish and fish parts? Are these mammals possibly the same ones that you have previously reported seeing?

FORM 11(A)

~~FOREIGN~~ FISHING OBSERVER
MARINE MAMMAL SIGHTING FORM
* DO NOT FILL IN BOXES PRECEDED BY AN ASTERISK

CRUISE NO. ____________
VESSEL CODE ____________

1. OBSERVER NAME Charlie Tuna — RECORD ID * [ ][ ][ ][ ][ ][ ] (1 2 3 4 5 6)
   VESSEL NAME American Boat

2. DATE (Yr./Mo./Day) & TIME (~~GMT~~) OF SIGHTING — YR, MO, DAY: 8 9 / 1 0 / 1 1 (7 8 9 10 11 12); TIME (GMT): 0 3 0 0 (13 14 15 16)

3. LATITUDE (degrees/minutes/10ths)—N/S — DEGREES, MIN., 10ths: 5 4 5 9 4 (18 19 20 21 22) * N (23)

4. LONGITUDE (degrees/minutes/10ths)—E/W — DEGREES, MIN., 10ths: 1 5 7 3 6 8 (24 25 26 27 28 29) E/W: W (30)

5. SPECIES Unidentified Balenoptera (Common name) Balenoides sp. (Scientific name) * [ ][ ] (33 34) TENTATIVE * [ ] (35)

6. NUMBER SIGHTED 7 ± 2 — C.I. * [ ] (36) — [ ][ ][ ][7] (37 38 39 40)

7. BEHAVIOR Appeared to be feeding; short shallow dives in a concentrated area * [ ][ ] (45 46)

8. ANGLE FROM BOW [ ][9][0] (47 48 49)

9. INITIAL SIGHTING DISTANCE 2 statute miles — 10's of meters [3][2][2] (50 51 52)

10. VISIBILITY 5 statute miles

11. WAVE HEIGHT (meters) 1.5 m

12. VIS CODE * [ ] (53)

13. WEATHER (& WIND SPEED) Lt. Rain/Fog; Wind 10k @ 200°

14. SURFACE WATER TEMP. (° C) ± [+] (54) [0][9] (55 56)

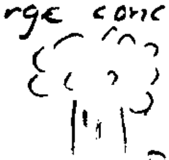
15. PLATFORM CODE * [1][9][9][4] (57 58 59 60)

16. TIME ZONE * [ ] (61) * [ ][0] (62 63)

17. How did you identify animal(s)? Sketch and describe animal; associated organisms; behavior (include closest approach); comments.

Straight tall blows, very falcate dorsal fin. 7 ± 2 animals about 2 miles off starboard beam heading slowly away from ship. Observed blows followed by dorsal fin after blow disappeared. Chief Officer pointed out on fish finder, a large concentration of plankton in the area.


Dorsal Fin


Blow

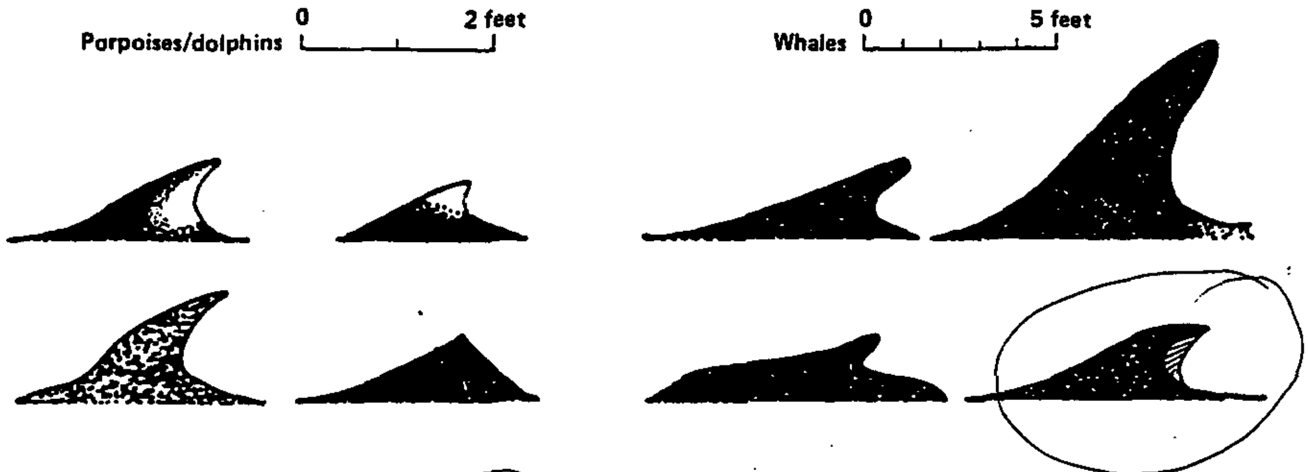
[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] (65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80)

To aid in your identification of whales and porpoises, circle the characteristics corresponding to the features you observed.

Body length (estimation): < 10 feet 10–25 feet 25–50 feet 50–80 feet

Dorsal fin? Yes No

Shape of dorsal fin:

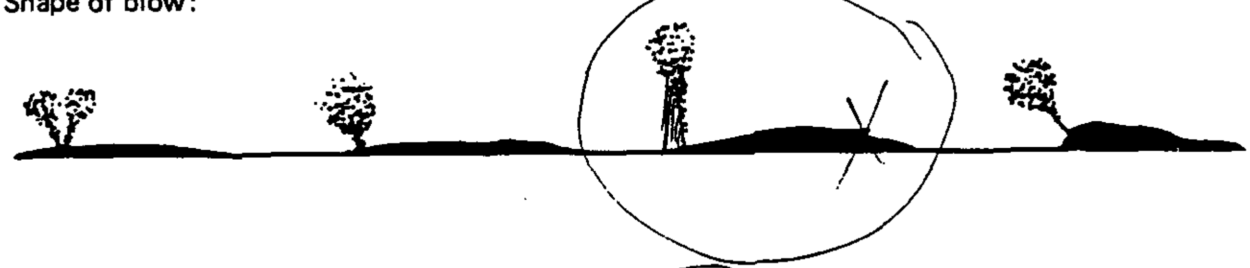


Prominent blow? Yes No

Number of blows before a long dive: N/A 1–3 4–7 8–15

Length of dive: < 2 minutes 5–7 minutes 10–20 minutes

Shape of blow:



Showed flukes upon dive? Yes No

Other behavior characteristics:
- No specific behavior
- Following vessel
- Breaching
- Stern riding
- Bow riding
- Slow rolling
- Porpoising
- Other Feeding?

Distinctive markings (scarring, white patches, etc.): None observed

GENERAL DIRECTIONS FOR OBSERVERS ON LONGLINERS

Longline boats may be the "catcher only" type that ice and deliver their fish to a shoreside plant or to a mothership for processing, or they may be catcher/processors. Longliners catch fish using a line with baited hooks attached to it (refer to the gear diagram). The "long line" is usually maintained aboard in sections coiled onto "skates" or in a rack and called "magazines". During retrieval of the line, the end of one skate, magazine, or half magazine and the start of the next may be flagged by a line marker or a weight attached to the line. Hooks are each attached to the longline by a length of light line called "gangen." A longline is put out to fish or "set" through a hatch in the stern of the vessel, left to soak for a couple hours, and later retrieved over a roller into a cutout in the starboard side of the vessel called the "pit". There are typically three sets made and retrieved each day, and the target groundfish species are sablefish (also called black cod), Pacific cod, or Greenland turbot. Halibut are primarily fished with longline gear also. On a longliner, the fish are removed from the hooks one at a time as line is retrieved and are immediately processed or iced. This effort is labor-intensive but it produces a very high quality product.

CATCH RATE ESTIMATES

The skipper's catch weight estimates are always based on line counts and production data. There are no deck or bin estimates of catch weight. Longliner catches are logged by set, and all sets are attributed to the day that the retrieval of that set was completed. Just as for trawlers, the only time a noon position is recorded on form 1US is on a non-fishing day. (Refer to Form 1US of a following page.) Observers on longliners should be able to estimate the total catch of each sampled longline set using the following proportion:

$$\text{Estimated catch weight} = \text{weight sampled} \times \frac{\text{Hooks retrieved}}{\text{Hooks sampled}}$$

(for that set)

Since part of the observer's catch estimate is dependent upon the number of hooks, observers *should try to periodically verify their number. Some methods for determining this are as* follows:

1. Obtaining hook count from the automatic baiter.
2. Actual count of hooks on several skates and tallying skates during retrieval.
3. Overall timing of the setting of skate with a calculation of the average number of seconds to set one skate.
4. A conversion of miles of gear set to skate using the video course plotter.

If some sections of line or some pots are set but not retrieved due to bad weather or gear conflicts, note this in your logbook and final report. Do not include catch estimations of this lost gear in the total catch estimation.

FICTITIOUS DATA

FORM 1US - CATCH SUMMARY FOR U.S. LONGLINE AND POT VESSELS

1. Leading zeros in columns 12, 14, 33 - 36 only.
2. Skip line after each day
3. On days with no sets, enter date, noon position in 24 - 32 and set no. = 0. Note reason.
4. Trailing zeros are required in columns 60 - 74.

Depth (column 41)
M = meters
F = fathoms

Cruise no. (1-5)	Vessel code (6-9)	Year (10-11)
132	A321	87

Sets sampled	Date Mo. (12-13)	Date Day (14-15)	Set no. (16-18)	Gear type (19-20)	Gear performance (21)	Processing mode (22)	Location code (23)	End position of set (N) latitude (24-27)	E/W (28)	(I) longitude (29-32)	Soak time hrs (33-34)	Soak time min (35-36)	Avg. bottom depth (37-40)	M/F (41)	Longline fishery No. of skates (42-44)	Skate length (fathoms) (45-48)	No. hooks/skate (49-52)	Pot fishery No. of pots (53-55)	Length of set (fathoms) (56-59)	Retained catch (round wt.) (mt.) (60-64)	Official total catch (mt.) (65-69)	Observers total catch (mt.) (70-74)	ADF+G stat. area (75-80)
✓	10	20	1	8	1	1	R	5534	W	6842	10	45	325	F	10	300	140			1.62	2.30	2.16	68553
			2					5542		6842	12	10	285		10					1.45	1.65		685530
✓			3					5528		6821	12	20	165		12					1.08	1.80	1.65	685500
			4					5524		6802	11	50	127		12					.85	1.55		685500
✓		20	5					5456		6711	11	50	186		10					.62	1.00	1.20	675430
✓		21	6					5458		6720	10	20	215		10					.58	1.40	1.20	675430
✓			7					5445		6711	10	45	190		12					1.75	2.15	2.58	
			8					5448		6708	09	15	195		10					1.23	1.60		
✓		21	9				R	5436		6710	09	30	253	F	10	300	140			1.90	2.20	2.40	675430
		22	0				N	5420		6518	NO		FISHING — TOO ROUGH										65540
✓		23	10				R	5418		6520	16	30	110	F	10	300	140			2.05	2.65	2.48	65540
✓	10	24	11	8	1	1	R	5417	W	6542	17	10	130	F	10	300	140			1.62	2.05	2.28	65540

INSTRUCTIONS FOR FILLING OUT
DOMESTIC LONGLINE AND POT VESSEL FORMS

FORM 1US - CATCH SUMMARY

This form is used to collect the fishing effort and total catch data for either longline or pot/trap vessels. Most of the form is filled out by observers on both longline or pot vessels, but there is a part of the form that is specific for each type of vessel. Points to note :

1. Collect Form 1US data for the entire period you are aboard. Make certain that you have all of the sets recorded for the days you begin and end sampling.

2. The identifying cruise number and vessel code will be assigned after you return and will be different for each vessel you are on. Keep the data for each cruise separate.

3. Place a check mark in the far left column to indicate which sets of longline or strings (sets) of pots you sampled.

4. A given set number should be used only once - no duplicates. The set numbers must be in numerical sequence (like haul numbers). Make sure that the set numbers do not *exceed 3 digits. All sets must be recorded unless there was a gear malfunction resulting* in a zero catch. A set number must be assigned to every set. If you reach set number 999, the next set should be "1", not "0." Set number "0" means that the vessel did not finish retrieving any set that day.

5. Enter the gear type:

   6 - pot or trap vessel
   8 - longline vessel

6. Enter the gear performance code:

   1 - no problem
   6 - gear conflict (groundline cut)
   7 - considerable predation of catch by sea lions
   8 - considerable predation of catch by killer whales (orca)

7. Enter the processing mode: (Indicates where the utilized fish from that set are processed)

   1 -Most of the processing is done on board the catcher vessel (a catcher/processor). The products are placed in a freezer hold and the trip usually lasts more than a few days.

   2 -The catch is delivered to a mothership at sea for processing.

   3 -Utilized catch is delivered to a shore-based processing plant. The trip usually

lasts no more than 3 to 4 days and in the meantime the catch is kept on ice.

8. For the location code, enter R if the location in columns 25-33 is the location that the last of the set was retrieved or N if it is a noon position on a nonfishing day.

9. If no set retrieval is completed on a given day (due to bad weather, transfer of cargo, traveling, etc.), enter the noon position of the vessel in columns 24 - 32 and enter 0 in the set number column. In columns 33 - 74, comment on the reason there was no fishing. All days at sea must be accounted for in this manner.

10. The location entered should be the latitude and longitude of the ship at the time the retrieval of the set was completed. Make sure that all positions are reasonable -i.e., 58° 63' does not exist; double check positions that indicate large movements if you have not been aware of any. The first digit of longitude (1) is understood, so record only the following digits. Each longline or set of pots must have a position. On days in which no retrieval of a set is completed, record noon position in these columns.

11. Enter the soak time of the set - the time interval from the time the first part of the line was laid until the time the last of the set is brought in. If bad weather or killer whales prevent the crew from bringing in any of the line for a period of time, subtract the time spent waiting from the total elapsed time. The elapsed time should be entered in hours and minutes; the two digit hour designation (use leading zeros as necessary), should be entered in columns 33 and 34 to the left of the dashed line, and the minutes (use leading zeros again as necessary) should be entered in columns 35 and 36 to the right of the dashed line. For example, a soak time of 38 hours and 5 minutes would be entered as 38|05.

12. A set is assigned to a day according to the time the retrieval of the set is completed, which is not necessarily the same day that the set was begun to be laid or the day that you sample. Sets whose retrieval is completed before 0000 hours are attributed to the previous day, and sets whose retrieval is completed on or after 0000 hours are assigned to the next day.

13. The average bottom depth (cols 37 - 40) can be recorded in either fathoms (more likely) or meters, depending on the depth recording instruments that the vessel has, and in some cases, what units they are set at. Make sure that you indicate the units (fathoms or meters) with an "F" or an "M" in column 41 for every depth that you record.

14. Longline vessels only:

The number of skates (columns 42-44) should represent the number of units of longline that are retrieved from the set, not necessarily the number that are set. If possible, however, keep track of the number of skates that are lost and include that in your daily log and final report.

The skate length (columns 45-48) should represent the length of groundline that the average skate consists of. The length should be recorded in fathoms, not feet or meters, so convert the length to the proper units, if necessary (see Table of Equivalents). If the set consists of skates of different lengths, record the mean length (proportional average).

The average number of hooks per skate should be recorded in columns 49-52. This number usually remains constant throughout the cruise. Sometimes a line consists of alternating skates with different numbers of hooks - find out what the pattern is and note this in your final report.

15. Pot/trap vessels only:

Record the number of pot/traps retrieved per set or string in columns 53-55. If pots are lost, then this will not be the same number as was set. If possible, keep track of the number of pots that are lost and include that in your daily log and final report.

Record the total length of the groundline of the set in columns 56-59. This length should be recorded in fathoms, not feet or meters, so convert the length to the proper units, if necessary (see Table of Equivalents).

16. Retained catch: this is the amount of catch (in metric tons, not pounds or short tons--see Table of Equivalents) that is retained aboard the ship. On catcher processors, generally the retained catch is just the round weight of the fish that are actually utilized for products. The retained catch may thus be the ship's estimates of the products (converted to round weight using product recovery figures and from pounds to metric tons).

On vessels that deliver catch to shoreside processing plants, there may be some discard of prohibited species, small fish, and nonutilized species at sea, but the main discard of fish may occur at the processing plant. Your job will be to estimate the amount that is actually discarded at sea and hence, by subtraction, the amount that is delivered to the processing plant, not what is eventually retained by the processing plant. On longline vessels, probably only the utilizable species and sizes are being retained. If discard is occurring at sea, the best way to determine how much, may be to estimate the amount of utilizable species in the set using the observer sampling data for the set or the day, and a rough estimate of the amount of the undersized target species that were discarded.

Use your judgement as to how to obtain the most accurate data--this figure should always be filled in, even for nonsampled sets, and must be recorded to two decimal places. Give a complete description in your report of how these figures were obtained.

17. Official total catch (mt.): this will be the official catch weight for the set, and should be used in all calculations involving set weight on Forms 3US and radio message worksheets. This should be the best estimate of total catch (all species included), and in most cases it should be based on the ship's estimate of retained catch (round weight), adjusted for the nonutilized species (using the observer's sample data). To adjust sets for which you do not have sampling data, calculate an adjustment factor for the day (see example below) and multiply the retained catch for that set times the adjustment factor for that day. If you observed the set but did not sample it, and feel that the adjustment

factor for that day would not give an accurate estimate of the total catch, then use your judgement as to how to obtain the best estimate of total catch. If the vessel officers can provide good estimates of total catch (all species included), then convert these estimates from pounds to metric tons and use them as the official catch weight. This figure must always be filled in (record it to two decimal places). Note at the top of the form the origin of the official total catch estimate. (The first sheet is sufficient unless it changes.) Give a complete description in your report of how these figures were obtained.

(see form 2US notes for directions for adjusting a sampled set)

$$\frac{\text{sum of adjusted ship's estimates for the sampled sets for the day}}{\text{sum of the retained catch estimates for the sampled sets for the day}} = \text{adjustment factor for the day}$$

$$\text{adjustment factor for the day} \times \text{retained catch est. for a nonsampled set} = \text{adjusted ship est. for that set}$$

18. Observer's estimate: record your estimate of the sets that you sample. This will be an extrapolation of your sampling data for the skates/pots that you sampled to the total number of skates/pots in the set. (See your sampling manual for a more detailed description of the extrapolation.) Record it to two decimal places.

19. Enter the 6-digit ADF&G statistical area that the end position of set (cols 24-32) places each set in. Refer to the special supplement on the ADF&G statistical areas for your determination of the correct area.

20. Leading zeros should be in the dates (cols 12 & 14) and the soak time (cols 33-35) only, as needed.

21. Skip a line after each day.

22. Any notes, or comments (other than notes for nonfishing days) should be placed in a part of the form that is not keypunched.

OBTAINING SPECIES COMPOSITION ON LONGLINERS

Unlike the situation on a trawler, all of the fish from a longline set are not dumped at once into a bin. On longliners, the catch comes up one fish at a time and the fish are usually processed as they come aboard. Observers have noted "patchiness" of fish on a longline set. The change in species composition in different portions of the set makes it important to get samples that are representative of the entire set. Try to get as large a sample size as possible, that is, sample large portions of the longline set.

The large size of the target fish makes basket sampling impractical since the sample baskets would fill up quickly and contain few fish. Tally sampling is the most practical method for observers on longliners. Determine which species dominates the catch at a given time--it may be sablefish, Pacific cod, or rattails. As this chosen species is brought aboard during your sampling period, tally the number of these fish using a thumb counter or a stroke-tally on a plastic sheet. (As you gain in proficiency, it may be possible to tally two species at once, such as sablefish and rattails.) Include in your count, tally fish that drop off the hooks and are missed by the gaffer. Place in your sample baskets everything else that comes up on the line--including those organisms that are normally not wanted and are usually knocked off the hooks so that they are not brought aboard (such as crabs, halibut, sea anemones, sea cucumbers, etc.). Do not bother to include rocks, old fishing gear, etc. -- only organisms. Note also how many units of gear were retrieved during the sampling period using a thumb counter or tally marks on a plastic sheet.

Sort the samples by species, weigh each species group and count the individual organisms in each group as you would in any other form of basket sampling. As close as possible to your sampling period, gather several baskets of the species that you tallied, making sure that you get every fish in your representative sample. Weigh the baskets and count the fish to obtain an average weight of the tallied species. (You will also be able to use these fish for your length frequency sample, if desired.) Multiply the average weight of the tallied species times the number tallied to obtain the total weight of those fish brought aboard during your sampling period.

Some observers have found it convenient to make their tallies from the deck immediately above the longline pit, since it is less dangerous during rough weather and they were able to obtain a good view of the fish coming up on the line without getting in the way. Be aware that the back-up gaffer has a long gaff pole and can jab you in the face with the upper end of it when he pulls in a fish if you're not careful. Wherever you choose to stand, make sure that from your vantage point (whether above the pit or on the fishing deck) you can watch the crew place all of the non-tallied species in your baskets. Obviously, this method requires a good deal of cooperation and understanding on the part of the crew, so it may not be possible to use this sampling method on board your vessel.

If you are unable to use the above sampling method; or, for the first few days until you become familiar with the fish and fishing operation, you may wish to resort to the following easier sampling method. Simply place all of the catch in your sample baskets until they are filled. Note how many hooks it takes to fill the baskets. Take as many basket samples as possible to increase the sample weight. Weigh and count the species groups.

FORM 3US - SPECIES COMPOSITION FOR LONGLINE or POT VESSELS

Leading zeros in columns 12 and 14 only. Skip line between sample sizes when space permits.

Worksheet

Species:	Sablefish	Pect. rattails				
No. weighed:	98	71				
Wt. of above:	298.5	224.0				
Avg. weight:	3.046	3.155				

Other calc.; comments: sampled 7 out of 10 skates. Tallied sablefish and pectoral rattails.

Cruise no. (1–5)	Vessel code (6–9)	Year (10–11)	Mo. (12–13)	Day (14–15)	Set no. (16–18)
132	A321	87	10	21	9

ST = Sampling type
L = Longline
T = Trap/pot
V = Viability only

Check those seen:
- Halibut ☑
- Salmon ☐
- King crab ☑
- Tanner crab ☐

Species name	Sex (19)	Species code (20–22)	ST (23)	Number (24–29)	Weight (in kg. w/ decimal pt.) (30–40)	No. of hooks or pots sampled (41–51)	Viability: Number excellent (52–54)	Viability: Number poor (55–57)	Viability: Number dead (58–60)
(Keypunch check)		999		582	1682.60	Set wt. 2200.0	15	11	9
sablefish		203	L	235	715.81	980			
shortspine thornyhds		350		8	5.04				
pectoral rattail		82		208	656.24				
unid. skate		90		6	14.8				
walleye pollock		201		12	37.2				
arrowtooth flounder		141		27	37.0				
roughscale rattail		81		5	5.0				
shortraker rockfish		326		7	11.7				
Pacific cod		202		35	92.0				
red king crab, M	M	13		2	6.48		2		
red king crab, F	F	13		1	1.20		1		
golden king crab, M	M	8		1	1.02			1	
Pacific halibut, U	U	101		35	99.11		12	10	9
Tanner crab, unid. U	U	3	↓	0	0.0	↓			
Salmon, unid., U	U	220	L	0	0.0	980			

Change is being considered

FORM 3US - SPECIES COMPOSITION FOR LONGLINE OR POT VESSELS

This form is very similar to the 3US form for trawlers - only some of the labels for the sampling type and column headings are different. In fact, if you do run out of longline/pot forms, you can substitute the trawler forms (and vice-versa), so long as you realize what ought to be recorded in the columns. At this time I will not reiterate column by column what should be recorded on this form, but will simply indicate the features that make this different from the U.S. trawler forms.

1. Column 23: note the sampling type code. Use an "L" for longline and a "T" for trap/pot vessel. Do not use "P" for pot, because P is already reserved for "partial whole-haul sample." Use a "V" if you are sampling the set only for viability (in which case, use a separate sheet). *In most cases you will be recording the viability data for the same set* (though possibly a different portion of the same set) and you will be able to use the same form.

2. Columns 41-51: Number of hooks or pots sampled: As the sampling on longline vessels will probably be much the same as on foreign longline vessels, you should use the same sample size for all of the species. If you sample multiples of whole skates, all you need to do to obtain the number of hooks sampled is to multiply the number of skates sampled times the average number of hooks per skate. With pot vessels, you will probably sample a random number of pots and record everything that was in those pots. If you do run into a large number of small individuals of a given species, the form does allow you to sample a smaller random sample of pots for those species, and a larger number of pots for the larger, rarer species. If you do use different numbers of pots to sample different species, remember to take this into account when you do your extrapolation for your radio messages.

3. A reminder: just as for the trawler form, it is necessary to indicate the sample size for halibut, salmon, king crab, and Tanner crab, even if you do not see individuals of those species in your samples. If no individuals of a given species group were observed, then the observer should enter that group name, species code (use codes 2, 3, 101, 220), sample type, number of hooks or pots monitored for that species group, 0 for the number, and 0.0 for the weight. Use the checkoff boxes above the viability column to remind yourself to record those groups not seen.

FORMS 7US AND 9US: refer to the instructions included with the trawler forms.

SAMPLING AND DATA RECORDING INSTRUCTIONS FOR SHORESIDE PROCESSING PLANTS

As a result of the implementation of amendments to the Fishery Management Plans for the Groundfish Fishery of the Gulf of Alaska and Bering Sea and Aleutian Islands Area, managers of shoreside facilities that annually receive 10,000 mt or more of groundfish are required to have an observer at the facility each day it receives groundfish. Also, managers of shoreside facilities that annually receive between 1,000 mt and 10,000 mt of groundfish must have an observer present at the facility for 30 percent of the days it receives groundfish for each 3-month quarter of the fishing year. Individual observer assignments will vary; some observers may be stationed at only one 100% coverage plant, others may be expected to cover one 100% coverage plant and one or two 30% coverage plants, while others may cover two 100% coverage plants that are owned by the same company and are in close proximity to each other.

SAMPLING WORKLOAD

Prohibited Species Sampling: As often as is possible and practicable. This is a high priority, but you must be able to sample the entire delivery and the delivery must be from a vessel where the catch has been sampled by an onboard observer.

Length Frequencies: For 100% coverage plants--150-200/day; for 30% coverage plants--150-200/day on days that you work at the plant (you'll be working at this plant approximately 30% of the time). You may sample deliveries that come from vessels that do not have observers onboard.

Age Structures: For 100% coverage plants--200-300/plant/mo; for 30% coverage plants--300/plant/3 mo. period. You may sample deliveries that come from vessels that do not have observers onboard.

Product Recovery Rates: Collect product recovery rate information (PRR) for major products on a time available basis. This is not a high priority duty but the information is of value.

Density Determinations: Collect density information for the most common species and species mixes. Accurate density measurements can be acquired at shoreside plants much easier than onboard ship. Large, uniform-sized fish totes can be used and accurate weights can be achieved with little trouble. There is no data form for this information at this time. Record information on an eyeball estimate of species composition, the sample weights and volumes in your logbook. (If density samples of are taken from deliveries of observed vessels, the vessel observers composition could be accessed and a comparison of at-sea versus plant density values could be made). This is not a high priority duty but there is a great need for information of this kind.

Special Projects: Observers are sometimes asked to collect special biological information such as pollock maturity or stomach samples. If you are assigned a special project, follow the directions that will be provided.

SAMPLING INSTRUCTIONS

Prohibited Species Sampling:

An important emphasis is to be placed on prohibited species sampling. Your efforts at this time in the development of the domestic observer program will enable program managers to analyze whether the prohibited species sampling effort carried on at sea is sufficiently accurate.

Only deliveries from vessels that have observers on them, should be sampled and the observer must sample the entire delivery. Thus, observers should also be mindful of the amount of time it will take to sample the entire haul for prohibited species. It is essential that the observer monitor the entire delivery, since the purpose of the work is to determine the accuracy of the sampling methods employed at sea. As an example, consider that the shipboard observer estimates that five salmon fell into the holds and were not sorted out before delivery, and the shoreside observer monitors half of a delivery and counts five salmon, should the shoreside observer conclude that he has accounted for the five salmon that the shipboard observer saw fall into the holds?, or should the shoreside observer extrapolate the salmon figures and assume that there are ten salmon in the entire delivery? It's the classic dilemma of sampling for the incidence of a species that occurs only very rarely in the catch--an observer must sample the entire catch. This example points out another area of concern. It is crucial that the shipboard observer record the number of prohibited species that were estimated in their sample (if there were any). Otherwise, (as in the example above) one could not tell whether the five salmon sorted out of the delivery by the shoreside observer have already been counted by the shipboard observer, or whether these five salmon were entirely missed by the shipboard observer, and the total salmon bycatch for that ship should be at least fifteen salmon. (Note: If the shipboard observer is estimating prohibited species that have been thrown overboard and dumped into the holds, then a distinction between the two should be made on the shipboard observer's form 3US.)

Observers should be cautioned against relying on plant personnel to sort, save and or count prohibited species for them. They should also not use the prohibited species figures that are recorded in the "Alaska Groundfish Daily Cumulative Production Logbook" for shoreside processing plants. These logs can be useful for comparison of figures, but they cannot be used as a substitute for an observers sampling effort.

Length Frequency Sampling:

Collect lengths from the major or target species that are being delivered to the plant. If more than one target species is being delivered to the plant you may collect length frequencies from more than one species, however, you must collect 150-200 lengths from each species that you collect lengths from on that day. It is important to strive for random, unbiased sampling; therefore select fish from several samples spaced throughout the delivery. If you are sampling at a plant that requires 100% observer coverage, you should strive to collect 150-200 lengths per day. When you are sampling at a plant that requires 30% observer coverage, you should collect at least 150-200 lengths for each day that you work at that plant. Since, the plant only requires approximately one-third of the sampling effort, it will most likely be sampled only every third day or so.

Age Structure Collection:

Observers are asked to collect 200-300 age structures per plant per month, when working at a plant that requires 100% observer coverage. When sampling at plants that require only 30% observer coverage, the observer should collect 300 age structures per plant per three month period. Since most observers are hired for 2-3 months, they will be expected to complete one collection of about 300 age structures, for each plant requiring 30% observer coverage, during their tour of duty.

Age structure collections should be stratified/random collections (5 per cm. per sex) unless otherwise instructed. When you start a second collection at a plant (second month at a 100% coverage plant), continue the numbering of the vials from where you left off, because you can't have duplicate age structure numbers for the same port sampler/processing plant code.

The "roundfish" species of the highest priority for age structure collections are: Pollock, Pacific cod and all rockfish species including thornyheads (Sebastalobus spp.). The flatfish species of most importance are listed below in order of priority:

Bering Sea	Gulf of Alaska
Yellowfin sole	Rock sole
Rock sole	Flathead sole
Flathead sole	Rex sole
Alaska plaice	Dover sole

If you have collected lengths from more than one species in a month, do not split your age structure collection between the two species. Collections are of most value if they consist of about 200 age structures for any one species. If you begin an age structure collection and then find out that the species that you are collecting lengths and age structures from, is no longer going to be delivered, you have a decision to make concerning whether or not to keep the partially completed age structure collection. The rule of thumb to use in making this decision is: if the collection contains more than 50 age structures, go ahead and keep it, and use the remaining empty vials from that collection for another species; conversely, if the collection contains less than 50 age structures, dump it and use the entire collection of vials for a new species.

Product Recovery and Density Determinations:

Observers should follow the directions in the manual when determining product recovery rates. Use the form 8 and also use the form 8 worksheets. One difference in the directions for the from 8 worksheet, is that each test should consist of three samples of 50 fish, regardless of size. Product recovery rate determinations should be gathered for the most common products that are being made and need not be attempted for surimi.

Density measurements can be taken whenever it is practical and should be tailored to measuring the density of common assemblage mix of species as well as single species such as pollock. Since there are large, easy to measure, fish totes and accurate scales, density data gathered by port samplers will eventually replace the need to sample for density values at sea.

FORM A - PORT SAMPLE SUMMARY FORM

New

Port Sampler No.	3	4	5	Processing Plant Code	6	7	8	9	Year	13	14

Page ____ of ____

Shoreside Sampled	Observer Onboard	Delivery No.	Delivery Date				Gear Type	NMFS Area Code	ADF&G Stat. Area	No. of Tows		Ave. Dur. (mins)	Total Wt. Delivered	LB / MT	Sample Sp. Code	Sorted Y/N	Wt. of Sample sp. Discarded at sea	Wt. of Sample sp. Delivered	LB / MT	Main Product	Abbreviation of Delivering Vessel
			Month		Day																
		10 - 12	15	16	17	18	19 - 20	21 - 23	24 - 29	30	31	32 - 35	36 - 42	43 44	45 - 47	48	49 - 55	56 - 62	63 64	65 - 66	67 - 81

should be an entry for every delivery wheather sampled or not

FORM A - PORT SAMPLE SUMMARY FORM

Port Sampler No.	3	4	5	Processing Plant Code	6	7	8	9	Year	13	14

refers to at sea NOT plant

Page ____ of ____

Shoreside Sampled	Observer Onboard	Delivery No.	Delivery Date Month		Day		Gear Type	NMFS Area Code	ADF&G Stat. Area	No. of Tows	Ave. Dur. (mins)	Total Wt. Delivered	LB / MT	Sample Sp. Code	Sorted Y/N	Wt. of Sample sp. Discarded at sea	Wt. of Sample sp. Delivered	LB / MT	Main Product	Abbreviation of Delivering Vessel
		10 - 12	15	16	17	18	19 - 20	21 - 23	24 - 29	30 31	32 - 35	36 - 42	43 44	45 - 47	48	49 - 55	56 - 62	63 64	65 - 66	67 - 81

from boat log

Old

FORM A - PORT SAMPLE SUMMARY FORM

Port Sampler No.	3	4	5	Processing Plant Code	6	7	8	9	Year	13	14

Page ____ of ____

Shoreside Sampled	Observer Onboard	Delivery No.	Delivery Date		Gear Type	NMFS Area Code	ADF&G Stat. Area	No. of Tows	Ave. Dur. (mins)	Total wt. Delivered (lbs)	Sample Sp. Code	Sorted Y/N	Sample sp. Discarded at sea	Sample sp. Delivered (lbs)	Main Product	Abbreviation of Delivering Vessel
			No.	Day												
		10 -12	15- 16	17 - 18	19 - 20	21-23	24 - 29	30 - 31	32-35	36 - 42	43-45	46	47 - 53	54 - 60	61 - 62	63 - 77

Treat each plant as a separate "cruise" and maintain different sets of data forms for each. Instructions for filling out Form A are given below. Follow the instructions in the manual for forms 3US, 7US and 9US. Remember that you will not be doing any species composition sampling at shoreside processing plants.

Form A: Port Sample Summary Form

1. Maintain a separate set of Form A's for each plant. At the top of each set of forms, enter your name and the name of the processing plant. You should make an entry for every delivery made to the plant, whether or not it was sampled.

2. Port sampler no. (col. 3-5) and Processing plant code (col. 6-9): These columns will be filled out upon your return to Seattle, so leave them blank. On Forms 3US, 7US and 9US the Port sampler no. will substitute for the "Cruise no." and the Processing plant code will substitute for the "Vessel Code".

3. Year (col. 13-14): Enter the last two digits of the year.

4. Place a check mark in the far left column to indicate which deliveries you sampled. (Remember, you must enter data for all deliveries, not just the ones that you were able to sample.) Also place a check in the column labeled "Observer Onboard", if the delivered catch has been sampled by an onboard observer. This will enable staff at NMFS to easily know if the delivery had been previously sampled at sea.

5. Delivery no. (col. 10-12): Enter the delivery number which applies to the catch being delivered to the plant. Delivery numbers for each plant should be sequential and there cannot be any duplicate numbers within each port sampler/processing plant set of forms. Much of the delivery information can be obtained from the NMFS processing plant logs, NMFS ship logs, or through a skipper interview or interview with processing plant personnel. It is especially important to enter on this form every delivery that you sampled. On Forms 3US, 7US and 9US this number will substitute for the "Set/haul no." As with haul numbering on form 2US, you may use the delivery numbering system that is already being used by the processing plant as long as it meets the criteria stated above. This will probably be less confusing for you. However, if you choose, you may set up your own numbering system.

6. Delivery date (col.15-18): Enter the local date (not GMT date) that the catch was delivered to the processing plant. This should coincide with the date that is used in the NMFS processing plant logs and on the ADF&G fish ticket. If the catch is delivered over a period of two or more days, use the date that is on the processing plant logs. This will not necessarily be the date that you sampled the catch. You should use this same date (again, in some cases not the sampling date) on the Forms 3US, 7US and 9US.

7. Gear type (col. 19-20): Enter the appropriate code.

   1 = bottom trawl
   2 = midwater trawl
   3 = unknown or mixed trawl haul
   6 = pot or trap gear
   8 = longline gear

   If you are unsure of the gear type, take notes, leave this column blank for the time being, and discuss it with NMFS staff.

8. NMFS area code: This is the 3-digit code for the area in which the vessel fished (refer to the map in the radio message section of the manual). If the vessel fished in two or more areas for the catch delivered, record the area in which most of the fish was caught, but enter an *, and note on the back of Form A.

9. ADF&G statistical area: Refer to the maps supplied during training, giving the statistical area, using the more detailed map whenever possible, and record the 6-digit statistical area code for the area in which most of the fish were caught. (If you get this information through an interview with the skipper, it is best to take along copies of these maps when you interview the skipper, and have him point out the area or draw the area on the map so that there is no mistake.) If the vessel fished in two or more areas for the catch delivered, record the area in which most of the fish was caught, but enter an *, and note on the back of Form A all of the areas in which the catch was caught. If the skipper is reluctant to give you this detailed information, try to at least get the NMFS area in #9.

10. No. of tows: record the number of tows that were made during the trip. If the vessel is a longliner or a pot vessel, record the number of sets. This information can be obtained from the NMFS ship logs.

11. Average duration: record the average duration of the tows in minutes. Get the actual length of each haul from the NMFS logbook, add up the durations and divide by the number of hauls to get the average duration. You can go up to 9999 minutes for the average length of soak for a longline or pot set.

12. Total weight delivered (lbs): Record the total weight of the catch delivered to the processing plant for that trip. This can be taken from the NMFS processing plant logs. (See note below regarding how to handle cases in which a vessel delivers catch from a single trip to several different processing plants.) In most cases, this should be the same as the sum of the groups reported on the ADF&G fish ticket, but make sure that this includes all of the discards from the plant.

14. Sample species code: This is the three-digit code number for the species of fish referred to on the rest of this row. If you sampled this delivery, you must be sure to record the information on the species that you sampled, and in most cases, you will want to record on additional rows the other major species that were delivered. (Refer to the species

code list in the reference section of your manual--use the NMFS species codes and not the ADF&G species codes.)

15. Sorted? (Y or N): this question refers to whether or not any of the individuals of the species in columns 43-45 were sorted out of the catch and discarded at sea. Fishermen might discard undersized individuals, or fish of a given sex. It is important to know this, because this might affect the length frequency data. This <u>does not</u> refer to any sorting and discarding of other species, such as prohibited species or some other unwanted species.

16. Sample species discarded at sea: if the species in question was sorted for size or sex (as indicated with a Y for "Yes" in no. 15, or if some of the catch was dumped because the holds were already full, the fish were too old, or for some other reason, indicate the approximate amount in pounds that was discarded at sea. This information should be in the NMFS processing plant and ship logs.

17. Main product: the code for the main product that is made by the plant from the species in question. If the plant is making surimi out of pollock and also taking roe from mature female pollock, list the main product as surimi. (Refer to the "List of Alaska Product Types" in the appendix of the manual.)

18. Abbreviation of delivering vessel: There are 15 columns available for the vessel name. In most cases you will be able to write down the full name in the spaces provided--if not, choose an appropriate abbreviation. If you must abbreviate, make the abbreviated name as close to the original as possible. Do not use periods and count the space between words as one of the 15 columns. Check the list of joint venture catcher boats to see if NMFS already has an abbreviation.

<u>What to do when vessels deliver to more than one plant</u>: If you discover that a vessel is delivering fish caught in one trip to more than one plant, you should enter Form A information on only one set of Form A's, preferably the Form A's for the plant where most of the catch was delivered. Note on the back of Form A, or on an attached sheet, the amounts of fish delivered to each plant, but enter on the Form A the total amount delivered to all of the plants, the total amount of sample species delivered to all of the plants, and the total number of tows made during the trip. You may sample the catch from more than one of the deliveries (in fact, it might be a good idea, because you would be apt to sample catch from different parts of the hold), but enter the data on the Form 7's and 9's corresponding to the entry you made on the Form A. Note what you did on a non-keypunched portion of the forms. The two or more length frequency samples from the different plants may be kept as separate length frequencies on the Form 7's--the computer can add them together if necessary, or they may be analyzed separately for variance. Make sure that you do not have any overlapping otolith numbers when you reassign the otoliths to the same plant.

<u>NMFS Skipper Interview Form:</u>

The skipper interview form is a form you may chose to use in part or in whole, to help in collecting information needed to fill out the Form A. It might also be useful as a place to record anything unusual about the catch, the skipper's comments, more detailed information on the location of the hauls, and anything else that cannot be recorded on Form A. As the data needed for Form A has already been discussed, you should find the questions on the skipper interview form largely self-explanatory. A reminder: the questions referring to whether or not the catch was sorted, and if so, what percent was discarded, do not refer to a selective discard of prohibited species or some minor unwanted species--they refer to any size selection or sex selection of the main delivered species, although you may enter a more detailed explanation of exactly what was sorted and discarded at sea for clarification purposes.

Other Skipper Interview Notes:

Other useful information to collect during an interview might consist of information on schooling behavior of the target species, maturity of the fish, anything unusual about the hauls, or comments on areas in which he spent time searching for fish, whether or not anything was caught. If the vessel has a paper-recording fish finder, you might encourage the skipper to save the paper tape (labelled with haul # and depth) for some of the schools seen. Be sure and thank the skipper for any information that he provides, and explain its usefulness in determining the status of fishery stocks. (Note: Don't pursue this line of questioning if the skipper complains that the shipboard observer has already asked him for this information, or if you know for a fact that the shipboard observer has already collected this kind of information--use tact, diplomacy and common sense during any interview. Also, stress that all information collected will be held in strict confidentiality.)

Gear diagrams--if possible, get the skipper to fill out net diagrams for the nets used on vessels that do not have an onboard observer. There are two diagrams, one for midwater trawls (a Polish rope-wing trawl), and one for bottom trawls. Modify the diagrams as necessary to reflect what the nets are really like. If you can get only some of the information, try to at least get mesh size, especially codend mesh size. If the fisherman used two different nets on a trip, note that on the interview forms. The next time the vessel comes in there is no need to get another gear diagram, so long as the fisherman used the same nets as before--just confirm that fact.

Optional

NMFS SKIPPER INTERVIEW FORM

Port sampler no. ______________ Processing plant code ____________

Delivery no. ________________ Delivery date ____________________

Date of interview _____________ Time _______ AM PM

Vessel name ____

Person interviewed ____

Skipper? Yes, No, if not, position ___________________________

Vessel length _______________ tonnage ________________ horsepower ______________

Gear: midwater, bottom, mixed, other
Description of gear (refer to trawl diagrams) ____________________________

NMFS area fished _______________ ADF&G stat. areas fished _______________

Average steaming time to/from grounds: ______________ Searching time: ______________

Number of tows: ______________ Average haul duration (minutes): ________________

Was catch sorted (size, sex, etc) prior to delivery? yes no

If sorted, what percent discarded? _______ %

Species	Total wt. delivered	Amt. discarded at sea
	lbs	lbs
	lbs	lbs
total all species:	lbs	lbs

Method used to determine total weight of target species:

Method used to determine total weight of fish delivered:

Was observer aboard this trip? No, Yes--NMFS, Yes--ADF&G

General comments (fishing success, fish size, school size, comparisons to previous years, etc):

DISTRIBUTION: WHITE-PURCHASER YELLOW-FISH & GAME PINK-SELLER BLUE-NMFS

MOORE Speediset 405

PURCHASER

ALASKA DEPARTMENT OF FISH & GAME

GROUNDFISH TICKET

PLEASE REFER TO CODE LISTS PRINTED ON THE FRONT INSIDE COVER OF EACH BOOKLET

DO NOT WRITE IN THIS SPACE

G89 00000

Vessel Name: Americanization

Fishery →

Name →

Permit Number →

ADF&G NO. 99802

Date Trip Began: 1/6/89

Date Landed: 1/11/89

Days Fished: 5

Proc. Code: F9946

Company: American Fishing Co. LTD

Hauler

PORT OF LANDING OR VESSEL TRANSSHIPPED TO

Off-Bottom Trawl

PRINT TYPE OF GEAR USED

STATISTICAL AREA WORKSHEET

AREA	%	AREA	%

SPECIES	Code	STAT AREA	COND. CODE	POUNDS	PRICE	AMOUNT	SPECIES	Code	STAT AREA	COND. CODE	POUNDS	PRICE	AMOUNT
SABLEFISH	710						UNSPECIFIED DEMERSAL ROCKFISH	168					
							UNSPECIFIED PELAGIC ROCKFISH	169					
							UNSPECIFIED SLOPE ROCKFISH	144					
FLATHEAD SOLE	122						PACIFIC OCEAN PERCH COMPLEX	141					
ROCK SOLE	123												
YELLOWFIN SOLE	127						THORNYHEAD ROCKFISH	143					
ARROWTOOTH FLOUNDER	121						ATKA MACKEREL	193					
GREENLAND TURBOT	134						LING COD	130					
							SQUID	875					
							OTHER GROUNDFISH						
PACIFIC COD	110	645530	23	23,986									
		635501	23	20,944									
POLLOCK	270	645530	23	111,962									
		635501	23	36,244									
		635501	98	6,287									

EXAMPLE

Fisherman's Signature * John Smith

Fish Received by Jane Berger

FISH DELIVERED HEREBY WERE CAUGHT IN COMPLIANCE WITH STATE LICENSING LAWS

Joint venture catcher boat list sorted by full name: 09/27/89

Official#	Abbreviation	Full name	Len	Wt	Notes
599169	A J	A J	150	196	
626517	Al Sea	Al Sea	125	126	
566399	Alaskan Pride	Alaskan Pride	111	131	
909394	Alaskan Star	Alaskan Star	85	199	Sank in February 1988
664363	Aldebaran	Aldebaran	132	135	
590992	Alert	Alert	91	107	Sank in February 1985
603820	Aleu Challenger	Aleutian Challenger	86	126	
623570	Aleut Harvester	Aleutian Harvester	94	144	Sank in November 1985
622750	Alliance	Alliance	107	134	
558548	Almighty	Almighty			
623611	Aloma	Aloma			
560237	Alyeska	Alyeska	125	131	
561771	Amalaska I	Amalaska I			
917066	Amalaska II	Amalaska II			
529425	Amber Dawn	Amber Dawn	97	116	
618713	Ambition	Ambition	95	136	There is >1 catcher boat w/ this name.
526899	Ambition*	Ambition (*)	61		There is >1 catcher boat w/ this name.
613847	American Beauty	American Beauty	123	135	
558605	American Eagle	American Eagle	120	129	
	American Scoter	American Scoter			
	Amy Lynn	Amy Lynn			
608349	Andrew McGee	Andrew McGee	123	131	
560532	Anita J	Anita J	110	134	
524384	Anna Marie	Anna Marie	78	120	
609117	Annihilator	Annihilator	82	93	
655328	Arcturus	Arcturus	132	135	
225604	Argo	Argo	58	26	
611365	Argosy	Argosy	105	135	
	Atlantic Pride	Atlantic Pride			New name is: Uyak II
639547	Auriga	Auriga	193	*00	
636919	Aurora	Aurora	193	*00	
	Barb Pacifico	Barb Pacifico			
623210	Barbara Lee	Barbara Lee	108	181	
521120	Bay Islander	Bay Islander	47		
653806	Bering I	Bering I	146	109	
526744	Betty A	Betty A			
	Billie Jean	Billie Jean			
514665	Blue Fox	Blue Fox			
531320	Bon-Su-Mar	Bon-Su-Mar	90	126	Previous name was: Tam-Ran
	Bottom Line	Bottom Line			Sank in November 1984
591368	Buck n Ann	Buck n Ann	56	33	
590758	Calif Horizon	California Horizon	90	181	
	Cal Hor/Mag Lyn	California Horizon & Margaret Lyn			They fish together as a pair trawler.
626220	Cape Falcon	Cape Falcon	86	90	
618158	Cape Kiwanda	Cape Kiwanda			
513228	Captain Julian	Captain Julian	72	58	Sank in October 1986
583916	Caravelle	Caravelle	77	114	
615699	Clr Water Heron	Clear Water Heron	92	198	
622773	Coho	Coho	66	61	
505269	Colentino Rose	Colentino Rose			
610150	Colentino R II	Colentino Rose II			
593809	Collier Bros	Collier Brothers	80	105	
615729	Columbia	Columbia	122	198	
914214	Commodore	Commodore	108	140	

Official#	Abbreviation	Full name	Len	Wt	Notes
	Cotto	Cotto			
532081	Dawn	Dawn	86	115	
619236	Defiant	Defiant	59	63	
536161	Distant Water	Distant Water	119	137	
628595	Dona Genoveva	Dona Genoveva	123	148	
651752	Dona Liliana	Dona Liliana	165	193	
651751	Dona Martita	Dona Martita	151	193	
637744	Dona Paulita	Dona Paulita	165	193	
550418	Dusk	Dusk	86	99	
526037	Elizabeth F	Elizabeth F	91	145	
505311	Emerald Sea	Emerald Sea	86	71	
592242	Endurance	Endurance	98	144	
576930	Excalibur	Excalibur	60	63	
	Excal/Irene Way	Excalibur & Irenes Way			They fish together as a pair trawler.
636602	Excalibur II	Excalibur II	78	81	
598666	Exodus	Exodus	90	89	
598380	Flying Cloud	Flying Cloud	124	132	
521106	Gold Rush	Gold Rush	93	91	
604315	Golden Dawn	Golden Dawn	123	135	
609951	Golden Fleece	Golden Fleece	104	128	
599585	Golden Pisces	Golden Pisces	81	154	
639329	Golden Pride	Golden Pride	65	99	
554298	Golden Provider	Golden Provider	66	99	
628789	Golden Venture	Golden Venture	85	112	Sank in May 1988
625876	Grande Duchess	Grande Duchess	110	143	
608458	Great Pacific	Great Pacific	110	136	
640130	Gun-Mar	Gun-Mar	135	132	
615796	Half Moon Bay	Half Moon Bay	108	133	
592211	Hazel Lorraine	Hazel Lorraine	75	98	There is >1 catcher boat w/ this name.
546558	Hazel Lorraine*	Hazel Lorraine (*)		21	New Name is: Three Daughters
610984	Haz Lorraine I	Hazel Lorraine I	110	129	
35418	Heidi Kay	Heidi Kay	51	42	
594154	Hickory Wind	Hickory Wind	75	100	
629033	Irenes Way	Irenes Way	78	108	
	Jeanette Marrie	Jeanette Marrie			
604146	Jonath Michael	Jonathan Michael	84	104	
652243	Karina	Karina	61	85	
594981	Karina Explorer	Karina Explorer	84	135	Sank in May 1986
616814	La Font	La Font	73	72	
45419	Lady Blue	Lady Blue	93	127	Sank in January 1987
631084	Lady Louise	Lady Louise	128	66	
597603	Lady Good Voy	Lady of Good Voyage	78	126	
584873	Leslie Lee	Leslie Lee	90	114	
609344	Lets Go	Lets Go	119	146	
578533	Linda Jeanne	Linda Jeanne	65	55	Sank in September 1985
	Lisa Melinda	Lisa Melinda			
585059	Little Bear	Little Bear	90	98	
520494	Lone Star	Lone Star	68	99	
523219	Mar Del Norte	Mar Del Norte	86	104	
524001	Mar Pacifico	Mar Pacifico	96	117	
525608	Mar-Gun	Mar-Gun	110	130	
596156	Marathon	Marathon	58	66	
517024	Marcy J	Marcy J	97	114	
615563	Margaret Lyn	Margaret Lyn	98	128	
509552	Mark I	Mark I	88	138	
	Miss Berdie	Miss Berdie			

Official#	Abbreviation	Full name	Len	Wt	Notes
600121	Miss In Soo	Miss In Soo	93		
563644	Miss Kelley	Miss Kelley			
650768	Miss Kelly II	Miss Kelly II			
522463	Miss Leona	Miss Leona	86	93	
604146	Miss Tracy	Miss Tracy	84		New name is Jonathan Michael
550112	Mistasea	Mistasea	61		
610393	Morning Star	Morning Star	123	128	
920936	Ms Amy	Ms Amy	90	148	
611524	Muir Milach	Muir Milach	84	126	
599534	Neahkahnie	Neahkahnie	98	133	
602177	New Janet Ann	New Janet Ann	78	93	
	New Life	New Life			
609850	Nordfjord	Nordfjord	127	134	Sank in September 1987
542651	Nordic Fury	Nordic Fury	110	137	
584684	Nordic Star	Nordic Star	108	199	
214904	Norma	Norma	36	6	
535026	Normar II	Normar II	83	115	Sank in September 1986
557467	Norpac I	Norpac I	166	130	
914351	Norpac II	Norpac II	162	297	
538803	Norpac III	Norpac III	165	186	
609064	Norquest	Norquest	110	65	
609344	Norselander	Norselander	85	102	
629262	Norska	Norska	70	75	
596308	Northern Aurora	Northern Aurora	155	133	
	Ocean Beaut'	Ocean Beaut			
615247	Ocean Dynasty	Ocean Dynasty	124	168	
549892	Ocean Harvester	Ocean Harvester	108	109	
652395	Ocean Hope I	Ocean Hope I	92	195	
	Ocean Hope II	Ocean Hope II	89	193	
652397	Ocean Hope III	Ocean Hope III	89	192	
622324	Ocean Hunter	Ocean Hunter	88	109	
561518	Ocean Leader	Ocean Leader	103	131	
552625	Ocean Mariner	Ocean Mariner	92	110	
517100	Ocean Spray	Ocean Spray	94	134	
602279	Oceanic	Oceanic	122	134	
573157	Oceanida One	Oceanida One	180	238	
	Olympic	Olympic			
530292	Orion	Orion	86	149	
694522	Pacific	Pacific	40	19	
612084	Pac Alliance	Pacific Alliance	89	131	
518937	Pac Challenger	Pacific Challenger	86	111	
561934	Pacific Fury	Pacific Fury	110	137	
612155	Pacific Future	Pacific Future			
	Pacific Raider	Pacific Raider			
	Pacific Ram	Pacific Ram			
555058	Pacific Viking	Pacific Viking	108	138	
548750	Paragon II	Paragon II	110	133	
507438	Pat San Marie	Pat San Marie	101	77	
599040	Patience	Patience	49	34	
	Patsy B	Patsy B			
621638	Patty A J	Patty A J	65	84	
565120	Pegasus	Pegasus	67	95	
502779	Peggy Jo	Peggy Jo	99	134	
611520	Pelagos	Pelagos	131	126	
536873	Perseverance	Perseverance	85	124	
581823	Persistence	Persistence	79		

Official#	Abbreviation	Full name	Len	Wt	Notes
212074	Pioneer	Pioneer	72	50	
559907	Polar Star	Polar Star	84	107	
565349	Progress	Progress	100	137	
547390	Queen Victoria	Queen Victoria	90	110	
249995	Raven	Raven	52	26	
697637	Rebecca Irene	Rebecca Irene	140	191	
555917	Ronnie C	Ronnie C	76	76	
509579	Rosella	Rosella	94	98	
624371	Royal American	Royal American	105	151	
559271	Royal Atlantic	Royal Atlantic	108	139	
260803	Royal Baron	Royal Baron	97	124	
622765	Ruby Lynn	Ruby Lynn	38	14	
614723	Sea Master	Sea Master			
610150	Sea Quest	Sea Quest	80	101	Previous name was Colentino Rose II
523458	Sea View	Sea View	108	145	Sank in January 1987
	Sea Wolf	Sea Wolf	123	135	
548685	Seadawn	Seadawn	94	133	
924585	Seeker	Seeker	90	184	
	Sharon Barbara	Sharon Barbara			
40638	Sharon Lorraine	Sharon Lorraine	110	129	
598904	Silver Chalice	Silver Chalice	83	139	
610436	Silver Sea	Silver Sea	102	130	
282626	Sisu	Sisu	83	97	
591482	Sleep Robber	Sleep Robber	78	111	
546375	Sonny Boy	Sonny Boy	79	120	
561651	Starfish	Starfish	108	199	
597065	Starlite	Starlite	122	199	
617807	Starward	Starward	123	199	
579702	State Rebel	State Rebel			New name is: Uyak I
620769	Storm Petrel	Storm Petrel	123	220	
598484	Sunset Bay	Sunset Bay	108	147	
531320	Tam-Ran	Tam-Ran	84	126	New name is: Bon-Su-Mar
632123	Tatiana	Tatiana			
629247	Te Ja	Te Ja	36	8	
575428	Topaz	Topaz	80	98	
904859	Tracy Anne	Tracy Anne	96	189	
929356	Traveler	Traveler	105	195	
529154	Tremont	Tremont	133	311	
	Unknown	Unknown			Catcher boat name was unknown
602309	US Dominator	US Dominator	124	136	
579702	Uyak I	Uyak I	174	133	Previous name was: State Rebel
	Uyak II	Uyak II			Sank in November 1987
611225	Vaerdal	Vaerdal	124	135	
617802	Vanguard	Vanguard	94	144	
516479	Vega	Vega	90	108	
553377	Vega Marie	Vega Marie	86	136	
611642	Vesteraalen	Vesteraalen	125	198	
565017	Viking	Viking	120	138	
605228	Viking Explorer	Viking Explorer	123	131	
616131	Voyager	Voyager	94	151	
257365	Wallowa	Wallowa			
257365	Walter N	Walter N	80	83	
	Warrior II	Warrior II			
524423	Western Dawn	Western Dawn	97	130	
615165	Westward I	Westward I	135	125	

Single side band

PORT SAMPLER PROHIBITED SPECIES SUMMARY FORM

Instructions: Deliveries recorded on this form must meet all four of the following criteria:

1. Delivery must come from a shoreside vessel that has an observer on board
2. Observer on board delivering vessel must have whole-haul sampled all hauls making up the delivery, for prohibited species.
3. The entire delivery must be delivered to a single plant
4. Port sampling observer must sample entire delivery for prohibited species

Cruise#*	Pcode*	Year	

Delivery Date		Delivery Number	Fish Ticket Number	Total Numbers of prohibited sp. found in delivery			
Mo	Dy			HALIBUT	KNG CRAB	TAN CRAB	SALMON

* Cruise# and Plant code are assigned to observers upon return to Seattle

SHORESIDE DELIVERY BOAT SAMPLER TALLY FORM
PROHIBITED SPECIES SEEN GOING INTO VESSEL HOLDS

SUMMARY TABLE

Cruise#*	Vcode*	Year	

Only enter a data line in summary table for deliveries in which all the hauls making up the delivery were whole haul sampled for prohibited species.

Delivery Date		Fish Ticket Number	Total Numbers of prohibited sp. seen going into hold, summarized by total delivery			
Mo	Dy		HALIBUT	KNG CRAB	TAN CRAB	SALMON

*Cruise# and Vcode are assigned to observers upon return to Seattle

WORK AREA

1. One line per haul - summarizes the numbers of prohibs seen going into the hold for that haul.
2. Upon delivery, total up the prohib numbers for all the hauls in delivery and make an entry in the summary table above

Delivery Date		Haul Date		Haul No.	Numbers of prohibited sp. seen going into the hold, for each haul in a delivery			
Mo	Dy	Mo	Dy		HALIBUT	KNG CRAB	TAN CRAB	SALMON

ADDITIONAL INSTRUCTIONS ON WRITING CATCH MESSAGES FOR DOMESTIC OBSERVERS

Processor Codes

Processor codes consist of a four digit numerical code beginning with the letter "F". The processor code can be obtained from the list of processor codes that follows these instructions. This list includes both shore-side processing plants and ocean-going processing vessels. The last column on the right-hand side of the list identifies the processor as either a shore-side plant (P) or an ocean-going ship (S). The processor code should follow immediately after the permit number in the catch message. Follow the directions below when deciding which processor code to use in a catch message. (Not all catch messages require a processor code)

1) Observers on vessels that deliver their sorted catch to another vessel (mothership) for processing, need to include the permit number for the catcher vessel and the processor code of the mothership in the catch message from the catcher vessel. If the catcher vessel divides it's delivery among more than one floating processor, the observer should only use the processor code of the last mothership and attribute the entire delivery to the last mothership visited. (Since the catch is being sorted, we place the observer on the catcher boat and not on the mothership.)

2) Observers on vessels that catch and process their own fish but do not process another vessel's catch, should include only their vessel's permit number, and not the vessel's processing code. This is the only situation in which a processor code is not required in a catch message from a vessel.

3) Observers on vessels that catch and process their own fish and also process another vessel's catch (they also serve as a mothership), need to include two PARA 1's, two PARA 2's and two PARA3's in their catch message (refer to example at the end). One portion of the message containing only their own vessel's catch (permit number, but no processing code); and a second portion (with permit number and processor code) containing only the information from the delivered catches (as in #1 above).

4) Observers at shoreside plants do not have a permit number and don't need to include the plant's processing code in their catch messages. Refer to "Special Directions for Observers at Shore-side Processing Plants" below.

5) Observers on vessels that deliver their catch to shoreside plants for processing need to report the permit number for their catcher vessel and the processor code for the processing plant in their catch message from the catcher vessel. If the catcher vessel divides a delivery among more than one plant, the observer should only use the processor code for the

last plant and attribute the entire delivery to that last plant visited.

6) Observers on motherships (floating processors) that process unsorted catch from catcher boats should include their permit number and the processor code for the mothership when reporting catch in their weekly catch messages. (Since the catch is not being sorted, we place the observer on the mothership and not on the catcher boat.)

Determination of Weekly Breakdown of Catch for Catch Messages

The way in which an observer attributes catch to a particular week varies according to vessel type. Domestic processors group and report their catch in the NMFS daily cumulative production log based on the date the catch was made into product. We have attempted to approximate this by grouping the observer's catch data according to the date of completion of the tow or delivery. Below are the options for catcher boats, motherships, or catcher/processors. (This grouping is not used for the observer's 2US or 3US forms. On these forms the haul information is grouped by using the net retrieval time.)

1) Observers on catcher/processors attribute catch according to when the retrieval of the net begins. (example - if a catcher/processor set a net on Saturday at 2300 ALT, but does not start retrieving the net until 0300 ALT on Sunday the catch would be attributed to the next week ending date.)

2) Observers on catcher boats attribute catch according to when the final delivery of catch is completed. All of the hauls made for a delivery are attributed to the week in which the last delivery of catch was completed. (example - a catcherboat makes tows on Wednesday, Thursday, and Friday, but does not finish making it's delivery to a shoreside plant until Sunday. Another catcher boat make tows on Friday, Saturday, and Sunday and completes it's delivery to a floating processor on the same Sunday. The observers on both of these vessels would attribute all of the catch to the next week ending date. Another possibility might be that a catcherboat delivers part of it's catch to Plant A on Saturday, but makes a final delivery to Plant B on Sunday. In this case, the catcher boat's observer would attribute all of the catch to the next week ending date.)

3) Observers on motherships that are receiving unsorted catch from catcher boats attribute catch according to the date that the codend was received. (example - the catcher boat's net arrived at and left the fishing depth on Saturday, but the codend was not delivered until Sunday. The mothership's observer would attribute the haul to the next week ending date.)

Reporting Discards

Discards of any species or species report group need to be recorded separately from retained catch in the species composition section (PARA 1) of the catch report. Observers working at shore-side processing plants need not report discards in their catch messages. Observers should attempt to their best ability to independently estimate the amount of whole fish that are discarded, and then report those estimates in their catch message to the nearest 0.01 mt. If you consider your independent estimates of discard to be less accurate than the ship's estimates of discard, use the ship's estimate of discard in your catch message. However, continue to work to develop a more accurate technique of sampling for discards, so that you can report your own estimates of discard in the catch report. (On the other hand, a higher priority must be given to good species composition and prohibited species sampling.) Discard is to be identified in the catch message by adding the word "DIS" after the report group name. Refer to the example below, and remember that discard weight is only for whole fish that are discarded not the offal from production lines.

Gear Type

Observers must report gear type (bottom trawl, pelagic trawl, longline, or pots) in their catch messages. (Remember the gear type for trawls is based on configuration of the net and has nothing to do with where the net is fished.) Observers working at shore-side processing plants need not include gear type in their messages. The gear codes should be inserted in the catch message immediately after the area designation and before "days on grounds" (refer to the example below). If a vessel should fish two gear types within an area/week, the observer must extrapolate and report the catch composition data separately by gear type as well as by area/week (refer to example below). Gear codes consist of three letters that identify the gear type. The gear codes are as follows:

BTR ...... bottom trawl
PTR ...... pelagic trawl
LGL ...... longliner
POT ...... pot vessel

Total Weight (TOTAL) in PARA 2

The total weight of catch by area and gear type now should also be included in paragraph 2 (PARA 2) of each catch message. This will have already been reported in PARA 1, but it will be easier to work with if it's repeated in PARA 2. Place the total weight of catch landed (designated "TOTAL" as in PARA 1) after the area and gear type and preceding the weight of sampled hauls, "HW", in PARA 2 (refer to the example below).

Weight of the hauls sampled for marine mammals (MMTONS) in Para 3

The total weight of the catch by area for hauls sampled for marine mammals should also be included in paragraph 3 (PARA 3) of each catch message. In other words, this is the weight of the MMTOWS in metric tons. Place the MMTONS after MMTOWS in PARA 3 of your weekly catch messages. Remember, MMTOWS is the sum of the number of tows on the front side of form 10US for each week.

Notes for Observers Aboard Motherships

Observers aboard motherships may choose to coordinate the transmission of catch messages from observers on the catcher boat fleet by collecting all messages and sending them at the same time with their own message from the mothership. This sort of arrangement may serve to be the easiest and most efficient for all parties concerned.

Special Directions for Observers at Shore-side Processing Plants

Messages from shoreside processing plant observers need not follow the same format as those from observers aboard domestic vessels. They can be self-designed, but must include brief explanations of the work accomplished that week. Messages should include the following (at a minimum) for each plant that the observer worked at during the week:

1) Number of deliveries (and total weight of deliveries).

2) Number of deliveries sampled (also number of deliveries sampled for prohibited species).

3) Total delivery weight by species group.

4) Number of prohibited species and weight of halibut (if prohibited species sampling was done).

5) Rough estimate of number of lengths taken, and age structures collected.

6) Report product recovery rate work and density determinations accomplished, as well as progress on other special project assignments.

Example of a radio message sent from a domestic vessel fishing in the Bering Sea pollock fishery.

Shows: processed catch from its own operations including bottom trawl and midwater trawl; processed catch from catcher boats; reporting discards; Para 3; message sent Sunday.

TO: JANET WALL/AKC/SEATTLE WA
FROM: JOE OBSERVER/ FISH CATCHER/ FAX 907-775-6439/ ORC 101P2

PARA 1/ AK-90-9999/ JAN 20/ US DOM/ JAN 14-16/ A521P8/ BTR/ DG2D5P7/ SQU OD20P2/ TURB OD07P7/ OFLAT OD71P8/ OFLAT DIS 1D11P3/ POLL 205D11P9/ COD 21D29P14/ SAB DIS OD14P5/ OTH DIS 7D26P15/ NON DIS OD91P10/ TOTAL 236D80P19/ PTR/ DG0D5P5/ OFLAT DIS OD05P5/ POLL 101D02P4/ COD 1D42P7/ OTH DIS 1D01P2/ NON DIS OD05P5/ TOTAL 103D55P14/// JAN 17/ A522P9/ PTR/ DG1D0P1/ TURB DIS 1D11P3/ OFLAT 2D14P7/ OFLAT DIS OD52P7/ POLL 40D66P16/ COD 14D21P8/ COD DIS OD33P6/ POP DIS OD20P2/ OROCK DIS OD54P9/ OTH DIS 1D47P12/ NON DIS 1D07P8/ TOTAL 62D25P15///

PARA 2/ US DOM/ JAN 14-16/ A521P8/ BTR/ TOTAL 236D80P19/ HW 146D0P11/ OTHTAN 823D8P21/ HBT NOS 17D5P13 WT 30D1P4/ PTR/ TOTAL 103D55P14/ HW 56D89P28 /CHIN 1D0P1/// JAN 17/ A522P9/ JAN 17/ PTR/ TOTAL 62D25P15/ HW 62D25P15/ BTAN 7D0P7/ HBT NOS 12D4P7 WT 25D6P13///

PARA 3/ A521P8/ TOWS 22P4/ DUR 2670P15 MIN/ MMTOWS 18P9/ MMTONS 202D89P21/ CU 1P1/ A522P9/ TOWS 3P3/ DUR 145P10 MIN/ MMTOWS 3P3/ MMTONS 62D25P15 /MAMM 0P0///

PARA 1/ AK-90-9999/ F0000/ JAN 20/ US DOM/ JAN 18-20/ A521P8/ BTR/ DG3D0P3/ SQU DIS OD61P7/ TURB DIS OD04P4/ OFLAT 1D42P7/ OFLAT DIS 4D69P19/ POLL 82D13P14/ POLL DIS 2D66P14/ COD 18D99P27/ COD DIS 1D44P9/ OTH DIS 7D00P7/ NON DIS 2D02P4/ TOTAL 121D00P4///

PARA 2/ US DOM/ JAN 18-20/ A521P8/ BTR/ TOTAL 121D00P4/ HW 121D00P4/ OTHKNG 4D6P10/ BTAN 10D0P10///

PARA 3/ A521P8/ TOWS 20P2/ DUR 2433P12 MIN/ MMTOWS 20P2/ MMTONS 121D00P4/ MAMM 0P0/ STOP

Notice that the "Total" in PARA 1 and 2 is the sum of all the species weights (retained and dicarded) and is also the sum of all of the hauls for that week, area, and gear type taken from RM-1.

PROCESSOR CODES

PROCESSOR	PROCESSOR CODE	SHIP (S) PLANT (P)
ACONA	-0-	S
ADMIRALTY SEAFOODS INC	F1189	P
AL-LOU'S FISH	F0255	P
ALASKA FISHTRADE	F0405	P
ALASKA FRESH SEAFOODS INC	F0321	P
ALASKA GLACIER SEAFOODS	F0246	P
ALASKA I	F9511	S
ALASKA MIST	F1042	S
ALASKA OCEAN	-0-	S
ALASKA PACIFIC SEAFOODS	F0210	P
ALASKA PIONEER	F9576	S
ALASKA RANGER	F9591	S
ALASKA SALMON & SEAFOOD	F0861	P
ALASKA SEAFOOD INC	F0937	P
ALASKA SEAKETCH	F1179	P
ALASKA SPECIALTY SEAFOODS	F0570	P
ALASKA VOYAGER	F9512	S
ALASKAN COMMAND	F9584	S
ALASKAN ENTERPRISE	F9507	S
ALASKAN GOURMET, INC.	F0403	P
ALASKAN HARVESTER	F9580	S
ALASKAN HERO	F9553	S
ALASKAN I	F1147	S
ALEUTIAN CHALICE	F1228	S
ALEUTIAN DRAGON FISHERIES	F0622	P
ALEUTIAN ENTERPRISE	F9505	S
ALEUTIAN MIST	F9606	S
ALEUTIAN SPEEDWELL	F9550	S
ALEXANDRE	-0-	S
ALL ALASKAN SEAFOODS INC.	F0222	P
ALLIED PROCESSING, INC.	F1183	P
ALYESKA SEAFOODS	F0753	P
AMERICAN DYNASTY	F9605	S
AMERICAN EMPIRE	F9585	S
AMERICAN EMPRESS	F9588	S
AMERICAN ENTERPRISE	F9540	S
AMERICAN NO. 1	F9521	S
AMERICAN SPITFIRE	-0-	S
AMERICAN TITAN	-0-	S
AMFISH	F9590	S
ANNETTE ISLAND PACKING CO	F9517	P
ANPAC, INC.	F0800	P
ARCTIC ENTERPRISE	F1132	S
ARCTIC HERO	-0-	S
ARCTIC STAR	F0138	S
ARCTIC STORM	F9539	S
ARCTIC TRAWLER	F9536	S
ARICA	F9573	S
ATKA FISHERMANS ASSOC.	F0305	P
AZUMA CORPORTATION, LTD.	F0990	P
BERING 1	F9585	S
BERING ENTERPRISE	F9519	S
BERING STAR	F0137	S
BERING TRADER	F0150	S
Overside delivery	F9999	- usually selling cod to crab fishermen

PROCESSOR	PROCESSOR CODE	SHIP (S) PLANT (P)
BLUE ICE	F9615	S
BOUNTIFUL	F0947	S
BRISTOL ENTERPRISE	F9544	S
BROWNS POINT	F9562	S
CAPITAL SEAFOODS, INC.	F0995	P
CHATHAM STRAIT SEAFOOD CO	F0582	P
CHEYENNE ARROW	-0-	S
CHIGNIK PRIDE FISHERIES	F0365	P
CHUGACH AK FISH(CORDOVA)	F0930	P
CHUGACH AK FISH(ORCA)	F0213	P
CHUGACH AK FISH(PT.GRAH)	F0830	P
CLAUDIA'S FISHERIES	F0132	P
CLAYMORE SEA	F9583	S
CLIPPER ENDEAVOR	F9559	S
CLIPPER SURPRISE	F9538	S
CONTINUITY	F9593	S
COOK INLET PROC(KENAI)	F0186	P
COOK INLET PROC(KODIAK)	F1155	P
COOK INLET PROCESSING	F0886	P
COPPER R. FISHERMENS COOP	F0146	P
CRYSTAL CLIPPER	F9587	S
CRYSTAL VIKING	F9581	S
DEEP CREEK CUSTOM PACK.	F1051	P
DEEP PACIFIC	F9549	S
DEEP SEA HARVESTER	F0997	S
DEJON DELIGHTS	F0088	P
DIAMOND STAR	-0-	S
DIOMEDES	F1138	S
DRAGNET FISHERIES CO INC.	F0030	P
E.C. PHILLIPS & SONS INC.	F0110	P
EAGLE FISHERIES L.P.	F0878	P
ENDURANCE	F9583	S
ERIN INC.	F0144	P
EVENING STAR	F1141	S
FAROS	F1013	P
FARWEST FISHERIES, INC.	F0778	P
FAVCO, INC.	-0-	P
FRESH FISH COMPANY, INC.	F0484	P
FRONTIER MARINER	F9613	S
FRONTIER SPIRIT	F9610	S
G&G ALASKA SMOKERY	F1143	P
GIANT CLAM COMPANY	F1190	P
GOLDEN ALASKA	F9516	S
GOLDEN PICES	F9614	S
HARVESTER ENTERPRISE	F9533	S
HEATHER SEA	F9592	S
HIGH TIDE SEAFOODS	F0958	P
HIGHLAND LIGHT	-0-	S
HOONAH COLD STORAGE	F0777	P
ICICLE SEAFOODS(HOMER)	F0133	P
ICICLE SEAFOODS(PBERG)	F0134	P
ICICLE SEAFOODS(SEWARD)	F0135	P
INLET FISHERIES	F1086	P
INLET FISHERIES(KASILOF)	F1085	P
INLET FISHERIES(KENAI)	F1039	P
INT'L SFOODS OF AK	F0020	P

PROCESSOR	PROCESSOR CODE	SHIP (S) PLANT (P)
INT'L SFOODS OF AK(SHEIL)	F0021	P
ISLAND ENTERPRISE	-0-	S
JACQUELYN R	-0-	S
JESSICA B	F1153	S
JOHN CABOT CO (ANCHORAGE)	F0932	P
JOHN CABOT CO(SELDOVIA)	F0989	P
JUDI B	F9520	S
K.O. KAN, INC.	F1037	P
KAKE TRIBAL CORPORATION	F1213	P
KANAWAY SEAFOODS, INC.	F1206	P
KEENER PACKING CO., INC.	F0394	P
KENAI CUSTOM SEAFOODS	F1182	P
KENAI PACKERS	F0361	P
KETCHEKAN SEAFOODS	F1075	P
KING CRAB, INC.	F004	P
KJEVOLJA	F9599	S
KODIAK ENTERPRISE	F9603	S
KUPREANOF SEAFOODS, INC.	F0317	P
MELISSA BETH	F1154	S
MICHELLE IRENE	F9597	S
NANA SEAFOODS	F0378	P
NAUTILUS MARINE INC.	F0815	P
NELBRC PACKING CO.	F0075	P
NEWKIRK & SONS FISH.	F0875	P
NORTH PACIFIC COLD STOR.	F0557	P
NORTH PACIFIC PROCESSORS	F0232	P
NORTHERN AURORA	F9526	S
NORTHERN EAGLE	F9558	S
NORTHERN ENTERPRISE	F9532	S
NORTHERN GLACIER	F9560	S
NORTHERN HAWK	-0-	S
NORTHERN HERO	-0-	S
NORTHERN JEAGER	-0-	S
NORTHERN VICTOR	-0-	S
NORTHWEST ENTERPRISE	F9506	S
NORTHWEST SEAFOODS	F1169	P
OCEAN ENTERPRISE	F9510	S
OCEAN PHOENIX	F9611	S
OCEAN PROWLER	-0-	S
OCEAN ROVER	-0-	S
PACIFIC ALASKA SEAFOODS	F0130	P
PACIFIC BREEZE	F9608	S
PACIFIC ENTERPRISE	F9513	S
PACIFIC GLACIER	F9575	S
PACIFIC TRAWLER	F9601	S
PARAGON STAR	-0-	S
PELICAN SEAFOODS, INC.	F1171	P
PETER PAN SEAFDS (VALDEZ)	-0-	P
PETER PAN SFOODS (KING COVE)	F0142	P
PETER PAN SFOODS (VALDEZ)	F1041	P
PHOENIX SEAFOODS, INC.	F1184	P
POINT ADOLPHUS SEAFOODS	F0306	P
POLAR MIST	F9607	S
PREDATOR	F9574	S
PRIBILOF ISLAND PROCESSOR	F1139	P
PRIME ALASKA SEAFOODS	F1113	P

PROCESSOR	PROCESSOR CODE	SHIP (S) PLANT (P)
PROGRESS	F9609	S
PROWLER	F9555	S
QUEEN FISHERIES	F0331	P
QUEEN FISHERIES(KODIAK)	F0330	P
REBECCA B	F1137	S
REBECCA IRENE	F9561	S
RESOLUTE	F9612	S
ROYAL ALUETIAN SFOODS INC	F1093	P
ROYAL KING	F9547	S
ROYAL PACIFIC FISHERIES	F0409	P
ROYAL PRINCE	F9546	S
ROYAL SEA	F9522	S
SALAMATOF SEAFOODS, INC.	F0039	P
SALMON RIVER SMOKEHOUSE	F0828	P
SANS SCUCI SEAFOODS	F0416	P
SEA HAWK SEAFOODS, INC.	F0223	P
SEA LEVEL SEAFOODS	F0709	P
SEA STAR	F0817	S
SEAFOOD FROM ALASKA, INC.	F0324	P
SEAFOODS PRODUCERS COOP.	F0172	P
SEATTLE ENTERPRISE	F9554	S
SEATTLE STAR	F9534	S
SILVER ICE	F9595	S
SILVER LINING SEAFOODS (KETCHIAN)	F0016	P
SITKA SMOKEHOUSE	F0887	P
SITKA SOUND SEAFOODS, INC	F0147	P
SNOW KING	F9541	S
SOUTH NAKNEK SEAFOODS	F0796	P
SPECIALTY FISH PRODUCTS	F0983	P
SPEEDWELL	F9552	S
ST. ELIAS OCEAN PRODUCTS	F0121	P
STARBOUND	F9589	S
TAKU SMOKERIES	F0115	P
TEDDY'S SMOKED FISH	F0936	P
TREMONT	F9530	S
TRIDENT SEAFOODS, CORP.	F0939	P
TRIDENT SEAFOODS, CORP.	-0-	P
U.S. ENTERPRISE	F9542	S
UNIMAK ENTERPRISE	F9586	S
UNISEA, INC. (GL. PLANT)	F1180	P
UNISEA, INC.(DUTCH)	F0188	P
URSIN SEAFOODS(411 SHELIKOF AVE, KODIAK)	F0283	P
URSIN SEAFOODS(511 SHELIKOF AVE, KODIAK)	F0291	P
VAERDAL	F9600	S
VALIANT	F9548	S
WAKKANAI	-0-	S
WARDS COVE PACK.(EXCURSION INLET)	F0274	P
WARDS COVE PACK.(KENAI)	F0270	P
WARDS COVE PACK.(PORT BAILEY)	F0268	P
WESTERN AK FISHERIES, INC	F0320	P
WESTERN ENTERPRISE	F9545	S
WESTWARD WIND	F9508	S
WHITNEY FOODS	F0827	P
WHITTIER SEAFOODS, INC.	F1166	P
WINDJAMMER	F1064	P
WRANGELL FISHERIES, INC.	F0319	P

PROCESSOR	PROCESSOR CODE	SHIP (S) PLANT (P)
YUKON QUEEN	F9602	S
ZENITH	F9598	S

List of species codes for radio messages: ALPHABETICALLY LISTED

13 - ARROW (BERING SEA ONLY)
36 - ARROW DIS (BERING SEA ONLY)
08 - ATKA
35 - ATKA DIS
06 - COD
41 - COD DIS
32 - DEMRF
46 - DEMRF DIS
48 - DFLT
51 - DFLT DIS
09 - HAKE
14 - HERRING DIS (BERING SEA ONLY)
10 - JACK
27 - JACK DIS
53 - NON
70 - NON DIS
03 - OFLAT (BERING SEA ONLY)
22 - OFLAT DIS (BERING SEA ONLY)
12 - OROCK
25 - OROCK DIS
99 - OTH
26 - OTH DIS
33 - PELRF
45 - PELRF DIS
05 - POLL
47 - POLL DIS
11 - POP
24 - POP DIS
34 - RSOLE
39 - RSOLE DIS
07 - SAB
23 - SAB DIS
49 - SFLT
52 - SFLT DIS
31 - SLPRF
44 - SLPRF DIS
16 - SNAMTS
01 - SQU
42 - SQU DIS
20 - THRN (GULF ONLY)
43 - THRN DIS (GULF ONLY)
50 - TOTAL
21 - TURB (BERING SEA ONLY)
38 - TURB DIS (BERING SEA ONLY)
18 - WIDOW
30 - WIDOW DIS
02 - YELL
37 - YELL DIS
17 - YTAIL
29 - YTAIL DIS

List of species codes for radio messages: NUMERICALLY LISTED

01 - SQU
02 - YELL
03 - OFLAT (BERING SEA ONLY)
05 - POLL
06 - COD
07 - SAB
08 - ATKA
09 - HAKE
10 - JACK
11 - POP
12 - OROCK
13 - ARROW (BERING SEA ONLY)
14 - HERRING DIS (BERING SEA ONLY)
16 - SNAMTS
17 - YTAIL
18 - WIDOW
20 - THRN (GULF ONLY)
21 - TURB (BERING SEA ONLY)
22 - OFLAT DIS (BERING SEA ONLY)
23 - SAB DIS
24 - POP DIS
25 - OROCK DIS
26 - OTH DIS
27 - JACK DIS
29 - YTAIL DIS
30 - WIDOW DIS
31 - SLPRF
32 - DEMRF
33 - PELRF
34 - RSOLE
35 - ATKA DIS
36 - ARROW DIS (BERING SEA ONLY)
37 - YELL DIS
38 - TURB DIS (BERING SEA ONLY)
39 - RSOLE DIS
41 - COD DIS
42 - SQU DIS
43 - THRN DIS (GULF ONLY)
44 - SLPRF DIS
45 - PELRF DIS
46 - DEMRF DIS
47 - POLL DIS
48 - DFLT
49 - SFLT
50 - TOTAL
51 - DFLT DIS
52 - SFLT DIS
53 - NON
70 - NON DIS
99 - OTH

FORMAT FOR DOMESTIC RADIO MESSAGES

If you are at sea for more than one week, prepare a catch message for transmission from the vessel and request that it be sent to NMFS in Seattle by telex or rapidfax. (See the letter of introduction for the different possibilities for transmission.) When preparing a message for fax transmission, use only plain, not lined, paper and write your message in larger than normal, block, **dark** lettering. If your messages are not being sent or are not getting through to our office, ask whether they are getting communications through to their company office. If they can send messages to their office, have your weekly message sent there with a note to the addressee such as, "Unable to transmit message to NMFS directly. Please forward this message to: Janet Wall/ AKC/ Seattle WA/ Telex 329422 (Callback NWASC SEA)/ Fax (206)526-4004/ Phone (206)526-4195."

Report week's catcher boat according to delivery Date & Time

If your vessel is unable to transmit any messages, or you are aboard a vessel for a week or less, (as is commonly the case in shoreside delivery vessels), or you have just gotten off a vessel and have the last few day's data to send in, phone in your catch message after you have returned to port. Instead of formatting a catch message as you do for transmission, fill out the RM-2 and RM-4 forms using the instructions given on the following pages. Call our logistics staff person and ~~read the RM-2 and RM-4~~ information to them over the phone. Weekly radio messages are critical. Please remember, the data must be divided into report weeks which run from Sunday through Saturday, ALT time and date.

Also, NMFS will need to obtain copies of fish ticket(s) for your vessels. When phoning in catch information, or checking in after your cruise, please give the name of the vessel, the date(s) of catch deliveries, and the port catch was delivered to. With this information we will be able to request the proper fish ticket information from ADF&G.

On formatting for transmission, please notice the paragraph 3 containing effort and marine mammal information by subarea. For any take of marine mammals, designate the species with the species codes given in the instructions for Form 10US. As usual, we will need to know your first date of sampling.

RAPIDFAX NO OR TELEX NO
TO: JANET WALL/ AKC/ SEATTLE WA
FROM: JANE OBSERVER/ SEA GULL/ TELEX /ORC 107P8

PARA 1/ AK 87-0001/ OCT 10/ US DOM/ OCT 4-6/ A513DP9/ DG3DOP3/ SQU 0D62P8/ TURB 5D34P12/ OFLAT 1D20P3/ POLL 83D37P21/ COD 18D21P12/ OTH OD68P14/ NON 0D58P13/ TOTAL 110D00P2/// OCT 7-10/ A511P7/ DG4D0P4/ YELL 109D75P22/ TURB 8D24P14/ OFLAT 72D34P16/ POLL 6D58P19/ COD 24D52P13/ OTH 0D29P11/ NON 13D28P14/ TOTAL 235D00P10///

PARA 2/ US DOM/ OCT 4-6/ A513P9/ HW 85D0P13/ BLUKNG 29D0P11/ OTHKNG 4D0P4/ BTAN 81D0P9/ CHIN 12D0P3/// OCT 7-10/ A511P7/ HW 125D0P8/ REDKNG 3720D3P15/ BTAN 111D7P10/ OTHTAN 33D9P15/ HBT NOS 91D0P10 WT 360D55P19///

PARA 3/ A513P9/ TOWS 20P2/ DUR 2520P9 MIN/ MMTOWS 20P2/ CU 1P1/// A511P7/ TOWS 28P10/ DUR 3240P9 MIN/ MMTOWS 22P4/ MAMM 0P0///IDS OCT 4/ STOP

<u>For Longline and Pot Fishing Vessels</u>, paragraph 3 should look like this:
PARA 3/ A540P9/ TOTAL SETS 18P9/ TOTAL HOOKS 25200P9/ SOAK TIME 189P18 HRS 42P6 MIN/ STOP

(Be careful in dividing by 60 to obtain total hours and minutes!) Pot fishing vessels should substitute TOTAL POTS for TOTAL HOOKS.

TELEPHONE, RAPIDFAX, TELEX NUMBERS, ETC.

Alaska Fisheries Science Center (for sending or phoning catch messages; for between-trip debriefing) :

Telex: 329422 callback=NWASC-SEA
(backup telex in Bldg.#1 at NWAFC = 9104442786)
Rapidfax: (206) 526-4004
Phones: (will accept collect calls) Karen or Mike
2nd choice ~~Angela Dougherty~~ (206) 526-4191
~~Russ Nelson~~ (206) 526-419~~0~~5 ← Janet Work # 4th choice *
Janet Wall (home phone) (206) 283-1690 – emergency
Message recorder phone (to leave catch messages or non-urgent messages on weekends, nights) You can leave up to a 5-minute message, (won't accept collect calls). (206) 526-4205 ← 1st choice *
Angela Dougherty 526-4192 ← Catch Message 3rd choice *
526 4207 Receptionist Ron
* - catch messages

Address: Janet Wall
Alaska Fisheries Science Center
7600 Sand Point Way NE
BIN C15700, Bldg. 4
Seattle, WA 98115-0070

Alaska Regional Office

Telex:	45377 callback = NMFS AKR JNU
Rapidfax:	(907) 586-7131
Phone:	(907) 586-7229 (Janet Smoker/Jessie Gharrett)
Address:	Janet Smoker National Marine Fisheries Service, FAK P.O. Box 1668 Juneau, AK 99801

National Marine Fisheries Service, Kodiak Laboratory
(to store, or obtain access to stored gear)
Phone: (907) 487-4961 (-4962)
Address: P.O. Box 1638, Kodiak, AK 99615 (on Coast Guard base)

Alaska Department of Fish & Game (ADF&G)
ADF&G in Kodiak
phone: (907) 486-4791 (Leslie Watson)
address: 211 Mission Road, Kodiak AK 99615

ADF&G in Dutch Harbor (to obtain extra supplies from Foreign Fishery Observer Program supplies)
Ken Griffin (907) 581-1239
Carolyn Griffin (907) 581-1529

GENERAL INSTRUCTIONS FOR WEEKLY CATCH MESSAGES

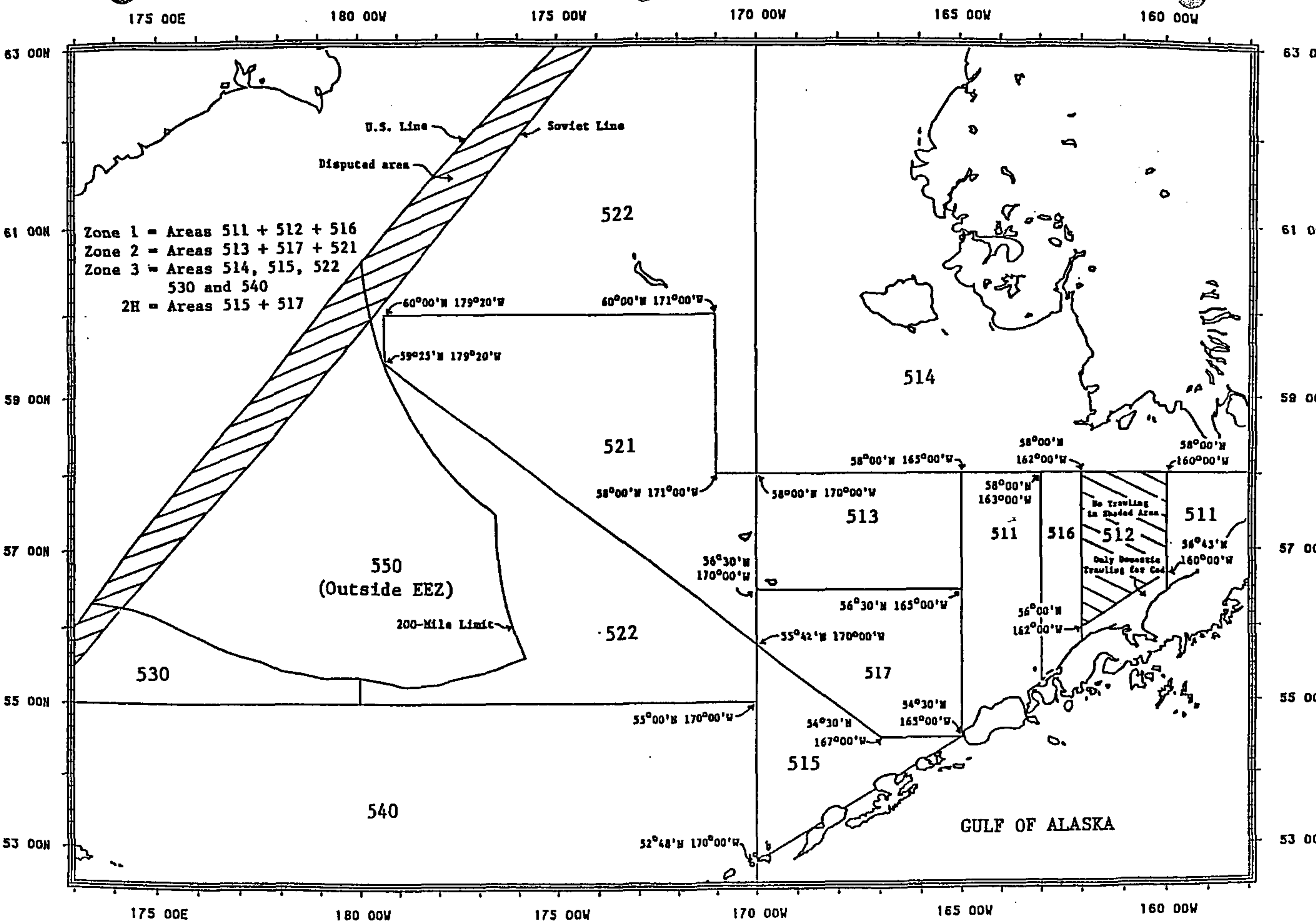
One of the primary tasks of the Observer Program is the estimation of the catch of groundfish and prohibited species throughout the year to insure that these catches remain within the quotas established by the management councils. In order that the observer's data may be utilized before returning from sea, a catch message is sent each week to the Alaska Fisheries Science Center summarizing the week's fishing activity. The first paragraph of the message will give the estimated catch by species group (species composition data) for each area, the second paragraph will provide data on the catch of prohibited species, and the third paragraph will provide fishing effort information and a marine mammal catch report.

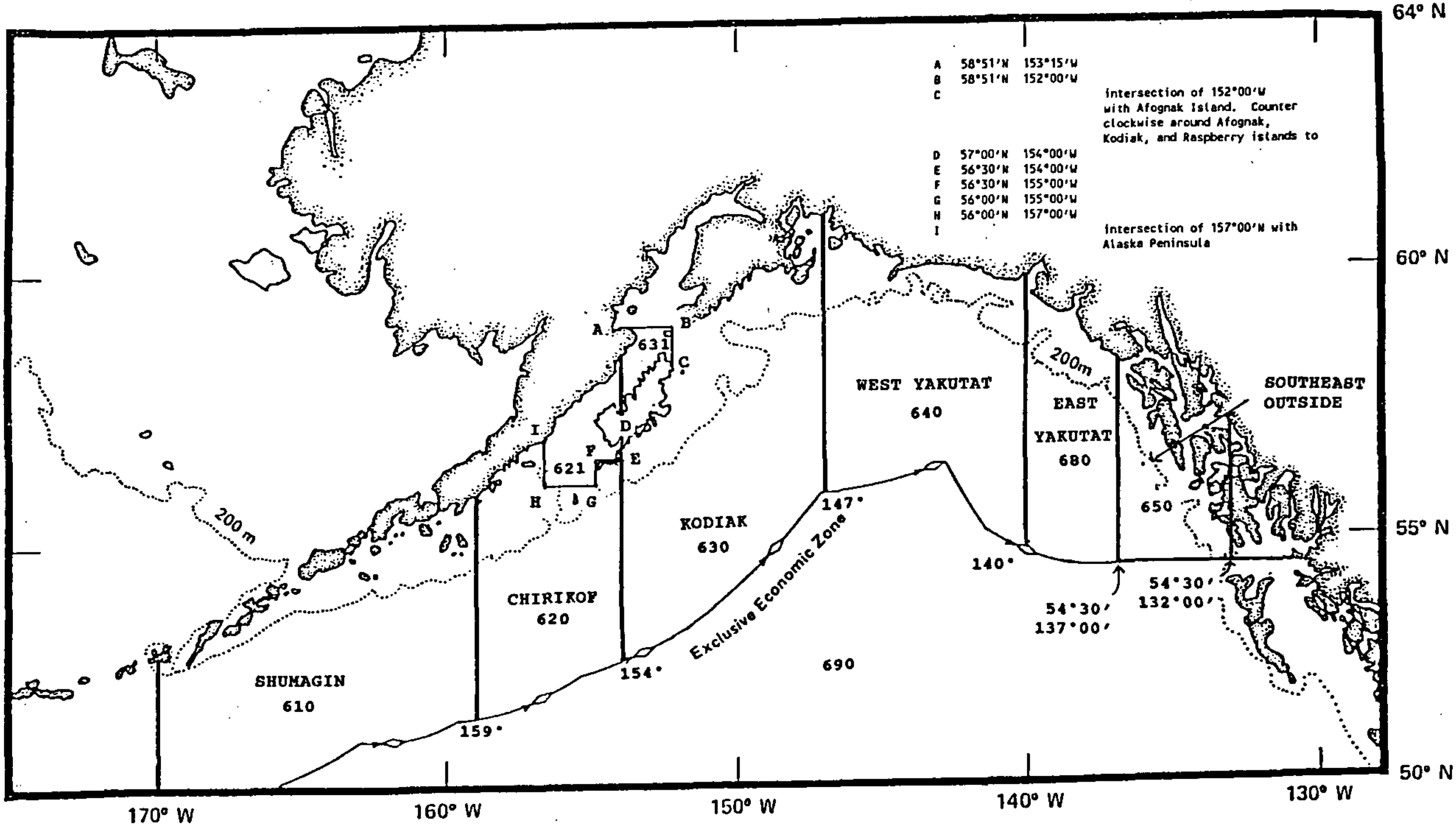
The report week for each message will always run from SUNDAY through SATURDAY, Alaska Local Time and date regardless of the date the message is actually sent. The reporting areas to be used for catch messages are shown in the maps on the following pages. The catch report messages should be sent on the Sunday following the report week. Catch messages are critical and must be sent on time. When asked to repeat a message, please do so immediately and do not wait until the end of the week.

When you are at sea for more than one week, prepare a catch message for transmission from the vessel and request that it be sent to NMFS in Seattle by telex or rapidfax. (See the letter of introduction for the different possibilities for transmission.) When preparing a message for fax transmission, use only plain, not lined, paper and write your message in larger than normal, block, **dark** lettering. If your messages are not being sent or are not getting through to our office, ask whether they are getting communications through to their company office. If they can send messages to their office, have your weekly message sent there with a note to the addressee such as, "Unable to transmit message to NMFS directly. Please forward this message to: Janet Wall/ AKC/ Seattle WA/ Telex 329422 (Callback NWASC SEA)/ Fax (206)526-4004/ Phone (206)526-4195."

Failing this, it may be possible to phone in your weekly message via a ship-to-shore, collect, radio telephone call. Call Angela Dougherty collect at (206)526-4191. Whenever catch (or any other) information is being relayed by radio telephone, anyone can listen and it must be kept in mind that the conversation is public. As catch information must be kept confidential, be sure to follow the ~~RM-2 and RM-4~~ data format and use the number codes **only** for the species. Do not voice the species names with their catch tonnages. Using codes would also be appropriate when relaying catch information for one vessel from another, subsequent vessel.

If your vessel is unable to transmit any messages, or you are aboard a vessel for a week or less, (as is commonly the case in shoreside delivery vessels), or you have just gotten off a vessel and have the last few day's data to send in, phone in your catch message after you have returned to port. Instead of formatting a catch message as you do for transmission, fill out the keypunch forms ~~RM-2 and RM-4~~ using the instructions given on following pages. Call our logistics staff person and read the ~~RM-2 and RM-4~~ information to them over the phone. Keep a copy of all messages sent and received. You will be asked to transfer the weekly catch message information to forms ~~RM-2 and RM-4~~ for verification purposes upon your return to Seattle.


175 00E
180 00W
175 00W
170 00W
165 00W
160 00W
63 00N
61 00N
59 00N
57 00N
55 00N
53 00N
U.S. Line
Soviet Line
Disputed area
Zone 1 = Areas 511 + 512 + 516
Zone 2 = Areas 513 + 517 + 521
Zone 3 = Areas 514, 515, 522
530 and 540
2H = Areas 515 + 517
522
514
521
513
511
516
512
517
515
530
540
550
(Outside EEZ)
200-Mile Limit
GULF OF ALASKA
60°00'N 179°20'W
60°00'N 171°00'W
59°23'N 179°20'W
58°00'N 171°00'W
58°00'N 170°00'W
58°00'N 165°00'W
58°00'N 162°00'W
58°00'N 160°00'W
58°00'N 163°00'W
No Trawling in Shaded Area
Only Domestic Trawling for Cod
56°43'N 160°00'W
56°30'N 170°00'W
56°30'N 165°00'W
56°00'N 162°00'W
55°42'N 170°00'W
55°00'N 170°00'W
54°30'N 167°00'W
54°30'N 165°00'W
52°48'N 170°00'W



Regulatory and reporting areas of the Gulf of Alaska.

USING THE SUBAREA TABLES
FOR THE BERING SEA AND ALEUTIANS

When you are given a position that is close to the diagonal boundary lines that separate areas 513 and 515 or areas 521 and 522, it may be difficult to determine exactly which subarea the deliver should be attributed to. These tables will aid you in that determination.

<u>The 1st table</u>: Table 1, is a plot of the line intersecting areas 513 and 515. The line gives the corresponding latitude position for each minute of longitude.
<u>The 2nd table</u>: Table 2, is a plot of the line intersecting areas 521 and 522.

<u>How To Use The Tables</u>

First find the longitude of your delivery position in Column B of the table. The corresponding latitude in Column A marks the point on the line which intersects the two subareas. If the latitude of your delivery position is greater than the table latitude, your position falls in the subarea to the north of the line. If the latitude of your delivery position is less than the table latitude then your position falls in the subarea to the south of the line.

<u>Special Cases</u>

For delivery positions that fall exactly on the line, or if the delivery position falls on "Four Corners", the intersecting point of 55-46 N 170-00 W, use the trawl data you have for the delivery to decide which subarea the fish were caught in and assign the delivery to that subarea.

<u>Example of Use</u>

To demonstrate the use of the tables: suppose your ship had received a codend and records the delivery position as 54-39 N 68-07 W. Determine what subarea this delivery position falls in.

1. First, find longitude 168-07 W in Column B of the tables:
   (longitude 168-07 is found in Table 1)

Col. A	Col.B	
5457. 72	16805. 00	
5458. 15	16806. 00	
5458. 57	16807. 00	<----- delivery longitude
5458. 99	16808. 00	
5459. 42	16809. 00	

2. Read the corresponding latitude from Column A:

	Col. A	Col. B
	5457. 72	16805. 00
	5458. 15	16806. 00
----->	5458. 57	16807. 00
	5458. 99	16808. 00
	5459. 42	16809. 00

3. Determine whether your delivery latitude is greater than or less than the latitude in Column A:

   delivery latitude 54-39 (5439. 00) is lower than Intersecting latitude 5458. 57

4. Determine the subarea:
   Remember that Table 1, where the delivery longitude was found, represents points on the line between subareas 513 and 515. Table B represents points on the line between subareas 521 and 522.

   Since the delivery latitude was lower than the line latitude, the delivery position falls *into subarea 515, the subarea south of the line.*

<u>Summary Table</u>

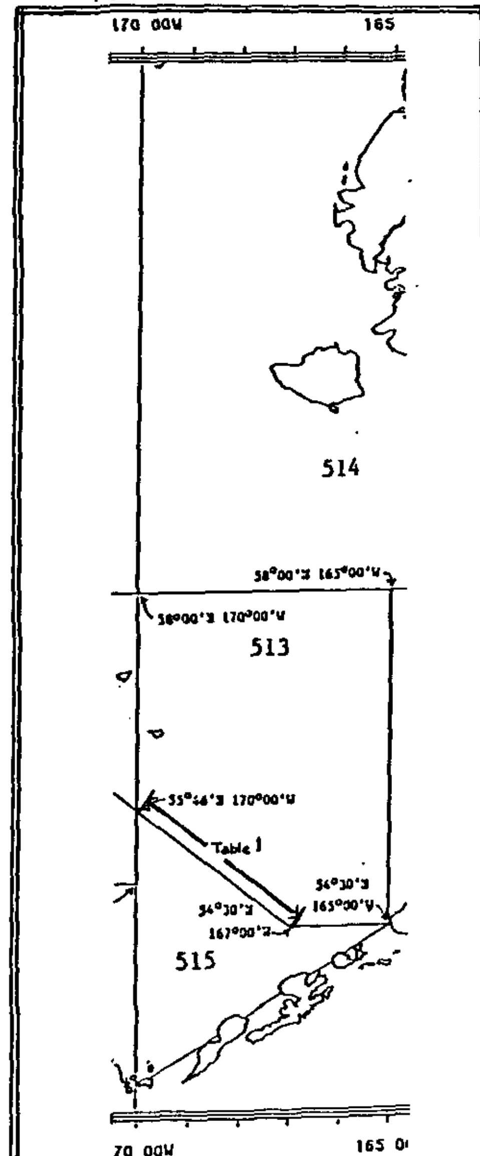
	Table 1	Table 2
Delivery latitude less than line latitude	SUBAREA 515	SUBAREA 522
Delivery latitude greater than line latitude	SUBAREA 513	SUBAREA 521

LAT COL. A	LONG COL. B	LAT COL. A	LONG COL. B	LAT COL. A	LONG COL. B	LAT COL. A	LONG COL. B
		5434.73	16758.00	5520.09	16858.00	5545.17	16958.00
		5435.18	16759.00	5520.51	16859.00	5545.58	16959.00
5430.00	16700.00	5435.60	16800.00	5520.93	16900.00	5546.00	17000.00
5430.43	16701.00	5436.03	16801.00	5521.35	16901.00		
5430.86	16702.00	5436.45	16802.00	5521.77	16902.00		
5431.29	16703.00	5436.87	16803.00	5522.19	16903.00		
5431.72	16704.00	5437.30	16804.00	5522.61	16904.00		
5432.14	16705.00	5437.72	16805.00	5523.03	16905.00		
5432.57	16706.00	5438.15	16806.00	5523.45	16906.00		
5433.00	16707.00	5438.57	16807.00	5523.87	16907.00		
5433.43	16708.00	5438.99	16808.00	5524.29	16908.00		
5433.86	16709.00	5439.42	16809.00	5524.71	16909.00		
5434.29	16710.00	5439.84	16810.00	5525.13	16910.00		
5434.71	16711.00	5500.27	16611.00	5525.55	16911.00		
5435.14	16712.00	5500.69	16612.00	5525.97	16912.00		
5435.57	16713.00	5501.11	16813.00	5526.39	16913.00		
5436.00	16714.00	5501.54	16814.00	5526.81	16914.00		
5436.43	16715.00	5501.96	16815.00	5527.23	16915.00		
5436.85	16716.00	5502.38	16816.00	5527.64	16916.00		
5437.28	16717.00	5502.81	16817.00	5528.06	16917.00		
5437.71	16718.00	5503.23	16818.00	5528.48	16918.00		
5438.14	16719.00	5503.65	16819.00	5528.90	16919.00		
5438.56	16720.00	5504.08	16820.00	5529.32	16920.00		
5438.99	16721.00	5504.50	16821.00	5529.74	16921.00		
5439.42	16722.00	5504.92	16822.00	5530.16	16922.00		
5439.85	16723.00	5505.34	16823.00	5530.57	16923.00		
5440.27	16724.00	5505.77	16624.00	5530.99	16924.00		
5440.70	16725.00	5506.19	16625.00	5531.41	16925.00		
5441.13	16726.00	5506.61	16826.00	5531.83	16926.00		
5441.55	16727.00	5507.03	16627.00	5532.25	16927.00		
5441.98	16728.00	5507.46	16828.00	5532.66	16928.00		
5442.41	16729.00	5507.88	16829.00	5533.08	16929.00		
5442.83	16730.00	5508.30	16830.00	5533.50	16930.00		
5443.26	16731.00	5508.72	16831.00	5533.92	16931.00		
5443.69	16732.00	5509.15	16832.00	5534.34	16932.00		
5444.11	16733.00	5509.57	16833.00	5534.75	16933.00		
5444.54	16734.00	5509.99	16834.00	5535.17	16934.00		
5444.97	16735.00	5510.41	16835.00	5535.59	16935.00		
5445.39	16736.00	5510.83	16836.00	5536.01	16936.00		
5445.82	16737.00	5511.26	16837.00	5536.42	16937.00		
5446.25	16738.00	5511.68	16838.00	5536.84	16938.00		
5446.67	16739.00	5512.10	16839.00	5537.26	16939.00		
5447.10	16740.00	5512.52	16840.00	5537.67	16940.00		
5447.52	16741.00	5512.94	16841.00	5538.09	16941.00		
5447.95	16742.00	5513.36	16842.00	5538.51	16942.00		
5448.38	16743.00	5513.78	16843.00	5538.93	16943.00		
5448.80	16744.00	5514.21	16844.00	5539.34	16944.00		
5449.23	16745.00	5514.63	16845.00	5539.76	16945.00		
5449.65	16746.00	5515.05	16846.00	5540.18	16946.00		
5450.08	16747.00	5515.47	16847.00	5540.59	16947.00		
5450.50	16748.00	5515.89	16848.00	5541.01	16948.00		
5450.93	16749.00	5516.31	16849.00	5541.42	16949.00		
5451.35	16750.00	5516.73	16850.00	5541.84	16950.00		
5451.78	16751.00	5517.15	16851.00	5542.26	16951.00		
5452.20	16752.00	5517.57	16852.00	5542.67	16952.00		
5452.63	16753.00	5517.99	16853.00	5543.09	16953.00		
5453.05	16754.00	5518.41	16854.00	5543.51	16954.00		
[illegible]	16755.00	5518.83	16855.00	5543.92	16955.00		
[illegible]	16756.00	5519.25	16856.00	5544.34	16956.00		
		[illegible]	[illegible]	[illegible]	[illegible]		

TABLE 1

plot of the points on the line intersecting between subareas 513 and 515.

pg. 1



Map Section showing the line that the points of Table follow.

LAT COL. A	LONG COL. B
5546.41	17001.00
5546.82	17002.00
5547.23	17003.00
5547.64	17004.00
5548.05	17005.00
5548.46	17006.00
5548.87	17007.00
5549.28	17008.00
5549.70	17009.00
5550.11	17010.00
5550.52	17011.00
5550.93	17012.00
5551.34	17013.00
5551.75	17014.00
5552.16	17015.00
5552.57	17016.00
5552.97	17017.00
5553.38	17018.00
5553.79	17019.00
5554.20	17020.00
5554.61	17021.00
5555.02	17022.00
5555.43	17023.00
5555.84	17024.00
5556.25	17025.00
5556.66	17026.00
5557.07	17027.00
5557.48	17028.00
5557.89	17029.00
5558.29	17030.00
5558.70	17031.00
5559.11	17032.00
5559.52	17033.00
5559.93	17034.00
5600.34	17035.00
5600.75	17036.00
5601.15	17037.00
5601.56	17038.00
5601.97	17039.00
5602.38	17040.00
5602.79	17041.00
5603.19	17042.00
5603.60	17043.00
5604.01	17044.00
5604.42	17045.00
5604.83	17046.00
5605.23	17047.00
5605.64	17048.00
5606.05	17049.00
5606.46	17050.00
5606.86	17051.00
5607.27	17052.00
5607.68	17053.00
5608.08	17054.00
5608.49	17055.00
5608.90	17056.00
[illegible]	17057.00

LAT COL. A	LONG COL. B
5609.71	17058.00
5610.12	17059.00
5610.52	17100.00
5610.93	17101.00
5611.34	17102.00
5611.74	17103.00
5612.15	17104.00
5612.56	17105.00
5612.96	17106.00
5613.37	17107.00
5613.78	17108.00
5614.18	17109.00
5614.59	17110.00
5614.99	17111.00
5615.40	17112.00
5615.80	17113.00
5616.21	17114.00
5616.62	17115.00
5617.02	17116.00
5617.43	17117.00
5617.83	17118.00
5618.24	17119.00
5618.64	17120.00
5619.05	17121.00
5619.45	17122.00
5619.86	17123.00
5620.26	17124.00
5620.67	17125.00
5621.07	17126.00
5621.48	17127.00
5621.88	17128.00
5622.29	17129)00
5622.69	17130.00
5623.09	17131.00
5623.50	17132.00
5623.90	17133.00
5624.31	17134.00
5624.71	17135.00
5625.12	17136.00
5625.52	17137.00
5625.92	17138.00
5626.33	17139.00
5626.73	17140.00
5627.13	17141.00
5627.54	17142.00
5627.94	17143.00
5628.35	17144.00
5628.75	17145.00
5629.15	17146.00
5629.56	17147.00
5629.96	17148.00
5630.36	17149.00
5630.76	17150.00
5631.17	17151.00
5631.57	17152.00
5631.97	17153.00
5632.38	17154.00
5632.78	17155.00
5633.18	17156.00
5633.58	17157.00

LAT COL. A	LONG COL. B
5633.99	17158.00
5634.39	17159.00
5634.79	17200.00
5635.19	17201.00
5635.60	17202.00
5636.00	17203.00
5636.40	17204.00
5636.80	17205.00
5637.20	17206.00
5637.61	17207.00
5638.01	17208.00
5638.41	17209.00
5638.81	17210.00
5639.21	17211.00
5639.61	17212.00
5640.01	17213.00
5640.42	17214.00
5640.82	17215.00
5641.22	17216.00
5641.62	17217.00
5642.02	17218.00
5642.42	17219.00
5642.82	17220.00
5643.22	17221.00
5643.62	17222.00
5644.02	17223.00
5644.43	17224.00
5644.83	17225.00
5645.23	17226.00
5645.63	17227.00
5646.03	17228.00
5646.43	17229.00
5646.83	17230.00
5647.23	17231.00
5647.63	17232.00
5648.03	17233.00
5648.43	17234.00
5648.83	17235.00
5649.23	17236.00
5649.63	17237.00
5650.03	17238.00
5650.43	17239.00
5650.83	17240.00
5651.23	17241.00
5651.62	17242.00
5652.02	17243.00
5652.42	17244.00
5652.82	17245.00
5653.22	17246.00
5653.62	17247.00
5654.02	17248.00
5654.42	17249.00
5654.82	17250.00
5655.22	17251.00
5655.61	17252.00
5656.01	17253.00
5656.41	17254.00
5656.81	17255.00
5657.21	17256.00
5657.61	17257.00

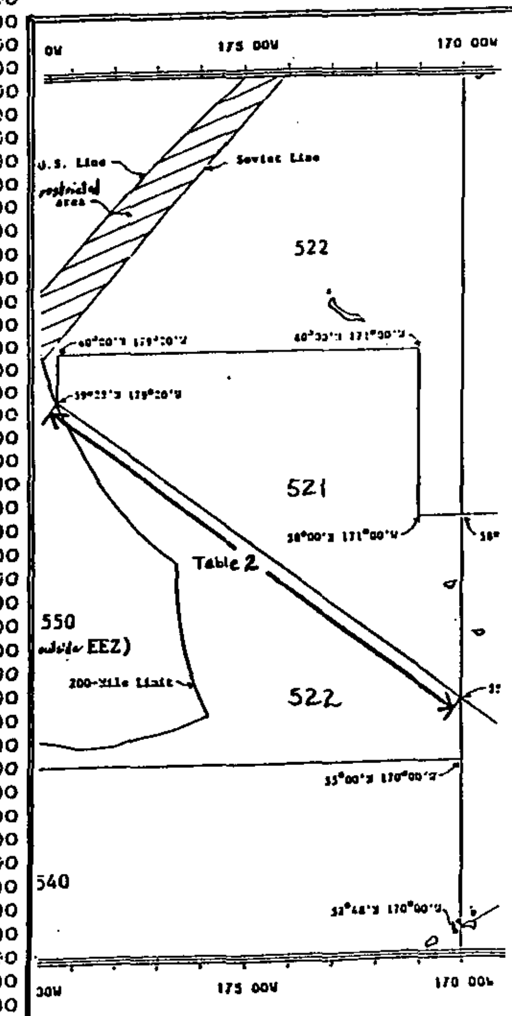
LAT COL. A	LONG COL. B
5658.00	17258.00
5658.40	17259.00
5658.80	17300.00
5659.20	17301.00
5659.60	17302.00
5659.99	17303.00
5700.39	17304.00
5700.79	17305.00
5701.19	17306.00
5701.59	17307.00
5701.98	17308.00
5702.38	17309.00
5702.78	17310.00
5703.17	17311.00
5703.57	17312.00
5703.97	17313.00
5704.37	17314.00
5704.76	17315.00
5705.16	17316.00
5705.56	17317.00
5705.95	17318.00
5706.35	17319.00
5706.75	17320.00
5707.14	17321.00
5707.54	17322.00
5707.94	17323.00
5708.33	17324.00
5708.73	17325.00
5709.13	17326.00
5709.52	17327.00
5709.92	17328.00
5710.31	17329.00
5710.71	17330.00
5711.11	17331.00
5711.50	17332.00
5711.90	17333.00
5712.29	17334.00
5712.69	17335.00
5713.08	17336.00
5713.48	17337.00
5713.87	17338.00
5714.27	17339.00
5714.67	17340.00
5715.06	17341.00
5715.46	17342.00
5715.85	17343.00
5716.25	17344.00
5716.64	17345.00
5717.03	17346.00
5717.43	17347.00
5717.82	17348.00
5718.22	17349.00
5718.61	17350.00
5719.01	17351.00
5719.40	17352.00
5719.80	17353.00
5720.19	17354.00
5720.59	17355.00
5720.98	17356.00
5721.37	17357.00

LAT COL. A	LONG COL. B
5721.77	17358.00
5722.16	17359.00
5722.55	17400.00
5722.95	17401.00
5723.34	17402.00
5723.74	17403.00
5724.13	17404.00
5724.52	17405.00
5724.92	17406.00
5725.31	17407.00
5725.70	17408.00
5726.10	17409.00
5726.49	17410.00
5726.88	17411.00
5727.28	17412.00
5727.67	17413.00
5728.06	17414.00
5728.45	17415.00
5728.85	17416.00
5729.24	17417.00
5729.63	17418.00
5730.02	17419.00
5730.42	17420.00
5730.81	17421.00
5731.20	17422.00
5731.59	17423.00
5731.99	17424.00
5732.38	17425.00
5732.77	17426.00
5733.16	17427.00
5733.55	17428.00
5733.95	17429.00
5734.34	17430.00
5734.73	17431.00
5735.12	17432.00
5735.51	17433.00
5735.90	17434.00
5736.29	17435.00
5736.69	17436.00
5737.08	17437.00
5737.47	17438.00
5737.86	17439.00
5738.25	17440.00
5738.64	17441.00
5739.03	17442.00
5739.42	17443.00
5739.81	17444.00
5740.20	17445.00
5740.59	17446.00
5740.99	17447.00
5741.38	17448.00
5741.77	17449.00
5742.16	17450.00
5742.55	17451.00
5742.94	17452.00
5743.33	17453.00
5743.72	17454.00
5744.11	17455.00
5744.50	17456.00
5744.89	17457.00

TABLE 2

Plot of the points on the line intersecting between subareas 521 and 522.

pgs. 2-3



Map section showing the line that the points of Table 2 follow.

LAT COL. A	LONG COL. B
5745.28	17458.00
5745.67	17459.00
5746.06	17500.00
5746.44	17501.00
5746.83	17502.00
5747.22	17503.00
5747.61	17504.00
5748.00	17505.00
5748.39	17506.00
5748.78	17507.00
5749.17	17508.00
5749.56	17509.00
5749.95	17510.00
5750.34	17511.00
5750.73	17512.00
5751.11	17513.00
5751.50	17514.00
5751.89	17515.00
5752.28	17516.00
5752.67	17517.00
5753.06	17518.00
5753.44	17519.00
5753.83	17520.00
5754.22	17521.00
5754.61	17522.00
5755.00	17523.00
5755.38	17524.00
5755.77	17525.00
5756.16	17526.00
5756.55	17527.00
5756.94	17528.00
5757.32	17529.00
5757.71	17530.00
5758.10	17531.00
5758.49	17532.00
5758.87	17533.00
5759.26	17534.00
5759.65	17535.00
5800.03	17536.00
5800.42	17537.00
5800.81	17538.00
5801.20	17539.00
5801.58	17540.00
5801.97	17541.00
5802.36	17542.00
5802.74	17543.00
5803.13	17544.00
5803.52	17545.00
5803.90	17546.00
5804.29	17547.00
5804.67	17548.00
5805.06	17549.00
5805.45	17550.00
5805.83	17551.00
5806.22	17552.00
5806.60	17553.00
5806.98	17554.00
5807.[illegible]	17555.00
5807.[illegible]	17556.00

LAT COL. A	LONG COL. B
5808.53	17558.00
5808.92	17559.00
5809.30	17600.00
5809.69	17601.00
5810.07	17602.00
5810.46	17603.00
5810.84	17604.00
5811.23	17605.00
5811.61	17606.00
5812.00	17607.00
5812.38	17608.00
5812.77	17609.00
5813.15	17610.00
5813.54	17611.00
5813.92	17612.00
5814.31	17613.00
5814.69	17614.00
5815.08	17615.00
5815.46	17616.00
5815.85	17617.00
5816.23	17618.00
5816.61	17619.00
5817.00	17620.00
5817.38	17621.00
5817.77	17622.00
5818.15	17623.00
5818.53	17624.00
5818.92	17625.00
5819.30	17626.00
5819.68	17627.00
5820.07	17628.00
5820.45	17629.00
5820.83	17630.00
5821.22	17631.00
5821.60	17632.00
5821.98	17633.00
5822.37	17634.00
5822.75	17635.00
5823.13	17636.00
5823.52	17637.00
5823.90	17638.00
5824.28	17639.00
5824.66	17640.00
5825.05	17641.00
5825.43	17642.00
5825.81	17643.00
5826.19	17644.00
5826.58	17645.00
5826.96	17646.00
5827.34	17647.00
5827.72	17648.00
5828.10	17649.00
5828.49	17650.00
5828.87	17651.00
5829.25	17652.00
5829.63	17653.00
5830.01	17654.00
5830.40	17655.00
5830.78	17656.00

LAT COL. A	LONG COL. B
5831.54	17658.00
5831.92	17659.00
5832.30	17700.00
5832.68	17701.00
5833.06	17702.00
5833.45	17703.00
5833.83	17704.00
5834.21	17705.00
5834.59	17706.00
5834.97	17707.00
5835.35	17708.00
5835.73	17709.00
5836.11	17710.00
5836.49	17711.00
5836.87	17712.00
5837.25	17713.00
5837.63	17714.00
5838.01	17715.00
5838.39	17716.00
5838.77	17717.00
5839.15	17718.00
5839.53	17719.00
5839.91	17720.00
5840.29	17721.00
5840.67	17722.00
5841.05	17723.00
5841.43	17724.00
5841.81	17725.00
5842.19	17726.00
5842.57	17727.00
5842.95	17728.00
5843.33	17729.00
5843.71	17730.00
5844.09	17731.00
5844.47	17732.00
5844.84	17733.00
5845.22	17734.00
5845.60	17735.00
5845.98	17736.00
5846.36	17737.00
5846.74	17738.00
5847.12	17739.00
5847.50	17740.00
5847.87	17741.00
5848.25	17742.00
5848.63	17743.00
5849.01	17744.00
5849.39	17745.00
5849.77	17746.00
5850.14	17747.00
5850.52	17748.00
5850.90	17749.00
5851.28	17750.00
5851.65	17751.00
5852.03	17752.00
5852.41	17753.00
5852.79	17754.00
5853.17	17755.00
5853.54	17756.00

LAT COL. A	LONG COL. B
5854.30	17758.00
5854.67	17759.00
5855.05	17800.00
5855.43	17801.00
5855.81	17802.00
5856.18	17803.00
5856.56	17804.00
5856.94	17805.00
5857.31	17806.00
5857.69	17807.00
5858.07	17808.00
5858.44	17809.00
5858.82	17810.00
5859.20	17811.00
5859.57	17812.00
5859.95	17813.00
5900.32	17814.00
5900.70	17815.00
5901.08	17816.00
5901.45	17817.00
5901.83	17818.00
5902.20	17819.00
5902.58	17820.00
5902.96	17821.00
5903.33	17822.00
5903.71	17823.00
5904.08	17824.00
5904.46	17825.00
5904.83	17826.00
5905.21	17827.00
5905.58	17828.00
5905.96	17829.00
5906.33	17830.00
5906.71	17831.00
5907.08	17832.00
5907.46	17833.00
5907.83	17834.00
5908.21	17835.00
5908.58	17836.00
5908.96	17837.00
5909.33	17838.00
5909.71	17839.00
5910.08	17840.00
5910.45	17841.00
5910.83	17842.00
5911.20	17843.00
5911.58	17844.00
5911.95	17845.00
5912.33	17846.00
5912.70	17847.00
5913.07	17848.00
5913.45	17849.00
5913.82	17850.00
5914.19	17851.00
5914.57	17852.00
5914.94	17853.00
5915.31	17854.00
5915.69	17855.00
5916.06	17856.00
5916.43	17857.00

LAT COL. A	LONG COL. B
5916.81	17858.00
5917.18	17859.00
5917.55	17900.00
5917.93	17901.00
5918.30	17902.00
5918.67	17903.00
5919.05	17904.00
5919.42	17905.00
5919.79	17906.00
5920.16	17907.00
5920.54	17908.00
5920.91	17909.00
5921.28	17910.00
5921.65	17911.00
5922.02	17912.00
5922.40	17913.00
5922.77	17914.00
5923.14	17915.00
5923.51	17916.00
5923.88	17917.00
5924.26	17918.00
5924.63	17919.00
5925.00	17920.00

REPORTING GROUPS FOR SPECIES COMPOSITION RADIO MESSAGES

Bering Sea/Aleutians (Areas 510 - 550)

Species Group	Report Group	Abbreviation
Squid	Squid	SQU
Yellowfin sole	Yellowfin sole	YELL
Rock sole	Rock sole	RSOLE
Greenland turbot	Greenland turbot	TURB
Arrowtooth flounder Kamchatka flounder	Arrowtooth Flounder	ARROW
Other flatfish (except halibut)	Other flatfish	OFLAT
Pollock	Pollock	POLL
Pacific cod	Pacific cod	COD
Sablefish	Sablefish	SAB
Atka mackerel	Atka mackerel	ATKA
Pacific ocean perch Rougheye rockfish Northern rockfish Sharpchin rockfish Shortraker rockfish	POP Complex *	POP
All other rockfish (Sebastes and Sebastolobus spp.)	Other rockfish	OROCK
Herring	Herring	HER
Sharks, skates, sculpins, eulachon, smelts, capelin and octopus only	Other fish	OTH
All remaining fish spp. Prohibited spp. (except herring) Invertebrates (except squid and octopus) Miscellaneous items	Non-allocated	NON

* The POP report group has changed to a group containing the following five rockfish species: Pacific ocean perch, Rougheye rockfish, Northern rockfish, Sharpchin rockfish and Shortraker rockfish.

Gulf of Alaska (Areas 610 - 680)

Species Group	Report Group	Abbreviation
Squid	Squid	SQU
Rex sole Dover sole Flathead sole	Deepwater flatfish	DFLT
Rock sole Yellowfin sole Butter sole Starry flounder All other flatfish (except halibut)	Shallow-water flatfish	SFLT
Pollock	Pollock	POLL
Pacific cod	Pacific cod	COD
Sablefish	Sablefish	SAB
Atka mackerel	Atka mackerel	ATKA
Pacific ocean perch (S. alutus) Northern rockfish (S. polyspinus) Rougheye rockfish (S. aleutianus) Sharpchin rockfish (S. zacentrus) Shortraker rockfish (S. borealis) Aurora rockfish (Sebastes aurora) Blackgill rockfish (S. melanostomus) Chilipepper rockfish (S. goodei) Darkblotched rockfish (S. crameri) Greenstriped rockfish (S. elongatus) Harlequin rockfish (S. variegatus) Pygmy rockfish (S. wilsoni) Red banded rockfish (S. babcocki) Shortbelly rockfish (S. jordani) Splitnose rockfish (S. diploproa) Stripetail rockfish (S. saxicola) Vermilion rockfish (S. miniatus) Yellowmouth rockfish (S. reedi)	Slope Rockfish	SLPRF

Gulf of Alaska (Areas 610 - 680) cont.

Species Group	Report Group	Abbreviation
Bocaccio (Sebastes paucispinus) Canary rockfish (S. pinniger) China rockfish (S. nebulosus) Copper rockfish (S. caurinus) Quillback rockfish (S. maliger) Redstripe rockfish (S. proriger) Rosethorn rockfish (S. helvomaculatus) Silvergray rockfish (S. brevispinus) Tiger rockfish (S. nigrochinctus) Yelloweye rockfish (S. ruberrimus)	Demersal Shelf Rockfish	DEMRF
Black rockfish (Sebastes melanops) Blue rockfish (S. mystinus) Dusky rockfish (S. ciliatus) Widow rockfish (S. entomelas) Yellowtail rockfish (S. flavidus)	Pelagic Shelf Rockfish	PELRF
Longspine thornyhead (Sebastolobus altivelis) Shortspine thornyhead (Sebastolobus alascanus)	Thornyhead Rockfish	THRN
Sharks, skates, sculpins, eulachon smelts, capelin and octopus **only**	Other fish	OTH
All remaining fish spp. Prohibited spp. (includes herring) Invertebrates (except squid and octopus) Miscellaneous items	Non-allocated	NON

INSTRUCTIONS FOR FORM RM

For catch messages, the relative importance of each haul you sample for species composition is dependent upon the size of the haul in relation to the size of other hauls that were sampled. In order to reflect the relative importance of each haul that is sampled in your daily calculation of catch, you must first determine the estimated weight for each species or species group from each haul sampled for your data in the following way:

1. Determine the statistical area of each catch sampled. Data for each area should be recorded on separate sheets of Form RM.

2. According to the list by region, (BSA, or GOA), write the species report group abbreviations, <u>in order</u>, across the tops of the columns on Form RM. (Note: There are not enough columns on the form to enable you to enter all of the report groups for the BSA. You will have to omit one or more report groups that you don't expect to see that week.)

For each sampled catch:

3. Enter the date and haul (or set) number in the first column.

4. Column A: Enter the haul weight, in metric tons, from the "Official Total Catch" columns on Form 1 or 2US or 2MUS.

5. Column B: If you have different sample sizes for the same haul, as in the example for haul 104, enter the data for each sample type on separate lines, the largest sample weight first, in kilograms, from Form 3US.

6. Column C: (For each species group within a sample type) - Enter the weight for the species or species group, in kilograms, from the sample data on Form 3US.

7. Column D: (For each species group of a sample type) - Calculate the total catch of each species or species group as shown below. **Record the result to the nearest .001 mt.** (Tonnages of .00049 or less may be recorded to the nearest .0001 and carried through the calculations to the summary for the week.)

Assuming the sample is representative of the haul, the **ratio** of each species weight to the sample weight should be the same as the ratio of the weight of each species in the haul to the total haul weight, that is:

$$\frac{\text{sp. wt. in haul (in mt)}}{\text{total haul wt. (mt)}} = \frac{\text{sp. wt. in sample (in kg)}}{\text{total sample wt. (kg)}} \text{ or, (see Form RM), } \frac{\text{Col. D}}{\text{Col. A}} = \frac{\text{Col. C}}{\text{Col. B}}$$

Solving, then, for the unknown quantity:

$$\frac{\cancel{\text{Col. A}}}{1} \times \frac{\text{Col. D}}{\cancel{\text{Col. A}}} = \frac{\text{Col. C}}{\text{Col. B}} \times \frac{\text{Col. A}}{1} \quad \text{and, Col. D} = \frac{\text{Col. A x Col. C}}{\text{Col. B}} \text{ or,}$$

$$\text{Col. D} = \frac{\text{(Col. A)}}{\text{(Col. B)}} \times \text{(Col. C)}.$$ (Don't round the A ÷ B ratio constant.)

Note: If you whole haul sampled for species composition, the entry in column D is simply a conversion of kilograms, in column C, to metric tons, rounded to three decimal places. Whole haul sample data must be entered in this manner, however, for clarity and ease of grouping and summations.

8. **More Than One Sample Type:** If you have different sample sizes for the same haul, repeat steps 5 - 7 for the other sample types. **Except:** In basket sampling, the observer is actually sampling only the species that remain. The basket sample data for species composition should not be expanded to the entire catch weight but to the catch weight minus the extrapolated weight of the species that were partial or whole haul sampled. The entry of data for haul 104 illustrates this.

9. **Math Check:** To make certain all weights were transcribed and that they are correct, add the kg sampled for each species group. This should equal the summation on the 999 line of form 3US in the sample weight column **exactly**. After computing column D for each species group, check your math by summing all the column D entries for a haul or set and comparing the summation to the total catch weight (on the first line for the haul, in column A). Make note of the variance in the margin so you can go back to it later. A variance of more than + or -.003 MT indicates the strong probability of a calculation error.

10. For the day's totals of sampled hauls by area, sum the total catchs for the sampled hauls and each column D. Skip a line between days.

11. Number pages consecutively regardless of area designation.

The aforementioned procedure was an extrapolation of the species composition data from the weight by species in the sample to the weight by species for the entire **sampled** haul. Observers now need to extrapolate the weight by species **from sampled hauls to** the weight by species for the **total catch of the day**, and sum these data for the week.

FORM RM WEEKLY RADIO REPORT WORK SHEET AREA 521

$D = \frac{A}{B} \times C$ CRUISE NO. 114 VESSEL CODE A121

No Rock Sole were seen

No herring were seen

	A	B	C	D																								
			SQU		YELL		TURB		ARROW		OFLAT		POLL		COD		SAB		ATKA		POP		OROCK		OTH		NON	
DATE & HAUL No.	HAUL WT MT	TOTAL SAMPLE WT KG	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL	KG SMPL	MT HAUL
9/10 101 wh	16.00	16000.0	3.6	.004	—	—	—	—	5.0	.005	1.45	.001	5778.79	5.779	—	—	72.6	.073	—	—	.45	.0004	14.00	.014	6.8	.007	115.92	.116
103 wh	20.00	20000.0	—	—	—	—	—	—	5.9	.006	1.4	.001	—	—	—	—	78.5	.079	—	—	—	—	—	—	3.8	.004	5.0	.005
103 bsk	19.905	137.6	—	—	—	—	—	—	—	—	—	—	117.2	16.954	20.4	2.951	—	—	—	—	—	—	—	—	—	—	—	—
104 wh	12.00	12000.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	92.95	.093
104 pwh	12.00	3000.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20.88	.084
104 bsk	11.823	453.80	51.8	1.350	—	—	—	—	—	—	—	—	350.0	9.119	23.8	.620	5.2	.135	—	—	—	—	23.0	.599	—	—	—	—
Day Total	48.00	.		1.354						.011		.002		41.852		3.571		.287				.0004		.613		.011		.298
-.001																												
9/11	—	—			No		Fishing																					
9/12 106 wh	11.75	11750.0	750.00	.750	—	—	—	—	2450.0	2.450	—	—	6500.0	6.500	2000.0	2.000	—	—	—	—	—	—	—	—	—	—	60.00	.060
108 wh	8.22	8220.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	86.0	.086
108 bkt	8.134	312.8	—	—	—	—	85.2	2.215	—	—	—	—	218.0	5.513	—	—	—	—	—	—	2.1	.055	—	—	13.5	.351	—	—
Days Total DOG = .8	19.97			.750				2.215		2.450				12.013		2.000						.055				.351		.136

FORM RM-1 - FOR ALL VESSEL TYPES

1. At the end of each day, determine the correct statistical area of each catch. The position which determines the statistical area is the retrieval position. The noon postion determines the area on non-fishing days. Data for each area should be recorded on separate sheets of Form RM-1.

2. Again, according to the list by region (BSA, or GOA), write the species report group abbreviations, in order, across the tops of the columns. (If all of the species report groups will not fit on the form, then leave out one or more report groups that you do not expect to see in that weeks' catch.)

3. Enter the date.

4. Column A: Record the total weight of catch landed by the vessel in the area that day. This is the sum of all individual catch weights from within the area for the day (both sampled and not-sampled catches), from Form 1US, 2US or 2MUS.

5. Column B: Enter the sum of the catch weights of sampled hauls or sets. This is in metric tons, not kilograms.

6. Column C: (For each species report group) - Record the total weight of each species report group from the day's species composition sample. This is the sum of each Column D for the day from Form RM and is recorded in metric tons to the nearest .001 mt.

7. Column D: (For each species group) - To calculate the total daily catch of each species report group, divide the total landed catch for the area (Column A) by the total weight of **sampled** catches in Column B. Store this constant ratio in the calculator memory and multiply it by the weight of each species in sampled catches, Column C. **Record the results to the nearest .001 mt.** (Tonnages of .00049 or less should be recorded to the nearest .0001 and carried through the calculations to the summary for the week.)

8. Check your calculations by adding the Column D's across for each day or set and comparing with Column A. A tolerance of +/- .01 mt is acceptable.

9. For the week: Sum Column A. Sum Column D's for each species report group. All summations should be recorded to either two or three decimal places consistently. Add the Column D's across. The total of the Column D's should be within +/- .02 mt of the sum of Column A for the week.

10. If the difference between the sum of Column D's and Column A is within the tolerance specified, it is probably due to rounding. In paragraph 1 of your catch message however, species weights must equal the total weight exactly. Differences due to rounding must be eliminated by adjusting a predominant species weight sum (Column D). The correct figure should be circled and the adjusted figure written below it.

FORM RM-1 WEEKLY RADIO REPORT WORK SHEET AREA 521

$D = \frac{A}{B} \times C$ CRUISE NO. 114 VESSEL CODE A121

* For motherships and longliners, column B should equal the total sample wt. in kg. and column C should equal kg. sampled

	A	B*	C* SQU	D SQU	YELL		TURB		ARROW		OFLAT		POLL		COD		SAB		ATKA		POP		OROCK		OTH		NON	
DATE	DAY WT MT	TOTAL WT OF SMPLD HAULS IN MT	MT SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY	KG SMPL	MT DAY
9/10/87	74.87	48.00	1.350	2.11	—	—	—	—	.011	.017	.002	.003	41.852	65.28	3.571	5.570	.287	.448			.0004	.0006	.613	.956	.011	.017	.298	.465
9/11	No	Fishing!																										
9/12	40.46	19.97	.750	1.520	—	—	2.215	4.488	2.450	4.964	—	—	12.013	24.338	2.000	4.052	—	—	—	—	.055	.111			.351	.711	.136	.276
Totals for the week	115.33			3.630				4.488		4.981		.003		89.618		9.622		.448				.112		.956		.728		.741
(2.8 DOG)																												

SPECIAL PROBLEMS

If Your Ship Fishes Outside of the EEZ

Continue to sample and send catch reports for any catches taken outside the EEZ. In the Bering Sea report the catch as coming from Area 550. Outside the EEZ in the Gulf of Alaska is Area 690. (Refer to the charts on previous pages.)

Lack of Species Composition Data from an Area for a Day Fished

If, during the middle of a cruise you did not sample at all for a given fishing day due to illness, severe weather problems, or other reasons, do not extrapolate catch data for that period. In your weekly catch message, include only the catch data for the days you did sample, indicate the reason for not sampling, and report the dates and total catch tonnage of the non-sampled days in a separate sentence. (See the example of a message sent from a "vessel fishing independently in the WOC Hake Fishery.)

If, however, the ship fished in two or more areas in a day that you sampled but you were unable to sample the catch for all of the areas in which the vessel fished that day, an extrapolation may be possible. Apply the sampling data (percent composition by weight) of the hauls from the previous or following day from that same area to the catch from that area for the day.

Two Distinct Types of Fishing Strategy within a Day

In those cases where the vessel uses two distinct fishing strategies during the day to target on two different types of fish (i.e. flatfish during the day and rockfish at night), the observer should use the following method to calculate the daily catch for the weekly catch message. Both types of catches must be sampled each day and you must be able to designate each haul or set as one of the two types.

Within each area fished during the day, treat the two types of hauls separately on Form RM and Form RM-1 so that you estimate the catch of each species group separately for each type of haul. Within each area you will have two separate daily estimates of catch by species on Form RM-1. At the week's end, sum all estimates from both types of hauls for each species (Column D). There is no need to separate the week's totals into two types of hauls. (Refer to the date 9/12 on the RM and RM-1 examples.)

FORM RM-3 - FOR ALL VESSEL CLASSES

The following instructions pertain to the data you have collected on the incidental catch of prohibited species (king crab, Tanner crab, halibut and salmon) and their inclusion in Paragraph 2 of the weekly catch message.

1. Entry of data on Form RM-3 will be made for every haul or set you sample (**even if none are found in your samples**).

2. All data should be separated by area (i.e. 513, 517, 521, etc., see charts on previous pages) and each area recorded on separate sheets of Form RM-3.

3. Enter date and the haul or set number. Remember the week runs from Sunday through Saturday.

4. Column A: Enter the "Official Total Catch" weight. Enter the weight in tons (mt), not kilograms.

5. Column B: Enter the weight of groundfish catch sampled for each of the prohibited species to the nearest 0.01 mt.

6. Column C: Enter the number observed for each prohibited report group. If you subsampled a prohibited species group, you need to extrapolate the data (by number) to the number observed for each report group before entering the results on the worksheet. For example: you entered 1000 Tanner crab on form 3 but you subsampled 100 for their species composition, sex and viability, obtaining 25 Bairdi, 50 opilio, and 25 angulatus. On the RM-3 worksheet you would enter 250 Bairdi and 750 other Tanner crab.

7. Column D: Compute the estimated number of individuals caught of each species and record the result to the nearest 0.1.

   Column D = Column A x Column C ÷ Column B

8. Column X: Enter the average weight to the nearest 0.001 kg for the halibut you observed on Form 3. (Please note that halibut is the only prohibited species that requires weight data on RM-3.)

9. Column Y: Compute the estimated weight of the halibut and record the result to the nearest 0.01 kg.

   Column Y = Column D x Column X

   (Note: If you whole haul sample and weighed or measured all of the halibut, simply enter the total number of halibut in column D and their total weight in column Y. Don't introduce rounding error by going through needless calculations.)

10. At the end of each week, sum columns A, D, and Y by area for each species.

11. Skip a line between weeks.

FORM RM-3 WEEKLY RADIO REPORT WORK SHEET FOR PROHIBITED SPECIES

CRUISE NO. 114 VESSEL CODE A121 AREA 521

* 91/95 × 562 = 538 + 91 = 629
** 4/95 × 562 = 24 + 4 = 28

$D = \frac{A}{B} \times C$

	A	B	C	D	C	D	C	D	B	C	D	C	D	C	D	B	C	X	D	Y	B	C	D	C	D	C	D
		KING CRAB							TANNER CRAB							PACIFIC HALIBUT					SALMON						
			REDKNG		BLUKNG		OTH KNG			BTAN		OTH TAN					HBT					CHIN		OTHSAL			
DATE AND HAUL NO.	HAUL OR DAY WT (mt)	3(1) Sample wt	No. Observ.	Est. No.	No. Observ.	Est. No.	No. Observ.	Est. No.	3(1) Sample wt	No. Observ.	Est. No.	No. Observ.	Est. No.	No. Observ.	Est. No.	3(1) Sample wt	No. Observ.	Avg. wt (kg)	Est. No.	Est. wt (kg)	3(1) Sample wt	No. Observ.	Est. No.	No. Observ.	Est. No.	No. Observ.	Est. No.
9/10 101	16.00	16.00	0	—	0	—	0	—	16.00	*629	629	**28	28			16.00	2	wh	2	6.20	16.00	3	3	0	—		
103	20.00	20.00	0	—	0	—	0	—	20.00	0	—	0	—			20.00	1	wh	1	5.00	20.00	0	—	0	—		
104	12.00	3.00	0	—	0	—	0	—	3.00	100	400	16	64			12.00	11	wh	11	74.19	12.00	3	3	2	2		
9/11 No	Fishing																										
9/12 106	11.75	11.75	1	1	8	8	0	—	11.75	15	15	23	23			11.75	5	wh	5	32.00	11.75	2	2	1	1		
108	8.22	8.22	0	—	0	—	0	—	8.22	75	75	4	4			8.22	15	wh	15	76.00	8.22	0	—	3	3		
Weeks Total	67.97			1		8					1119		119						34	193.39			8		6		

FORMATTING CATCH MESSAGES FOR AT-SEA TRANSMISSION

This section of the instructions describes how to format a weekly catch message for transmission via telex or fax from a ship at sea. Remember that the weekly catch report is a high priority responsibility. Do not neglect to send these figuring, "When I get back to port will be soon enough." Only if your vessel will be at sea for seven days or less, or you are returning to port before the end of the report week, should you wait until you are in port and use the instructions for forms RM-2 and RM-4. Those forms must be filled out eventually for each weekly message anyway, and are used as a more convenient format for telephoning your data to the office.

The following abbreviations are to be used in formatting your catch messages:

A represents area

DG represents days on grounds

D represents a decimal point (put in each catch figure, even if tonnage is a whole number; i.e. 125 mt should be sent as 125D0P8).

P represents the numerical check which is the sum of the actual value of the digits in the weight or number being reported.

/ represents the equivalent of a comma in a sentence.

/// represents the equivalent of a period in a sentence.

STOP means "end of message".

The first lines are your heading or address. The "TO:" line should always read: "JANET WALL/ AKC/ SEATTLE WA". The "FROM: ____" should be written with the information shown below. The ORC number is a security code entry which will be explained to you in training.

TO: JANET WALL/ AKC/ SEATTLE WA
FROM: Your name/ vessel name/ vessel's telex or fax number/ ORC 107P8

If you are transferred to a new ship during a report week, you must report the catch and effort data for the period spent on each ship separately. Preferably, you will be able to pass the catch information to us from port before boarding your next vessel. If this is not possible, and your next port call is more than a week away, you must transmit the catch information by a means which protects its confidentiality.

After the heading comes the body of the message. The first paragraph of the message will contain the species composition information. Label this as "PARA 1." After the phrase "PARA 1/", the vessel's permit number should be written. The vessel's fishing permit number has the format AK-87-0001; where "AK" abbreviates Alaska, "87" indicates the year, and the last four digits are a specific identifier of that vessel.

TO: JANET WALL/ AKC/ SEATTLE WA
FROM: JANE OBSERVER/ SEA GULL/ TELEX 482935/ ORC 107P8

PARA 1/ AK-87-0001/ OCT 10/ US DOM/ OCT 4-6/ A513P9/ DG3DOP3/

Next, the Saturday date of the report week should be entered. Each report week is referenced by the week's ending date even if, say, you were only reporting data for Sunday and Monday of that week. For any dates reported in catch messages, **use only these three letter abbreviations for the month: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC.** Following the week ending date, identify the message as coming from a U.S. domestic vessel by writing "US DOM" meaning "U.S. domestic".

The next items written are a list of the inclusive **dates** of the observer days on grounds in the area, the statistical area, and the **number** of observer days on grounds. The number of observer days on the grounds (DG) is simply the number of calendar days during the seven-day period (Sun-Sat) spent in each area. Both fishing and non-fishing days are counted. **Days spent in transit, transferring cargo, or sitting out rough weather are considered normal days on the grounds. Do not include phrases informing us of these normal activities.**

The only time a day is not an observer day on grounds is when the ship is fishing and you don't sample, or when the ship is in port.

If the ship traverses an area in which it does not fish, then add to your catch message the date, area, days on grounds, and reason. (Example: Aug 18/ A620P8/ DG 1D0P1/ traversing/). If the vessel fishes in two areas in one day, divide the day proportionally to the actual time spent in each area. For example, if on your vessel, 40% of the day occurred in Area 521 and 60% in Area 522, then 0.4 of the day is attributed to Area 521, and 0.6 of the day to Area 522.

During your first week on board each vessel, you will only include the number of days beginning with your first day of sampling. The week that you get off a ship, days on grounds should end with your last sampling day. Days on grounds for all other weeks at sea will add up to 7 or should be accounted for in the message. The ship's captain is required to accurately report changes in fishing area and should therefore be recording the time of the area change. In a proper catch message, all seven days will be accounted for and each area entered will only be listed once.

After this information, list the abbreviated names and the weights of each species report group (by area) in the same order as is given in the list of report group abbreviations for that region. Species with zero catch do not need to be reported. Lastly, give a total tonnage by area. In para 1, weights may be reported to two or to three decimal places. Whichever you choose, (two or three decimal places), be consistant in paragraph 1 for the week. Remember

DOMESTIC OBSERVER CATCH MESSAGE FORM

ARROW - 13
ARROW DIS - 36
ATKA - 8
ATKA DIS - 35
COD - 6
COD DIS - 41
DEMRF - 32
DEMRF DIS - 46
DFLT - 48
DFLT DIS - 51
HERR DIS - 14
NON - 53
NON DIS - 70
OFLAT - 3
OFLAT DIS - 22
OROCK - 12
OROCK DIS - 25
OTH - 99
OTH DIS - 26
PELRF - 33
PELRF DIS - 45
POLL - 5
POLL DIS - 47
RSOLE - 43
RSOLE DIS - 39
SAB - 7
SAB DIS - 23
SFLT - 49
SFLT DIS - 52
SLPRF - 31
SLPRF DIS - 44
SQU - 1
SQU DIS - 42
THRN - 20
THRN DIS - 43
TOTAL WT - 50
TURB - 21
TURB DIS - 38
YELL - 2
YELL DIS - 37

BLU KNG - 6
RED KNG - 7
OTH KNG - 8
BTAN - 4
OTHTAN - 5
HBT - 101
CHIN - 222
OTHSAL - 220

1. Observer Name ____________________ ORC ______________

Vessel Name ____________________ Fax/telex # ______________

Permit # ______________ Initial Day of Sampling ______________

Processor Code ____________ Week Ending Date ____________
(if code unknown, give complete name)

Area ________ Gear Type ______ Days on Grounds ________

2. Groundfish catch by species

Code	Weight (MT)
Total-50	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________
____	________

3. Prohibited species catch

HW (MT) ______________

Catch by species

Code	#	WT (halibut only)
____	____	________
____	____	________
____	____	________
____	____	________
____	____	________
____	____	________

4. Marine Mammal/Effort Data for Trawlers

# of Tows ______ Duration __________

# of MM Tows ______ MM Tons ________ (wt. of tows which came in w/ MM)

Code	# of MM (if none, write none)
____	____
____	____

5. Effort Data for Longline Vessels

# of Sets ______ # of Hooks ________

Duration (hrs) ______ (min) ________

that the sum of the report group weights must equal the total weight for that area exactly. This completes the species composition portion of the catch message for all vessel types.

The following is the heading and first paragraph of the sample catch message. In this example, the vessel Sea Gull fished in two areas during the week ending October 10. The data has been calculated by area and will be presented by area within each paragraph. In paragraph one, the data for the second area starts with the dates of the observer days on grounds, the area corresponding to those dates and the number of observer days on grounds.

TO: JANET WALL/ AKC/ SEATTLE WA
FROM: JANE OBSERVER/ SEA GULL/ TELEX 482935/ ORC 107P8

PARA 1/ AK-87-0001/ OCT 10/ US DOM/ OCT 4-6/ A513P9/ DG3DOP3/ SQU 0D62P8/ TURB 5D34P12/ OFLAT 1D20P3/ POLL 83D37P21/ COD 18D21P12/ OTH OD68P14/ NON 0D58P13/ TOTAL 110D00P2///
OCT 7-10/ A511P7/ DG4D0P4/ YELL 109D75P22/ TURB 8D24P14/ OFLAT 72D34P16/ POLL 6D58P19/ COD 24D52P13/ OTH 0D29P11/ NON 13D28P14/ TOTAL 235D00P10///

Paragraph 2 is a summary of the incidental catch of prohibited species information for the week. Begin paragraph 2 with "PARA 2", then identify the data as before with "US DOM". Then write the inclusive dates of the days on grounds in that area, the statistical area, and the sum of the haul weights sampled for prohibited species. The sum of the haul weights is written as "HW", followed by the sum of Column A from Form RM-3. Lastly, list the species report groups and their calculated **numbers to tenths and halibut weights to hundredths.** Use the following list of report groups and their abbreviations. As there are so many prohibited species report groups, report a prohibited species report group only if you observed some.

Abbreviations	Meaning
HW	haul weights, the sum of Column A on Form RM-3
REDKNG	Red King Crab
BLUKNG	Blue King Crab
OTHKNG	Golden & Couesi King Crab
BTAN	Bairdi Tanner Crab
OTHTAN	Opilio, Hybrid, Angulatus, & Tanneri Tanner Crab
HBT	Pacific Halibut
CHIN	Chinook Salmon
OTHSAL	the other species of salmon including steelhead
NOS, WT	numbers and weight, both are reported for halibut

The continuation of the message example shown below shows paragraph 2 and 3. The instructions for paragraph three follow. Notice again the two parts of each paragraph for each area.

PARA 2/ US DOM/ OCT 4-6/ A513P9/ HW 85D0P13/ BLUKNG 29D0P11/ OTHKNG 4D0P4/ BTAN 81D0P9/ CHIN 12D0P3/// OCT 7-10/ A511P7/ HW 125D0P8/ REDKNG 3720D3P15/ BTAN 111D7P10/ OTHTAN 33D9P15/ HBT NOS 91D0P10 WT 360D55P19///

PARA 3/ A513P9/ TOWS 20P2/ DUR 2520P9 MIN/ MMTOWS 20P2/ CU 1P1/// A511P7/ TOWS 28P10/ DUR 3240P9 MIN/ MMTOWS 22P4/ MAMM 0P0///IDS OCT 4/ STOP

For Trawlers: Paragraph 3 contains effort and marine mammal information by subarea. Observers should enter the number of hauls taken (tows landed) from each area for the week. Then, sum the minutes of fishing duration of these tows from Form 2US. Leave the duration in minutes; do not convert it to hours and minutes. Observers on trawlers next enter the number of randomly chosen tows which were monitored for incidental catch of marine mammals. On a trawler, the number of tows sampled for marine mammals would be at least the number of hauls sampled and could be as much as all the tows landed, (by area). For any incidental catch of a marine mammal, designate the species with the two letter species code given in the instructions for Form 10US. Only freshly dead or "lethally removed" mammals that are landed are to be reported. If no marine mammals were caught, use the notation "MAMM 0P0" as shown for area 511 in the example above.

For Longline and Pot Fishing Vessels: paragraph 3 should look like this -
PARA 3/ A540P9/ TOTAL SETS 18P9/ TOTAL HOOKS 25200P9/ SOAK TIME 189P18 HRS 42P6 MIN/ STOP

(Be careful in dividing by 60 to obtain total hours and minutes!) Pot fishing vessels should substitute TOTAL POTS for TOTAL HOOKS. As longline and pot fishing vessels virtually never catch marine mammals, observers on longliners and potfishing vessels need not report any marine mammal information in catch messages.)

The last entry that needs to be added to your first two catch messages of each cruise is an "Initial Date of Sampling" (IDS). You must inform us of your first day of sampling whenever you start work aboard a different ship, or start a new set of cruise data aboard the same ship. Use the following code at the end of your first **two** catch messages, "IDS mo. day". The IDS date is important to the observer program's data organization. Therefore, please repeat the IDS date in your second catch message to insure that it is received correctly and so we will know whether or not we received your first message. (Note that the "days on grounds" for the first week begins with this day. Example: if you start sampling on a Thursday, days on grounds will total 3 days for that week and Thursday's date is the IDS date.)

After an IDS date, (if needed), the observer could include any question or information relating to observer work. For example, questions about observer sampling or responsibilities, information about health problems, or logistical information are common in catch messages. A question or information should be written carefully so it is unmistakably clear, not too wordy, and appropriate and professional. To conclude, the word "STOP" indicates the end of the message.

SPECIAL DAILY CATCH MESSAGE

While you are out at sea, you may receive a message that asks you to begin sending daily catch messages. This is most apt to occur when a report group species is approaching its quota limit. These messages are to be sent in addition to your normal weekly catch message, and are to be sent on a daily basis. This daily message is similar to PARA 1 of the weekly catch report, except instead of giving the week-ending-date, give the date of the catch being reported and the label "Daily Catch". Instead of listing each report group in the days catch, include only the report group asked for and the total catch for that day.

Example of a Daily Catch Message

This is an example of a daily catch message sent June 11, and the catch is from June 10th. The daily message was requested for pollock.

TO: JANET WALL/ AKC/ SEATTLE WA
FROM: OSCAR MEYER/ HIGHLINER / Telex or Fax number of boat/ORC 111P3
PARA 1/ AK-90-1234/ JUN 10 DAILY CATCH/ US DOM/ A630P9/DG1D0P1 (enter DG 0D0P0 if you didn't sample this day)/ POLL 122D43P12/ TOTAL 130D79P20/ STOP

INSTRUCTIONS FOR FORMS RM-2 AND RM-4

[Use these forms to read the data over the phone to the observer Program offices in Seattle if your vessel is unable to transmit messages, or you are aboard a vessel for a week or less, (as is commonly the case in shoreside delivery vessels), or you have just gotten off a vessel and have the last few day's data to send in.]

When observer radio messages are received in Seattle, these messages are coded and entered into the computer system and are used to estimate each fishery's catch to date. The RM-2 and RM-4 forms are used as an easier format for transmission of weekly message data by telephone and for verification (and clarification!), of transmitted radio message data upon return to Seattle to make certain that no mistakes have been entered into this vital data base. If you have kept a copy of your weekly radio messages, it should take only a few minutes to fill out these forms. Separate forms must be filled out for each cruise number assigned. The RM-2 form is for species compsition data and the RM-4 form is for prohibited species data.

On your RM-2 form, you must account for all seven days in each week, except possibly your first and last week on each vessel. On each vessel, observer days on grounds start the first day you sample. From then on, every day in an area is included in days on grounds, whether the boat was fishing or not. The only exceptions to this would be for a day when the boat fished, but you did not sample, or a day the vessel was in port. That day is not included in observer days on grounds, and the catch for that day is not included in the weekly catch. Days that are not observer days on grounds must still be accounted for on the RM-2 form, however. Indicate the area, the fact that you did not sample and why, and the number of days.

If your vessel fished in the same area on two separate occasions in the same week, this data must be combined. There can only be one set of data for each area for the week.

If there are any corrections on the RM-2 and RM-4 forms for radio messages which you sent, these must be indicated. Place an asterisk, (*), in the right-hand margin of each line that is different from that sent.

FILLING OUT RM-2 FORMS:

Column 1: Indicate whether your ship was in a domestic or joint venture fishery. D = domestic, American catch J = joint venture catch F = foreign catch

Columns 3-12: Fill in the permit number of the ship to which this messages pertains (ignore A's and B's).

Columns 14-21: The date entered must always be a Saturday's date, the ending date for the week the ship fished, regardless of the actual date you stopped sampling or the ship stopped fishing.

Columns 23-25: Enter the 3-digit sub-area in which the ship fished.

Columns 28-29: Enter the following codes that take the place of the corresponding species report groups used in your messages..

01 - SQU
02 - YELL
03 - OFLAT AND FLAT
05 - POLL
06 - COD
07 - SAB
08 - ATKA
09 - HAKE
10 - JACK
11 - POP
12 - OROCK
13 - ARROW (BERING ONLY)
14 - HERRING (BERING ONLY)
16 - SNAMTS
17 - YTAIL
18 - WIDOW

20 - THRN (GULF ONLY)
21 - TURB (BERING SEA ONLY)
22 - FLAT DISRING SEA ONLY)
23 - SAB DIS
24 - POP DIS
25 - OROCK DIS
26 - OTH DIS
27 - JACK DIS
29 - YTAIL DIS
30 - WIDOW DIS
(23–30: ONLY FOR JV WASHINGTON AND OREGON)
31 - SLPRRF
32 - DEMRF
33 - PELRF
(31–33: GULF ONLY)
34 - RSOLE
50 - TOTAL
70 - NON
99 - OTH

Columns 31-38: Weight caught in metric tons. Use the same number of decimal places sent in the original radio message.

Columns 40: Days on ground to the nearest tenth of a day.

Columns 57, 61-64: Domestic observers should leave "TGT" and "Company code" columns blank.

Columns 71-72: Indicate your contracting agency:

AO = Alaska Observers, Inc.	DC = Data Contractors, Inc.
FO = Frank Orth & Assoc., Inc.	OS = Oregon State University
PO = Pacific Observers, Inc.	SI = Saltwater, Inc.

SKIP A LINE AFTER EACH WEEK.

FORM RM - 2 RADIO MESSAGE KEYPUNCH FORM

OBSERVER NAME Daniel Domestic CRUISE NO. ______

VESSEL NAME American Boat VESSEL CODE ______

1	PERMIT NO. (3–12)	Week Ending Date Year (14–17)	Mo. (18–19)	Day (20–21)	Area Code (23–25)	2-digit species group code (28–29)	Weight in MT with decimal pt. (31–38)	Days on ground (40)	TGT (57)	Company code (61–64)	Agency (71–72)
D	Ak - 00 - 1234	19 89	09	09	515	01	.026	4.0			FO
						34	.061				
						21	.481				
						13	3.075				
						03	.436				
						05	36.512				
						06	19.526				
						07	.034				
						08	8.982				
						11	.029				
						12	.176				
						14	.017				
						99	1.953				
						70	1.950				
					515	50	73.258	4.0			
					517	01	.019	3.0			
						34	.045				
						21	.360				
						13	2.306				
						03	.327				
						05	27.384				
						06	14.644				
						07	.025				
						08	6.736				
						12	.132				
						14	.013				
						99	1.465				
						70	1.462				
D	Ak - 00 - 1234	1 89	09	09	517	50	54.918	3.0			

FILLING OUT RM-4 FORMS:

Column 1: Indicate whether your ship was in a domestic or joint venture fishery. D = domestic, American catch J = joint venture catch F = foreign catch

Columns 3-12: Fill in the permit number of the ship to which this message pertains (ignore A's and B's).

Columns 14-21: The date entered must always be a Saturday's date, the ending date for the week the ship fished, regardless of the actual date you stopped sampling or the ship stopped fishing.

Columns 23-25: Enter the 3-digit sub-area in which the ship fished.

Columns 27-29: Enter the 3-digit code which corresponds to the species report group.

004 - C. bairdi
005 - Other tanner crab

006 - Blue king crab
007 - Red king crab
008 - Other king crab

101 - Halibut
222 - King salmon
220 - Other salmon

Columns 31-38: Haul weight in metric tons to the nearest hundredth ton.

Columns 40-46: Estimated number caught to the nearest tenth individual.

Columns 48-55: Estimated species weight in kg to the nearest hundredth kg.

Columns 57, 61-64: Domestic observers should leave these columns blank.

Columns 71-72: Indicate your contracting agency. Refer to the contractor abbreviations in the instructions for RM-2.

<u>If you do not see any prohibited species in your samples for an entire week you still must report a haul weight (HW).</u>

SKIP A LINE AFTER EACH WEEK

The example on the next page shows a typical RM-4 form.

FORM RM-4 PROHIBITED SPECIES RADIO MESSAGE KEYPUNCH FORM

OBSERVER NAME Daniel Domestic CRUISE NO' ______

SHIP NAME American Boat VESSEL CODE ______

002 - King crab
003 - Tanner crab
101 - Halibut
222 - King salmon
220 - Other salmon
004 - C. bairdi
005 - Other tanner crab
006 - Blue king crab
007 - Red king crab
008 - Other king crab

	PERMIT NO.	Week Ending Date Year	Mo.	Day	Area Code	3-digit species code	Haul weight in mt with decimal pt.	Estimated number with decimal pt.	Species weight in kg with decimal pt.	TGT	Company code	Agency
1	3 4 5 6 7 8 9 10 11 12	14 15 16 17	18 19	20 21	23 24 25	27 28 29	31 – 38	40 – 46	48 – 55	57	61 – 64	71 72
D	AK – 00 – 1234	1989	09	09	515	004	50.571	63.0				FO
						005		282.8				
						101		302.3	958.3			
					515	220	50.571	12.6				
					517	004	37.930	47.1				
						005		212.0				
						101		226.7	718.7			
D	AK – 00 – 1234	1989	09	09	517	220	37.930	9.4				

FORM RM-6 DOMESTIC CATCHER/PROCESSOR EFFORT AND MARINE MAMMAL INCIDENCE REPORT

OBSERVER NAME ____________________ CRUISE NO.__________

SHIP NAME ________________________ VESSEL CODE _______

PERMIT NUMBER	WEEK ENDING DATE			AREA CODE	TOTAL DURATION (mins.)	TOWS LANDED	MM TOWS SAMPLED	SPECIES NAME (Abbrev.)	NUMBER OF SPECIES
	YEAR	MON.	DAY						
1 2 3 4 5 6 7 8 9 10	12 13 14 15	16 17	18 19	21-23	25 - 33	35-37	39-41	43 - 47	49-51
- -	19								
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FORM RM-6 DOMESTIC LONGLINER EFFORT AND MARINE MAMMAL INCIDENCE REPORT

OBSERVER NAME ______________________ CRUISE NO. __________

SHIP NAME __________________________ VESSEL CODE ________

PERMIT NUMBER	WEEK ENDING DATE			AREA	TOTAL #	TOTAL #	SOAK TIME	
	YEAR	MON.	DAY	CODE	SETS	HOOKS	HRS	MINS.
1 2 3 4 5 6 7 8 9 10	12 13 14 15	16 17	18 19	21-23	25 - 27	29 - 37	39 - 43	44-45
- -	19							
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LOGBOOK ENTRIES

The observer logbook is not to be used as a personal diary but as a record book for notes and data not included on the forms, and a place to document circumstances and information concerning any possible violations of fishing regulations. From observation and conversations you learn what issues and concerns are driving the decisions on fishing strategy and schedules. Notes from conversations can provide valuable insight. Include in the logbook anything that you may later want to include or summarize in your final report; anything unusual that occurs on the cruise; or anything else that you feel may be of interest. Appropriate entries include: what situations dictated your choice of a sampling method, any changes in sampling procedure, sampling problems, calculation of codend or bin dimensions and densities and any calculations for total catch weight. Descriptions of how catch estimates were obtained should be recorded here. It is also a good place to keep the copies of all messages sent and received. Short comments on hauls sampled can go in the "comments" section of Form 3US, but additional explanations on anything unusual, such as a high percentage of rockfish in a tow, or comments on hauls not sampled, can be entered in the logbook. Some observers have noted details on factory processing, or on the biology of the target species. At the end of the cruise, important entries should be summarized and entered in the final report.

It is important to document carefully any suspected violations in the logbook as soon after the occurrence as possible. You cannot rely on your memory of details of events, it is important that these be written down as soon as possible. Although a complete report may be written upon your return, the original notes may be needed as evidence. If a correction must be made, draw a line through the incorrect word(s) instead of erasing or blackening them out. All logbook entries should be in ink, and any events that are recorded should be in chronological order. Please put your name, vessel name(s) and dates aboard each vessel on the first page inside the logbook.

If the vessel you are on is charged with a violation, all parties concerned, will have a legal right to inspect your logbook or any other evidence known to exist. It is thus important to make your entries factual and to avoid unfounded personal opinions. Do not use your logbook to "blow off steam". Statements such as "the captain acts and dresses like a slob" are irrelevant and detrimental to your statement.

Your logbook entries are not to be viewed by vessel personnel. Keep your logbook secured with your personal belongings.

DOMESTIC OBSERVER REPORTS

All cruise reports should contain the itinerary sheet, 2nd page shown in this report example, map, and gear diagram (when possible). If possible, make factory and/or weather deck diagrams indicating your sampling and working areas, flow of fish, and other items of interest.

Additional questions to answer in the report: (answer as completely as possible)

1. How was the "official total catch" obtained ? If the ship's estimates were adjusted, how were the adjustments made ?

2. How was the observer estimate obtained ?

3. How was the retained catch obtained ?

4. If the official total catch was not the ship's estimate, did they make an estimate? If so, why did you decide another estimate was more accurate ?

5. List the species groups, size groups that were retained and the species/size groups that were discarded. If this varied from haul to haul, indicate the basis for the variation.

6. How was the species composition sampling (including prohibited species sampling) accomplished ? Was it difficult to avoid interfering with shipboard procedures ? Include, if possible, a diagram of where you sampled and what you had to do to obtain, hold, gather data, and discard the fish/invertebrates. If you had to forego gathering certain data, indicate what and why. Discuss how lengths, otoliths, or special project data were obtained (or not obtained).

7. Did you see any molting or premolt crabs ? If so, briefly summarize your data.

8. Summarize any marine mammal observations or incidental catch of marine mammals.

9. Report on the fishing strategy employed, any innovative net design, navigational equipment, or processing machinery.

10. Recount any unusual occurrence such as an accident or injury at sea. Was there anything which made you feel this was an unsafe vessel ? Is there anything regarding safety that the next observer should be made aware of ?

11. Describe anything unusual regarding the catches.

12. Did your ship ever fish (or receive catches) from inside state waters)? If so, give the approximate percentage of the catch was taken inside state waters?

13. What did you do, if anything specific, to help build good working relationships with the captain/crew? How were you treated? What were your quarters like? Indicate the numbers, ship status and sex of those that you shared your quarters with. Where did

you do your paperwork? Were there any women in the crew?

14. Report anything you feel the next observer or NMFS should know about this vessel. Were there any noteworthy comments or opinions (regarding the fishery, observers, NMFS, ADF&G, etc.) given by the captain/crew that you feel we should know?

16. If your ship was a mothership, list the catcher boats which delivered catch.

Please fill in the following with information on ship conditions:

Target species______________________________

Approximate average haul size___________________________

Observer's room was: private____; semiprivate____; shared with 2 or more others____

Was bedding available? yes____; no, observer should bring______

Ship's bath: private______ or shared______

Bath availability: daily______ or other (describe)______

Laundry: by hand______; by machine______; by ship's steward_______

Drinking water: good_____; poor______; requires boiling_______

General cleanliness: clean_____; adequate______; not clean______

Presence of cockroaches?_______ Presence of rats or mice?_________

Video player?_____ VHS?_____ BETAMAX?_____ SUPER8?______
Videocamera available?_____

Typical meals: Breakfast____

Lunch____

Dinner____

Other____

Was the quantity and quality of the food sufficient ? If not, please explain.

CRUISE SUMMARY SHEET

YEAR __________

CRUISE #* __________ BEGIN EMPLOYMENT __________ END EMPLOYMENT __________

OBSERVER ______________________________

Instructions:

1. Observer must account for all time during cruise which was spent aboard a vessel or port sampling.
2. Entries should be in chronological order: make a new entry whenever there is a change of sampling vessel or port sampling plant.
3. Non-sampling spent on land does not need to be recorded.
4. The only time begin and end dates should overlap is when observer is covering more than one shoreside plant at the same time.
5. There may be multiple entries for a single vessel or plant, if an observer is alternating between vessel sampling and/or port sampling.

Plant or Vessel Name	Plant or Vessel code*	Coverage Begin Date**	Coverage End Date**	No. of Days of Coverage

* Cruise#, Plant and Vessel codes are assigned to observers upon return to Seattle

** for vessels: coverage begins the first day the boat sets gear, and ends when the vessel returns to port.

for shoreside plants: coverage begins the first day the observer samples, and ends the last day the observer samples (in a given sampling period). No. of days of coverage is the actual number of days the observer sampled at the plant between start and end dates.

CRUISE SUMMARY SHEET

YEAR __________

CRUISE #* __________ BEGIN EMPLOYMENT __________ END EMPLOYMENT __________

OBSERVER ______________________________

Instructions:

1. Observer must account for all time during cruise which was spent aboard a vessel or port sampling.
2. Entries should be in chronological order: make a new entry whenever there is a change of sampling vessel or port sampling plant.
3. Non-sampling spent on land does not need to be recorded.
4. The only time begin and end dates should overlap is when observer is covering more than one shoreside plant at the same time.
5. There may be multiple entries for a single vessel or plant, if an observer is alternating between vessel sampling and/or port sampling.

Plant or Vessel Name	Plant or Vessel code*	Coverage Begin Date**	Coverage End Date**	No. of Days of Coverage

* Cruise#, Plant and Vessel codes are assigned to observers upon return to Seattle

** for vessels: coverage begins the first day the boat sets gear, and ends when the vessel returns to port.

for shoreside plants: coverage begins the first day the observer samples, and ends the last day the observer samples (in a given sampling period). No. of days of coverage is the actual number of days the observer sampled at the plant between start and end dates.

APPENDIX

The 42 Most Common Mistakes on Data Forms

Form 1US, 2US, or 2MUS:

1. Latitude, longitude, or on/off bottom time recorded with greater than 60minutes.
2. Using 2400 for time instead of 0000.
3. A haul retrieved at 0000 attributed to the previous day.
4. Not putting the noon position under "Trawl Position" on non-fishing days.
5. Overlapping haul times; overlapping on and off bottom times of one haul or between hauls.
6. Recording catch weight to more or less than two decimal places.
7. Positions that are too far from the previous position to be plausible during the time recorded--the ship could not travel that fast.
8. Leaving haul number blank on non-fishing days is incorrect; enter a zero.
9. Missing ADF&G area codes on non-fishing days.
10. Location I.D. omitted.
11. No location listed at all -- you should go back to the fishing log and look up the position, or if it's too late for that, interpolate one from the positions before and after the missing one.
12. Fishing depth and/or bottom depth listed without the accompanying F/M identifier and fishing depths deeper than bottom depths.

Form 3US:

13. Numbers and/or weights don't add up correctly, do check your math!
14. Species code listed without data accompanying it.
15. A species code listed twice within a haul.
16. Species code doesn't match written name.
17. Species code 900 with a quantity greater than 1.
18. Decimal point not included in every weight figure.
19. A weight listed without a number.
20. Not having each of the four prohibited groups represented for each sampled haul/set.
21. Recording weights to > two decimal places--the computer won't accept them.
22. Viability entries not summed on the 999 line.
23. Haul number doesn't match the date (as listed on Haul Form).
24. Not skipping a line between sample types.
25. Recording a fish species that is out of it's normal range or normal depth. (Bring back a specimen for verification if this is the case.)

Form 4:

26. Not filling them out because the C. bairdi and/or red king crab were all in hard shell condition.
27. Filling the form out as for a joint venture processor

Form 7US:

28. Summations incorrect! (Recheck and double-check your math!)
29. Reversing the size group and the frequency.
30. Haul numbers and dates don't match the haul form.
31. Putting estimated lengths on Form 7.

32. Lengths off by 10 cm. (Write in the 10's values on the plastic strip!)
33. Crab measurements not to nearest 5 mm, size group entries do not end with digit 3 or 8.

Form 9US:
34. Not writing weights out to two decimal places. Do include trailing zeros!
35. Not grouping sexes together.
36. Numbering pages by area instead of by species.
37. Not separating the otolith collections taken on different boats. (See "General Instructions for Data Forms" section in your manual.)
38. Duplicate otolith or scale number within one species collection.
39. An otolith or scale number is skipped without any note as to why.

Form 10US:
40. Not filling them out.
41. Not filling them out for each haul sampled or viewed.
42. Writing in hauls not actually sampled--using crew information to fill out the form. (The entries on the front of Form 10 should only be of hauls the observer actually viewed or sampled.)

For All Forms:
43. Haul and/or set numbers not matching dates.

CONVERSION OF POUNDS TO KILOGRAMS (0.5 - 100 lb.)

lb	kg	lb	kg	lb	kg	lb	kg
.5	.2	19.0	8.6	47.0	21.3	75.0	34.1
1.0	.5	20.0	9.1	48.0	21.8	76.0	34.5
1.5	.7	21.0	9.5	49.0	22.2	77.0	35.0
2.0	.9	22.0	10.0	50.0	22.7	78.0	35.4
2.5	1.1	23.0	10.4	51.0	23.2	79.0	35.9
3.0	1.4	24.0	10.9	52.0	23.6	80.0	36.3
3.5	1.6	25.0	11.4	53.0	24.1	81.0	36.8
4.0	1.8	26.0	11.8	54.0	24.5	82.0	37.2
4.5	2.0	27.0	12.3	55.0	25.0	83.0	37.7
5.0	2.3	28.0	12.7	56.0	25.4	84.0	38.1
5.5	2.5	29.0	13.2	57.0	25.9	85.0	38.6
6.0	2.7	30.0	13.6	58.0	26.3	86.0	39.0
6.5	3.0	31.0	14.1	59.0	26.8	87.0	39.5
7.0	3.2	32.0	14.5	60.0	27.2	88.0	40.0
7.5	3.4	33.0	15.0	61.0	27.7	89.0	40.4
8.0	3.6	34.0	15.4	62.0	28.1	90.0	40.9
8.5	3.9	35.0	15.9	63.0	28.6	91.0	41.4
9.0	4.1	36.0	16.3	64.0	29.1	92.0	41.8
9.5	4.3	37.0	16.8	65.0	29.5	93.0	42.3
10.0	4.5	38.0	17.3	66.0	30.0	94.0	42.7
11.0	5.0	39.0	17.7	67.0	30.4	95.0	43.2
12.0	5.4	40.0	18.2	68.0	30.9	96.0	43.6
13.0	5.9	41.0	18.6	69.0	31.3	97.0	44.1
14.0	6.4	42.0	19.1	70.0	31.8	98.0	44.5
15.0	6.8	43.0	19.5	71.0	32.2	99.0	45.0
16.0	7.3	44.0	20.0	72.0	32.7	100.0	45.5
17.0	7.7	45.0	20.4	73.0	33.1		
18.0	8.2	46.0	20.9	74.0	33.6		

Table of Equivalents

2204.6 / 1000 Kg =

metric ton = 1000 kg = 2204.6 lb
meter = 100 cm = 1000 mm = 3.2808 ft = .54681 fathoms
foot = .3048 meter = .1667 fathoms
nautical mile = 1.15078 miles (statute mile) = 1 minute of latitude
statute mile = 5280 ft = 1.609 km
1000 meters = 1 km
1 liter = 1.0567 U.S. quarts

Relationship of Pacific halibut lengths (cm) to kilograms - round (live) weights

Length (cm)	Kilograms	Length (cm)	Kilograms	Length (cm)	Kilograms
10	.007	55	1.821	100	12.635
11	.010	56	1.930	101	13.049
12	.013	57	2.045	102	13.472
13	.017	58	2.163	103	13.905
14	.022	59	2.286	104	14.347
15	.027	60	2.414	105	14.799
16	.033	61	2.547	106	15.260
17	.040	62	2.685	107	15.731
18	.049	63	2.828	108	16.213
19	.058	64	2.976	109	16.705
20	.069	65	3.129	110	17.206
21	.080	66	3.288	111	17.718
22	.094	67	3.452	112	18.240
23	.108	68	3.621	113	18.773
24	.124	69	3.801	114	19.317
25	.141	70	3.978	115	19.871
26	.161	71	4.165	116	20.437
27	.182	72	4.358	117	21.013
28	.205	73	4.558	118	21.600
29	.229	74	4.763	119	22.200
30	.255	75	4.975	120	22.810
31	.284	76	5.193	121	23.431
32	.315	77	5.417	122	24.065
33	.348	78	5.649	123	24.710
34	.383	79	5.887	124	25.366
35	.421	80	6.132	125	26.035
36	.461	81	6.384	126	26.716
37	.504	82	6.642	127	27.409
38	.550	83	6.909	128	28.115
39	.598	84	7.182	129	28.832
40	.649	85	7.463	130	29.563
41	.715	86	7.751	131	30.306
42	.760	87	8.046	132	31.062
43	.820	88	8.350	133	31.831
44	.884	89	8.661	134	32.613
45	.950	90	8.981	135	33.408
46	1.021	91	9.307	136	34.216
47	1.095	92	9.644	137	35.038
48	1.172	93	9.987	138	35.874
49	1.253	94	10.340	139	36.723
50	1.337	95	10.700	140	37.586
51	1.426	96	11.070	141	38.463
52	1.519	97	11.447	142	39.354
53	1.615	98	11.834	143	40.259
54	1.716	99	12.230	144	41.178
				145	42.111

Relationship of Pacific halibut lengths (cm) to
kilograms - round (live) weights

Length (cm)	Kilograms	Length (cm)	Kilograms	Length (cm)	Kilograms
146	43.060	188	97.388	230	187.745
147	44.023	189	99.109	231	190.402
148	45.000	190	101.095	232	193.085
149	45.993	191	102.829	233	195.795
150	47.001	192	104.576	234	198.531
151	48.024	193	106.359	235	201.293
152	49.062	194	108.155	236	204.081
153	50.115	195	109.972	237	206.897
154	51.184	196	111.810	238	209.739
155	52.269	197	113.668	239	212.607
156	53.370	198	116.003	240	215.503
157	54.486	199	117.450	241	218.426
158	55.618	200	119.373	242	221.376
159	56.767	201	121.318	243	224.354
160	57.932	202	123.284	244	227.359
161	59.113	203	125.273	245	230.392
162	60.311	204	127.283	246	233.452
163	61.526	205	129.316	247	236.541
164	62.757	206	131.371	248	239.658
165	64.005	207	133.448	249	242.803
166	65.271	208	135.548	250	245.977
167	66.553	209	137.671		
168	67.830	210	139.817		
169	69.170	211	141.985		
170	70.505	212	144.177		
171	71.858	213	146.392		
172	73.229	214	148.631		
173	74.617	215	150.893		
174	76.024	216	153.179		
175	77.448	217	155.489		
176	78.891	218	157.822		
177	80.353	219	160.180		
178	81.833	220	162.562		
179	83.332	221	164.968		
180	84.850	222	167.399		
181	86.387	223	169.854		
182	87.943	224	172.334		
183	89.518	225	174.840		
184	91.113	226	177.370		
185	92.727	227	179.925		
186	94.360	228	182.506		
187	96.014	229	185.112		

OBTAINING INFORMATION ON PRODUCT RECOVERY RATES

A recovery rate represents the proportion of the organism that is used in the factory products. The recovery rate is also referred to as the "product recovery rate (PRR)" or the "recovery ratio". Vessel officers usually make use of recovery rates to estimate the weight of a catch from the tonnage of products produced from that catch by using the following equation:

$$\frac{\text{Product Weight}}{\text{Recovery Rate}} = \text{Whole Weight (before processing)}$$

Recovery rates are commonly expressed as a percent or as a ratio. Headed and gutted cod may have a recovery ratio of .62 to l, or 62% recovery, while fish frozen whole would have a recovery ratio of l.00 to l, or l00% recovery. A **conversion factor** is a number which can be multiplied times the product weight to obtain the round weight (whole weight of the fish). A conversion factor **is always greater than 1** (for example, the conversion factor of surimi weight to pollock weight may be 4.5). To convert a conversion factor to a recovery rate, divide the number l by the conversion factor.

A wide range of recovery rates are used to describe the utilization of different species in a variety of products. The type of processing, the size of the fish, the area and season of the year, the experience of the processing crew, and the vessel type may all have a bearing on the recovery rate of a particular species. Since there is a need to update the recovery rates are currently being used by data managers, observers may be asked to record the rates used on their vessels, and/or to run tests to determine recovery rates on their own.

To determine your own recovery rates for particular products, you must observe the following procedures: First of all, you would obtain a representative sample of the fish that are waiting to be processed. They should be sorted to species and be of the size and condition of those that are normally processed in one particular way. (For example, in order to obtain the recovery rate for roe from pollock, select a basket of roe-bearing, female pollock of the sizes normally used.) Weigh the sample of whole fish before processing, this would be called the "whole weight", "fresh weight" or "round weight". Have these fish processed by the factory crew as usual, then weigh the resulting product (the roe). The weight of the product divided by the weight of the fish before processing is the recovery ratio.

$$\frac{\text{Product Weight}}{\text{Fresh Weight}} = \text{Product Recovery Rate}$$

Actually there are two sampling approaches possible. In method A, as explained above, the observer collects a sample of fish, has those same fish processed and weighs the resultant product of those fish. This method is preferred over method B, particularly where the number of samples and their size are limited. In method B, the observer weighs a sample of fish waiting to be processed for a particular product as before. The observer then collects products from the same **number** of fish but not necessarily the **same** fish. For example, if you weighed 60 fish in the round, destined for fillets, 120 fillets would need to be weighed. (The products weighed should be from the same catch of fish.) Method B approaches the accuracy of method A when samples are large and there are many repetitions. Method B has the advantage of being easier to sample (less interference with the processing line) and as product to be sampled cannot be predicted by the processors, intentional bias can be avoided.

It would be very difficult for an observer to determine the PRR of such products as surimi and fish meal, so it is not expected. However, if the observer were able to run a test on the recovery rate of surimi, it would be very important to fully document the procedure in the logbook. The guidelines for conducting PRR tests are outlined on the worksheet below. Record only the "lowest" PRR test value and the "highest" PRR test value and the lowest and highest unit weight test values on the Form 8 itself. This will provide a range of PRR and unit weight values for each product by area/month/vessel-type designation. (For more complete information, refer to the Form 8 instructions that follow.)

WORKSHEET FOR PRODUCT RECOVERY RATE AND UNIT WEIGHT TESTS

Product Recovery Rate Tests:

1. Run PRR tests primarily on target species
2. Run PRR tests on secondary products as possible
3. Each PRR test will consist of three replications of 50 fish each.

Species: ______________________ Product: ______________________

Sorting Criteria: ____

Date: _____/_____/_____/ Haul No.: ________
Mo. Day Yr.

Test #	No. of fish	Product wt.	÷	Whole wt.	=	PRR

Date: _____/_____/_____/ Haul No.: ________
Mo. Day Yr.

Test #	No. of fish	Product wt.	÷	Whole wt.	=	PRR

Date: _____/_____/_____/ Haul No.: ________
Mo. Day Yr.

Test #	No. of fish	Product wt.	÷	Whole wt.	=	PRR

UNIT WEIGHT TESTS:

1. Run unit weight tests at least twice per cruise for the major products and once per cruise for minor products.
2. Each test should consist of weighing at least 10 units.

Unit Type	No.of Units Sampled	Total Wt.	-	Container Wt.	=	Unit Wt.

Average =

FORM 8 - PRODUCT RECOVERY RATES

This form is to be filled out with the product recovery rates that the ship or processing plant personnel are using, and the recovery rates that the observer has obtained through their own tests. Points to note about Form 8:

1. Enter the year and month (columns 8-11) in which the information was obtained and for which the data applied.

2. Likewise, enter the code for the area in which you collected your own recovery data and the area for which the vessel data applies. There are only two columns, 12 and 13, at this time to record area in. Write the third digit of the federal statistical report area beside column 13.

3. Use a separate sheet for each area, month, vessel or plant sampled.

4. Write the name of the species or species group which is processed and its appropriate code (columns 14-16) from the species code list. Observer-determined recovery data should be listed by each particular species, but figures supplied by vessel personnel are often applied to a group of species. "Unidentified fish" (code 901) may be used for the categories of fish and fish waste turned into fish meal and fish oil. Other possibly useful codes are flatfish unidentified (code 100), turbot unidentified (143), and rockfish unidentified (300).

5. Describe the product and enter the matching product code in columns 17-18 (see "Codes used for Product Recovery Form 8" on the following pages.) If in doubt of the appropriate code, draw a picture and take detailed notes describing the product. Discuss the unidentified product with the debriefer upon your return. Record only those products which were actually produced while you were aboard.

6. Indicate in column 19 whether the product was primarily prepared by machine (M) (includes rotary saw) or through cutting by hand (H).

7. Enter, to 2 decimal places, the recovery ratio used by the vessel or plant in columns 20-22 and observer's recovery rates in columns 28 - 30. If there is a range of values, then enter the data on two lines, first line for the lowest value and second line for the highest value. Use "Example Form 8" on the next page, as a guide.

8. The unit weight asked for in columns 24-27 and 32-35 is the weight of processed fish **(before freezing or addition of water)** in a block of frozen fish, a bag of surimi, or a sack of fish meal. The unit weight is not the weight of a box containing 2 or more blocks of fish, but the weight of the fish making up one of those blocks.

9. Columns 20-27 ask for data obtained from ship personnel and columns 28-35 are for data determined by the observer. The unit weight obtained by the observer should be the average of weighing no less than 10 random samples of each particular unit type. If you discover a range of unit weights for that product, in that area, during a particular month, enter the data on two lines, one for the lowest figure and one for the highest figure.

10. At the bottom of the form there is room for comments.

FORM 8 PRODUCT RECOVERY RATES

Cruise Number (1 2 3)	Vessel Code (4 5 6 7)	Year (8 9)	Month (10 11)	Area (12 13)
5 3 2	N S 5 4	8 4	0 7	5 2 2

Species Name	Species Code 14	15	16	Description of Product	Product Code 17 18	H/M 19	Vessel Data: Percent Recovery 20 21 22	Vessel Data: Unit wt. to .1 kg 24 – 27	Observer Data: Percent Recovery 28 29 30	Observer Data: Unit wt. to .1 kg 32 – 35
Pollock	2	0	1	surimi	36	M	.25	10.0	.	.
↓				"	36	M	.34	10.0	.	.
(large fish)		↓		dorsal fillets	30	H	.65	15.0	.	.
Pollock (large fish	2	0	1	skinless fillets	32	H	.40	.	.	.
Pacific Cod	2	0	2	headed + gutted	13	M	.50	.	.54	15.4
↓		↓		" "	13	M	.60	.	.60	.
Pacific Cod	2	0	2	fillet-skin on one side	31	H	.43	.	.	.
Pacific Ocean Perch	3	0	1	headed + gutted	13		.60	.	.	.
Harlequin Rockfish	3	2	3	" "			.62	.	.65	.
Sharpchin Rockfish	3	0	4	" "	↓		.62	.	.	.
Other Rockfish	3	0	0	" "	13	↓	.60	.	.	.
Sablefish	2	0	3	headed + gutted with pect. girdle	15	H	.70	.	.70	14.8
Atka Mackerel	2	0	4	frozen whole	10	H	1.00	.	.	
Greenland Turbot	1	0	2	headed + gutted	13	H	.55	.	.59	15.[illegible]
Flathead Sole	1	0	3	frozen whole	10	H	1.00	.	.	.
Other flatfish	1	0	0	headed + gutted	13	H	.70	.	.	.
Octopus		6	0	gutted	51		.80	.	.	.
Squid		5	0	mantles	52		.50	.	.	.
"		5	0	tentacles	53	↓	.30	↓	.	.
All skates		9	0	skate wings	26	H	.30	15.0	.42	.
All other fish + waste	9	0	1	fish meal	40	M	.20	20.0	.	.
All other fish + waste	9	0	1	fish oil	41	M	.05	.	.	.

Comments: The ship provided a range of figures for surimi and headed, gutt Pacific Cod, so only the high and low values are entered here. A rotary saw was sometimes used for heading the turbot as well as the cod, but cutting by hand was more common.

Codes Used for Product Recovery Form 8

Product Codes (columns 17-18)

10 Whole fish (the recovery rate would be 100%)
5 Fish with roe removed only
11 Gutted only
19 Headed (but not gutted)
12 Headed and tail removed
7 Pre-dressed: gutted, only part of head removed by diagonal cut (P. Cod specialty product. This product applies only to cod. If you have this product for another species, talk to the debriefer upon your return.
13 Headed and gutted
17 Headed and gutted, stomachs included
18 Headed and gutted, roe included
15 Headed and gutted, pectoral girdle included
16 Headed and gutted, pectoral girdle and roe included
14 Headed and gutted, tail removed
9 Headed and gutted, tail removed, roe included
4 Headed and gutted, tail and skin removed
28 Headed and gutted, skinned; tail and fins removed
8 Headed and gutted, fins clipped by scissors (tail on)
70 Headed and gutted, a diagonal cut from the back of the head to the anus, called tucza, a Polish product.
6 Tooshka - headed, gutted, fins clipped, tail removed (a Soviet product)
30 Dorsal fillet: The head and guts have been removed by a long diagonal cut, leaving the upper portion of the body, most of the backbone, and the posterior ventral portions (see sketch-these are made only from roundfish, not flatfish).
35 Otoshimi: type of minced fish flesh used for breaded fish sticks; also a component of surimi before washing and dehydration.
36 Surimi: a product made from minced fish flesh mixed with sugar, polyphosphate, and other ingredients. Let the debriefer know if you did your own product recovery determination. Write a description of your work in report two. If the ship occasionally adds a few cod to the pollock when making surimi, record it only as pollock. (Record cod or Atka mackerel surimi if they are using these species exclusively to make surimi.)
37 Kirimi: (steaks) vertical slices made from headed and gutted fish (usually for yellowfin sole); (see sketch)
38 Caudal peduncle: caudal fin removed (usually for yellowfin sole on the Japanese mothership, Kashima); (see sketch)
34 Punched section: body section stamped out by means of a punching machine (usually for yellowfin sole on the Japanese mothership, Kashima)
60 Gills and stomach lining (Korean product usually made from Pacific cod)
20 Heads
3 Cheeks - (usually of turbots)
21 Pectoral girdle - a section of the throat and pectoral girdle
22 Livers
66 Canned livers (a Soviet product from cod)
23 Stomachs
24 Ovaries - roe
25 Testes - milt

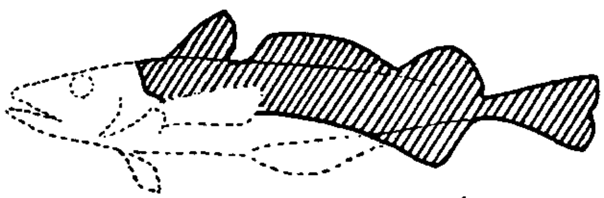
40	Fish meal (use species code 901--misc. fish)
41	Fish oil (use species code 901--misc. fish)
42	Bone meal
32	Skinless fillets
29	Skinless fillets, ribbed section removed (see sketch)
33	Deribbed skinless fillets - (ribs lifted out - flesh not removed)
31	Fillets with skin on one side
39	Deribbed fillet with skin on one side
43	Butterfly fillet - dorsal fillet with backbone and tail removed (see sketch)
44	Tailless and finless dorsal fillet (used on dogfish shark)
45	Salted dorsal fillet, backbone partially removed, tail present, *(Spanish P. cod product)
46	Salted dorsal fillet, backbone partially removed, tail removed, *(Portuguese P. Cod and pollock product)
26	Skate wings (There are no skate fillets.)
27	Skate - *tips of wings, nose and tail removed*
50	Whole squid or octopus
51	Gutted squid or octopus, beak removed
52	Head or mantle of octopus or squid
53	Arms or tentacles of octopus or squid
54	Skinned squid or octopus
65	Canned fish
61	Fish skin
80	Snail meats (for snailpot vessels only)

Processing Codes (H/M) - (Column 19)

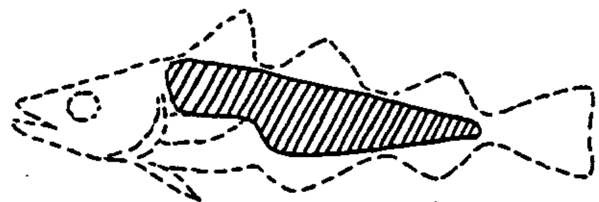
H = Product was primarily processed using hand labor (cutting or filleting by hand).
M = Product was primarily processed by machinery (includes cutting with a rotary saw).

* Salt cod and pollock	Codes **before salting**	Codes **after salting**
Portuguese (dorsal fillet, no tail)	44	46
Spanish (dorsal fillet, with tail)	30	45

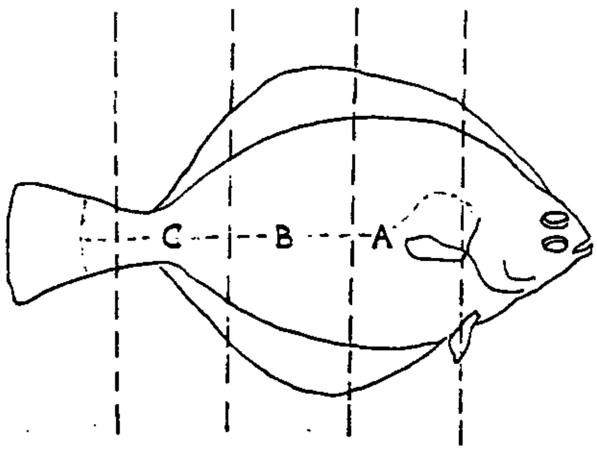
Sketches of Various Product Types Listed on Previous Pages:



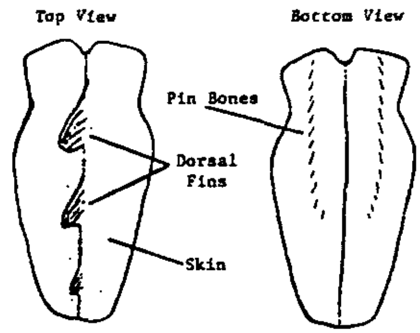
dorsal fillet from Pacific hake



skinless fillets, ribbed section removed



Kirimi steaks (A & B) and caudal peduncle (C) cut from yellowfin sole.



Butterfly fillet from pollock (backbone, tail and pectoral girdle removed)

APPENDIX

Appendix Table 1.--List of Alaska product types.

Product code	Description
1	Whole fish/food fish
2	Whole bait
3	Bled only
4	Gutted only
5	Headed and gutted (H & G)
6	Headed, gutted, with roe
7	H & G, Western cut
8	H & G, Eastern cut
9	H & G, with pectoral girdle
10	H & G, tail removed
11	Kirimi
12	Salted and split
13	"Wings"
14	Roe only
15	Pectoral girdle only
16	Heads
17	Cheeks or chins
20	Fillets with skin and ribs
21	Fillets with skin, no ribs
22	Fillets with ribs, no skin
23	Fillets, no skin or ribs
30	Surimi
31	Minced fish
32	Fish meal
33	Fish oil
97	Other - specify
98	Discarded at sea
99	Landed discard

Appendix Table 2.--Recovery rates for Alaska groundfish products.

Species code	Name of species	Product code	Conversion rate
100	Unspecified groundfish	1	1.00
100	Unspecified groundfish	2	1.00
100	Unspecified groundfish	3	0.98
100	Unspecified groundfish	8	1.00
100	Unspecified groundfish	32	0.17
100	Unspecified groundfish	98	1.00
100	Unspecified groundfish	99	1.00
110	Pacific cod	1	1.00
110	Pacific cod	2	1.00
110	Pacific cod	3	0.98
110	Pacific cod	4	0.85
110	Pacific cod	5	0.63
110	Pacific cod	7	0.64
110	Pacific cod	8	0.58
110	Pacific cod	9	0.60
110	Pacific cod	12	0.45
110	Pacific cod	14	0.05
110	Pacific cod	22	0.20
110	Pacific cod	23	0.20
110	Pacific cod	98	1.00
110	Pacific cod	99	1.00
120	Flounder	1	1.00
120	Flounder	2	1.00
120	Flounder	3	0.98
120	Flounder	4	0.90
120	Flounder	5	0.65
120	Flounder	8	0.65
120	Flounder	22	0.22
120	Flounder	32	0.17
120	Flounder	98	1.00
120	Flounder	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
121	Arrowtooth flounder	1	1.00
121	Arrowtooth flounder	2	1.00
121	Arrowtooth flounder	3	0.98
121	Arrowtooth flounder	4	0.90
121	Arrowtooth flounder	5	0.74
121	Arrowtooth flounder	8	0.65
121	Arrowtooth flounder	10	0.62
121	Arrowtooth flounder	22	0.22
121	Arrowtooth flounder	23	0.34
121	Arrowtooth flounder	98	1.00
121	Arrowtooth flounder	99	1.00
122	Flathead sole	1	1.00
122	Flathead sole	2	1.00
122	Flathead sole	3	0.98
122	Flathead sole	4	0.90
122	Flathead sole	5	0.65
122	Flathead sole	8	0.65
122	Flathead sole	22	0.22
122	Flathead sole	98	1.00
122	Flathead sole	99	1.00
123	Rock sole	1	1.00
123	Rock sole	2	1.00
123	Rock sole	3	0.98
123	Rock sole	4	0.87
123	Rock sole	5	0.65
123	Rock sole	6	0.78
123	Rock sole	8	0.65
123	Rock sole	20	0.28
123	Rock sole	22	0.22
123	Rock sole	98	1.00
123	Rock sole	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
124	Dover sole	1	1.00
124	Dover sole	2	1.00
124	Dover sole	3	0.98
124	Dover sole	4	0.90
124	Dover sole	5	0.65
124	Dover sole	8	0.65
124	Dover sole	22	0.22
124	Dover sole	98	1.00
124	Dover sole	99	1.00
125	Rex sole	1	1.00
125	Rex sole	2	1.00
125	Rex sole	3	0.98
125	Rex sole	4	0.90
125	Rex sole	5	0.65
125	Rex sole	8	0.65
125	Rex sole	22	0.22
125	Rex sole	98	1.00
125	Rex sole	99	1.00
126	Butter sole	1	1.00
126	Butter sole	2	1.00
126	Butter sole	3	0.98
126	Butter sole	4	0.90
126	Butter sole	5	0.65
126	Butter sole	22	0.22
126	Butter sole	98	1.00
126	Butter sole	99	1.00
127	Yellowfin sole	1	1.00
127	Yellowfin sole	2	1.00
127	Yellowfin sole	3	0.98
127	Yellowfin sole	4	0.90
127	Yellowfin sole	5	0.65
127	Yellowfin sole	11	0.48
127	Yellowfin sole	20	0.25
127	Yellowfin sole	22	0.22
127	Yellowfin sole	98	1.00
127	Yellowfin sole	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
128	English sole	1	1.00
128	English sole	2	1.00
128	English sole	3	0.98
128	English sole	4	0.90
128	English sole	5	0.65
128	English sole	22	0.22
128	English sole	99	1.00
129	Starry flounder	1	1.00
129	Starry flounder	2	1.00
129	Starry flounder	3	0.98
129	Starry flounder	4	0.90
129	Starry flounder	98	1.00
129	Starry flounder	99	1.00
131	Petrale sole	1	1.00
131	Petrale sole	2	1.00
131	Petrale sole	3	0.98
131	Petrale sole	8	0.65
131	Petrale sole	98	1.00
131	Petrale sole	99	1.00
132	Sand sole	1	1.00
132	Sand sole	2	1.00
132	Sand sole	3	0.98
132	Sand sole	98	1.00
132	Sand sole	99	1.00
133	Alaska plaice	1	1.00
133	Alaska plaice	2	1.00
133	Alaska plaice	3	0.98
133	Alaska plaice	5	0.65
133	Alaska plaice	12	0.48
133	Alaska plaice	98	1.00
133	Alaska plaice	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
134	Greenland turbot	1	1.00
134	Greenland turbot	2	1.00
134	Greenland turbot	3	0.98
134	Greenland turbot	4	0.90
134	Greenland turbot	5	0.74
134	Greenland turbot	8	0.65
134	Greenland turbot	10	0.65
134	Greenland turbot	20	0.30
134	Greenland turbot	22	0.40
134	Greenland turbot	98	1.00
134	Greenland turbot	99	1.00
135	Greenstripe rockfish	1	1.00
135	Greenstripe rockfish	2	1.00
135	Greenstripe rockfish	3	0.98
135	Greenstripe rockfish	4	0.82
135	Greenstripe rockfish	5	0.60
135	Greenstripe rockfish	7	0.60
135	Greenstripe rockfish	8	0.50
135	Greenstripe rockfish	22	0.25
135	Greenstripe rockfish	98	1.00
135	Greenstripe rockfish	99	1.00
136	Northern rockfish	3	0.98
137	Boccacio rockfish	3	0.98
138	Copper rockfish	3	0.98
139	Other rockfish	1	1.00
139	Other rockfish	2	1.00
139	Other rockfish	3	0.98
139	Other rockfish	4	0.82
139	Other rockfish	5	0.60
139	Other rockfish	7	0.60
139	Other rockfish	8	0.50
139	Other rockfish	20	0.42
139	Other rockfish	22	0.25
139	Other rockfish	98	1.00
139	Other rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
140	Red rockfish (red snapper)	1	1.00
140	Red rockfish (red snapper)	2	1.00
140	Red rockfish (red snapper)	3	0.98
140	Red rockfish (red snapper)	4	0.82
140	Red rockfish (red snapper)	5	0.60
140	Red rockfish (red snapper)	7	0.60
140	Red rockfish (red snapper)	8	0.50
140	Red rockfish (red snapper)	22	0.25
140	Red rockfish (red snapper)	98	1.00
140	Red rockfish (red snapper)	99	1.00
141	Pacific ocean perch	1	1.00
141	Pacific ocean perch	2	1.00
141	Pacific ocean perch	3	0.98
141	Pacific ocean perch	4	0.82
141	Pacific ocean perch	5	0.60
141	Pacific ocean perch	7	0.60
141	Pacific ocean perch	8	0.50
141	Pacific ocean perch	22	0.25
141	Pacific ocean perch	98	1.00
141	Pacific ocean perch	99	1.00
142	Black rockfish	1	1.00
142	Black rockfish	2	1.00
142	Black rockfish	3	0.98
142	Black rockfish	4	0.82
142	Black rockfish	5	0.60
142	Black rockfish	7	0.60
142	Black rockfish	8	0.61
142	Black rockfish	22	0.25
142	Black rockfish	98	1.00
142	Black rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
143	Thornyhead rockfish	1	1.00
143	Thornyhead rockfish	2	1.00
143	Thornyhead rockfish	3	0.98
143	Thornyhead rockfish	4	0.82
143	Thornyhead rockfish	5	0.60
143	Thornyhead rockfish	7	0.60
143	Thornyhead rockfish	8	0.50
143	Thornyhead rockfish	15	0.00
143	Thornyhead rockfish	22	0.25
143	Thornyhead rockfish	98	1.00
143	Thornyhead rockfish	99	1.00
144	Unspecified slope rockfish	1	1.00
144	Unspecified slope rockfish	3	0.98
144	Unspecified slope rockfish	4	0.82
144	Unspecified slope rockfish	5	0.60
144	Unspecified slope rockfish	7	0.60
144	Unspecified slope rockfish	8	0.50
144	Unspecified slope rockfish	98	1.00
144	Unspecified slope rockfish	99	1.00
145	Yelloweye rockfish	1	1.00
145	Yelloweye rockfish	2	1.00
145	Yelloweye rockfish	3	0.98
145	Yelloweye rockfish	4	0.82
145	Yelloweye rockfish	5	0.60
145	Yelloweye rockfish	7	0.60
145	Yelloweye rockfish	8	0.50
145	Yelloweye rockfish	12	0.65
145	Yelloweye rockfish	22	0.22
145	Yelloweye rockfish	98	1.00
145	Yelloweye rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
146	Canary rockfish	1	1.00
146	Canary rockfish	2	1.00
146	Canary rockfish	3	0.98
146	Canary rockfish	4	0.82
146	Canary rockfish	5	0.60
146	Canary rockfish	7	0.60
146	Canary rockfish	8	0.50
146	Canary rockfish	22	0.22
146	Canary rockfish	98	1.00
146	Canary rockfish	99	1.00
147	Quillback rockfish	1	1.00
147	Quillback rockfish	2	1.00
147	Quillback rockfish	3	0.98
147	Quillback rockfish	4	0.82
147	Quillback rockfish	5	0.60
147	Quillback rockfish	8	0.50
147	Quillback rockfish	22	0.22
147	Quillback rockfish	98	1.00
147	Quillback rockfish	99	1.00
148	Tiger rockfish	1	1.00
148	Tiger rockfish	2	1.00
148	Tiger rockfish	3	0.98
148	Tiger rockfish	5	0.60
148	Tiger rockfish	22	0.22
148	Tiger rockfish	98	1.00
148	Tiger rockfish	99	1.00
149	China rockfish	1	1.00
149	China rockfish	2	1.00
149	China rockfish	3	0.98
149	China rockfish	5	0.60
149	China rockfish	8	0.50
149	China rockfish	9	0.60
149	China rockfish	22	0.22
149	China rockfish	98	1.00
149	China rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
150	Rosethorn rockfish	1	1.00
150	Rosethorn rockfish	2	1.00
150	Rosethorn rockfish	3	0.98
150	Rosethorn rockfish	12	0.65
150	Rosethorn rockfish	22	0.22
150	Rosethorn rockfish	98	1.00
150	Rosethorn rockfish	99	1.00
151	Rougheye rockfish	1	1.00
151	Rougheye rockfish	2	1.00
151	Rougheye rockfish	3	0.98
151	Rougheye rockfish	4	0.82
151	Rougheye rockfish	5	0.60
151	Rougheye rockfish	7	0.60
151	Rougheye rockfish	8	0.50
151	Rougheye rockfish	22	0.22
151	Rougheye rockfish	98	1.00
151	Rougheye rockfish	99	1.00
152	Shortraker rockfish	1	1.00
152	Shortraker rockfish	2	1.00
152	Shortraker rockfish	3	0.98
152	Shortraker rockfish	4	0.82
152	Shortraker rockfish	5	0.60
152	Shortraker rockfish	7	0.60
152	Shortraker rockfish	8	0.50
152	Shortraker rockfish	17	0.00
152	Shortraker rockfish	22	0.22
152	Shortraker rockfish	23	0.25
152	Shortraker rockfish	98	1.00
152	Shortraker rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
153	Redbanded rockfish	1	1.00
153	Redbanded rockfish	2	1.00
153	Redbanded rockfish	3	0.98
153	Redbanded rockfish	4	0.82
153	Redbanded rockfish	5	0.60
153	Redbanded rockfish	7	0.60
153	Redbanded rockfish	8	0.50
153	Redbanded rockfish	22	0.22
153	Redbanded rockfish	98	1.00
153	Redbanded rockfish	99	1.00
154	Dusky rockfish	1	1.00
154	Dusky rockfish	2	1.00
154	Dusky rockfish	3	0.98
154	Dusky rockfish	4	0.82
154	Dusky rockfish	5	0.60
154	Dusky rockfish	7	0.60
154	Dusky rockfish	8	0.50
154	Dusky rockfish	22	0.22
154	Dusky rockfish	98	1.00
154	Dusky rockfish	99	1.00
155	Yellowtail rockfish	1	1.00
155	Yellowtail rockfish	2	1.00
155	Yellowtail rockfish	3	0.98
155	Yellowtail rockfish	8	0.50
155	Yellowtail rockfish	22	0.22
155	Yellowtail rockfish	98	1.00
155	Yellowtail rockfish	99	1.00
156	Widow rockfish	1	1.00
156	Widow rockfish	2	1.00
156	Widow rockfish	3	0.98
156	Widow rockfish	22	0.22
156	Widow rockfish	98	1.00
156	Widow rockfish	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
157	Silvergray rockfish	1	1.00
157	Silvergray rockfish	2	1.00
157	Silvergray rockfish	3	0.98
157	Silvergray rockfish	5	0.60
157	Silvergray rockfish	8	0.50
157	Silvergray rockfish	22	0.22
157	Silvergray rockfish	98	1.00
157	Silvergray rockfish	99	1.00
158	Redstripe rockfish	1	1.00
158	Redstripe rockfish	2	1.00
158	Redstripe rockfish	3	0.98
158	Redstripe rockfish	8	0.50
158	Redstripe rockfish	22	0.22
158	Redstripe rockfish	98	1.00
158	Redstripe rockfish	99	1.00
159	Darkblotched rockfish	1	1.00
159	Darkblotched rockfish	2	1.00
159	Darkblotched rockfish	3	0.98
159	Darkblotched rockfish	4	0.82
159	Darkblotched rockfish	5	0.60
159	Darkblotched rockfish	8	0.50
159	Darkblotched rockfish	98	1.00
159	Darkblotched rockfish	99	1.00
160	Bullhead sculpin	1	1.00
160	Bullhead sculpin	2	1.00
160	Bullhead sculpin	3	0.98
160	Bullhead sculpin	5	0.65
160	Bullhead sculpin	98	1.00
160	Bullhead sculpin	99	1.00
165	Riffle sculpin	3	0.98
168	Unsp. Demersel shelf rockfish	1	1.00
168	Unsp. Demersel shelf rockfish	2	1.00
168	Unsp. Demersel shelf rockfish	3	0.98
168	Unsp. Demersel shelf rockfish	5	0.60
168	Unsp. Demersel shelf rockfish	8	0.50

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
169	Unsp. Pelagic shelf rockfish	1	1.00
169	Unsp. Pelagic shelf rockfish	3	0.98
169	Unsp. Pelagic shelf rockfish	5	0.60
193	Atka mackerel	1	1.00
193	Atka mackerel	2	1.00
193	Atka mackerel	3	0.98
193	Atka mackerel	4	0.87
193	Atka mackerel	5	0.61
193	Atka mackerel	98	1.00
193	Atka mackerel	99	1.00
270	Pollock	1	1.00
270	Pollock	2	1.00
270	Pollock	3	0.98
270	Pollock	4	0.80
270	Pollock	5	0.62
270	Pollock	8	0.72
270	Pollock	9	0.56
270	Pollock (total pollock)	14	0.065
270	Pollock (usable female pollock)	14	0.1375
270	Pollock	22	0.30
270	Pollock	23	0.30
270	Pollock	30	0.22
270	Pollock	31	1.00
270	Pollock	32	0.17
270	Pollock	98	1.00
270	Pollock	99	1.00
510	Smelt (general)	98	1.00
510	Smelt (general)	99	1.00
511	Eulachon smelt	1	1.00
511	Eulachon smelt	98	1.00
511	Eulachon smelt	99	1.00
689	Shark (general)	1	1.00
689	Shark (general)	2	1.00
689	Shark (general)	3	0.98
689	Shark (general)	4	0.85
689	Shark (general)	5	0.72
689	Shark (general)	98	1.00
689	Shark (general)	99	1.00

Appendix Table 2.--Continued.

Species code	Name of species	Product code	Conversion rate
690	Salmon shark	1	1.00
690	Salmon shark	2	1.00
690	Salmon shark	3	0.98
690	Salmon shark	5	0.72
690	Salmon shark	98	1.00
690	Salmon shark	99	1.00
691	Spiny dogfish	1	1.00
691	Spiny dogfish	2	1.00
691	Spiny dogfish	3	0.98
691	Spiny dogfish	4	0.70
691	Spiny dogfish	98	1.00
691	Spiny dogfish	99	1.00
700	Skate	1	1.00
700	Skate	2	1.00
700	Skate	3	0.98
700	Skate	5	0.72
700	Skate	22	0.25
700	Skate	98	1.00
700	Skate	99	1.00
710	Sablefish (black cod)	1	1.00
710	Sablefish (black cod)	2	1.00
710	Sablefish (black cod)	3	0.98
710	Sablefish (black cod)	4	0.70
710	Sablefish (black cod)	5	0.60
710	Sablefish (black cod)	7	0.68
710	Sablefish (black cod)	8	0.62
710	Sablefish (black cod)	22	0.25
710	Sablefish (black cod)	23	0.25
710	Sablefish (black cod)	98	1.00
710	Sablefish (black cod)	99	1.00
870	Octopus	1	1.00
870	Octopus	3	0.98
870	Octopus	4	0.90
870	Octopus	5	0.85
870	Octopus	98	1.00
870	Octopus	99	1.00
875	Squid	1	1.00
875	Squid	2	1.00
875	Squid	98	1.00
875	Squid	99	1.00

TAGGED FISH AND CRAB

If you should find a tagged fish or crab while you are sampling, or if a crew member brings you a tagged fish or crab, return the tag, along with all pertinent information, to the debriefers at the end of your cruise. Such information should normally include the date, location, and circumstances of capture, and the length, weight, sex, and stage of maturity of the fish. Tags from yellowfin sole, halibut, cod, pollock, and other fish will be forwarded to the appropriate tagging agency. Otoliths and scales are often also very useful to the tagging agency.

The Pacific Biological Station at Nanaimo, B.C. injected a number of sablefish with a bone-marking chemical and tagged them with a small, yellow, plastic tube implanted just below the first dorsal fin. Obtain the otoliths and scales of these fish, and store them dry in an envelope to protect them from light which tends to fade the marking chemical. These samples, along with the accompanying data on date, position of capture, etc. will be forwarded to the Nanaimo laboratory after your return.

Tags are usually located on the dorsal surface of the fish, or on the gill cover. Tags can be of the anchor, spaghetti, or modified disk variety. Some fish may be tagged twice. NMFS will pay a $2 reward to the captain of the ship from which a sablefish tag is returned (the observer cannot be paid). To expedite the sending of the reward, include the captain's name and address with the data.

Some agencies tag salmon by inserting a coded wire into the snout of fingerling salmon. These wire-tagged salmon are marked by clipping their adipose fins. If you find a salmon missing an adipose fin, check to see whether it is missing any other fins, collect a scale sample, record the usual data, and in addition, weigh the gonads. Remove the snout by cutting well <u>behind the eye</u>, salt the snout, attach the completed data tag to the snout, and seal it in one of the provided plastic bags. After a few days, drain off any accumulated liquid and resalt the snout. Repeat the draining and resalting as needed. The tag should be filled out in pencil and the scale sample number written on the top.

The Alaska Department of Fish and Game along with other agencies have tagged crab with bright yellow or orange plastic, "spaghetti" tags. If one of these tagged crabs are found, record the needed information and measure the crab as best you can to the nearest millimeter, even if you were not assigned calipers or dividers to measure crab. (Refer to "Length Measurements For Various Species" in the Appendix). Sometimes tagged crabs that have been caught are alive and in good condition. If this is the case, record the pertinent information along with the tag number and release the crab as quickly as possible.

Collecting and returning tags is an important way to help fishery research. Please remember to bring back tags with as much of the following information as possible:

1. Tag or tag serial number.
2. Scale and/or otoliths for aging.
3. Fish length (in mm if possible).
4. Fish weight (in gm if possible).
5. Sex and maturity of gonads (immature, mature, spawning).

6. General appearance (poor body condition, good body condition).
7. Condition of tagging wound (healthy healed tissue, open wound, etc.).
8. Time and date of capture.
9. Capture location (latitude and longitude).
10. Capture depth.

SEXING FISH

During training you will have been instructed on the proper way to determine the sex of various fish species. Due to lack of availability of specimens of certain species for dissection purposes, you may not have been able to practice on your particular sampling species, but you should be able to determine the sex with practice by referring to photos of roundfish and flatfish gonads in the species photo guide. In determining sex, it is generally easiest to start with large, mature fish and work down in size to small, immature specimens. Thoroughly dissect a few fish and identify the various internal structures so that you know what you are looking for.

Some Japanese have shown observers a way of telling the sex of pollock without cutting them open. This method uses the relative size and shape of the pelvic fins to distinguish male from female. Since this method requires a fair amount of judgment and works consistently only for the larger specimens, we recommend that this method not be used. Pollock can be more accurately sexed by splitting the belly and inspecting the gonads, and with practice this can be accomplished very rapidly.

Halibut should not be sexed, but all other pertinent data should be obtained before releasing the fish. Most salmon have a very poor chance of surviving after being caught in a trawl net, especially if many scales have been lost, so identify the species and obtain the individual lengths, weights, scale samples, and sex before returning the fish. The gonads in salmon are up against the dorsal wall of the body cavity close to the backbone. When identifying the sex of salmon, make sure to slit the belly far enough forward to see the rounded sacks which are the ovaries of immature females. Male gonads are frequently two white tubes running right along the back bone.

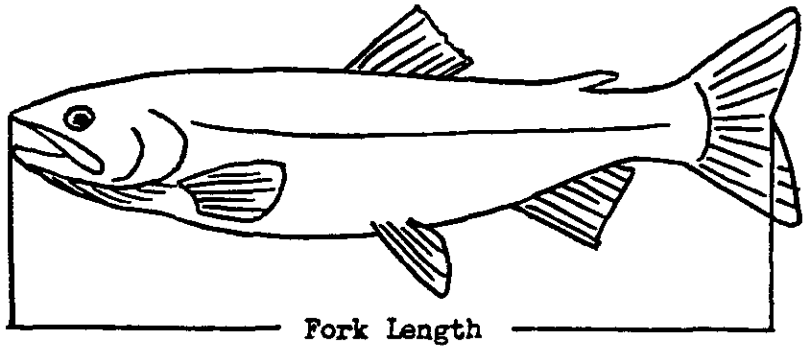
SEX DETERMINATION FOR SELECT TARGET AND INCIDENTAL SPECIES

	Walleye Pollock (Roundfish)	Pacific Halibut (Flatfish)	Pacific Ocean Perch (Rockfish)	Pacific Hake (Roundfish)
FEMALE				
Immature ovary	smooth, pink egg sacks; small, opaque eggs	triangular with a long tail lobe extending posteriorly	firm and yellow to *flabby and red and* gray	pinkish, small eggs *not yolked*
Gravid ovary	smooth, pink egg sacks, greatly enlarged; they fill cavity	same, white, eggs usually visible	firm and yellow; embryos present	pink, eggs yolked, some eggs translucent to all eggs translucent
MALE				
Immature testes	white, rippled membrane	same as female without tail lobe; pink, fibre texture		same as pollock
Ripened testes	white to pink ribbon-like folds, enlarged	same as immature male but soft, plump, pink to white and enlarged	all cases will be hard, finger-like projection extending to posterior; white	same as pollock
Spent testes	white to pink ribbon-like folds	same as immature male		same as pollock

LENGTH MEASUREMENTS FOR VARIOUS SPECIES

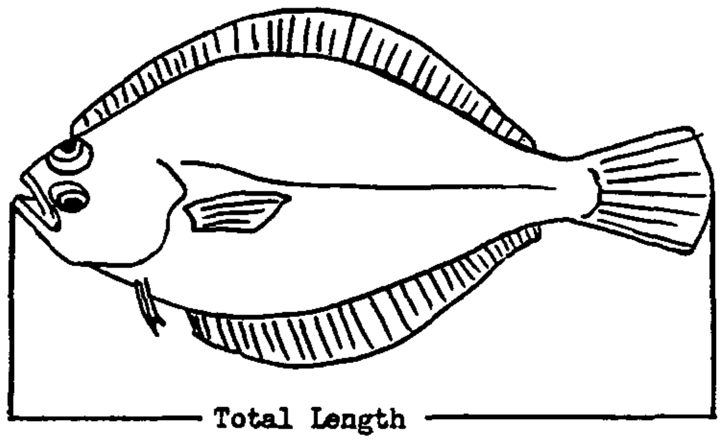
Fork Length Measure:

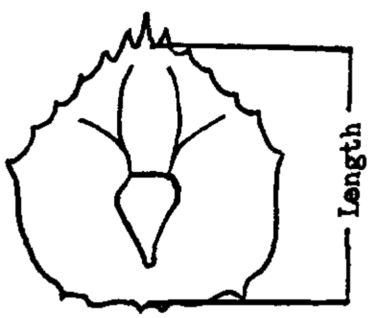
Roundfish
Rockfish
Salmon



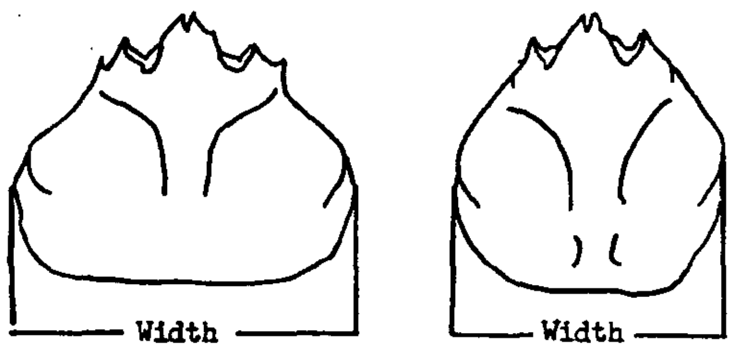
Total Overall Length:

Flatfish
From snout to middle
of tail.





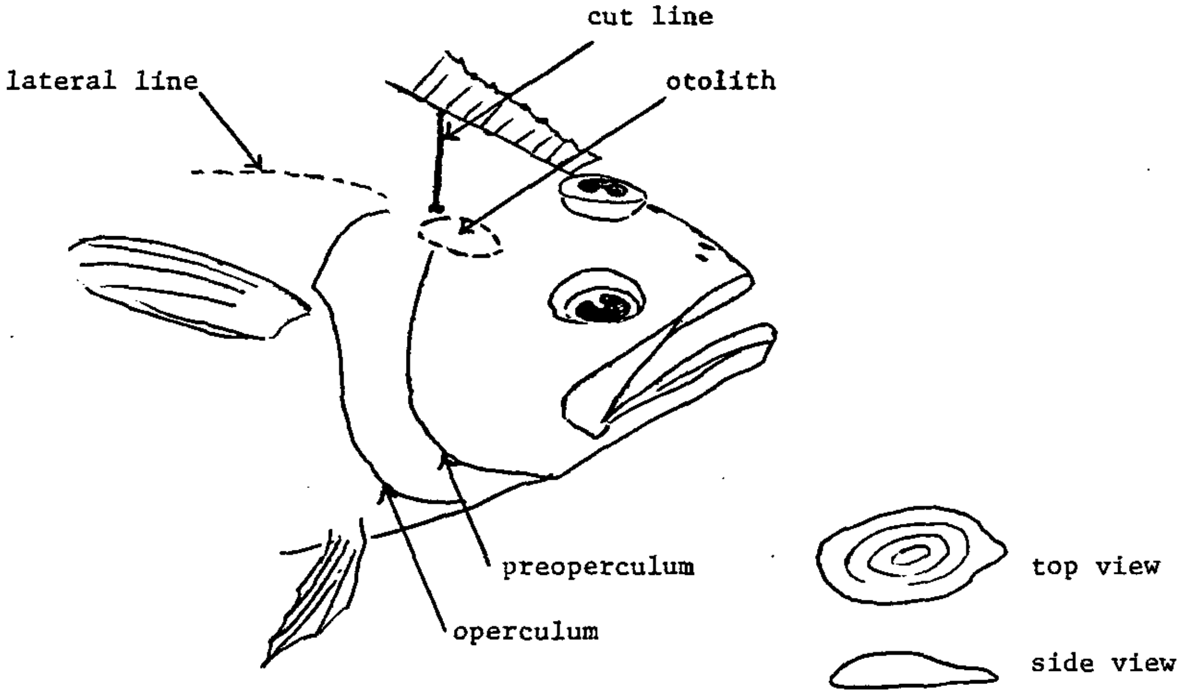
King Crab
Right eye socket to middle
of posterior margin.



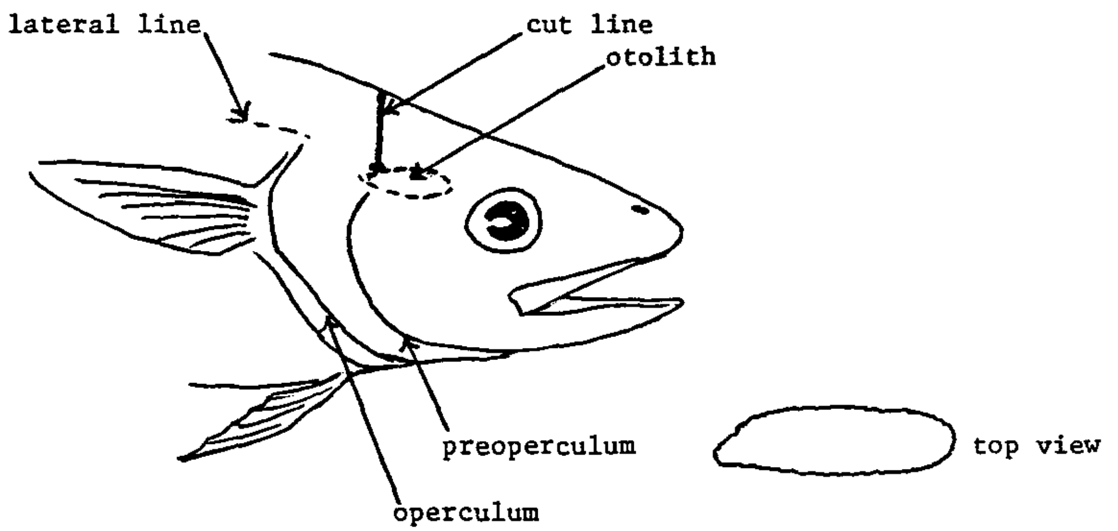
Tanner (Snow) Crab
C. bairdi C. opilio

Otolith and Scale Collection for Select Species

Species	Sample Type	Storage Container	Storage Media
Walleye pollock	Otolith	Plastic vial	50% alcohol 50% water
Yellowfin sole (or other flatfish)	Otolith	Plastic vial	Glycerol/Thymol Solution
Atka mackerel	Otolith	Plastic vial	50% alcohol 50% water
Pacific cod	Otolith & Scale (both in same vial)	Plastic vial	50% alcohol 50% water
Pacific hake	Otolith	Plastic vial	50% alcohol 50% water
Jack mackerel	Otolith	Plastic vial	Dry
Sablefish	Otolith & Scale (both in same vial)	Plastic vial	50% alcohol 50% water
Salmon	Scale	Paper envelope	Dry
Rockfish	Otolith	Plastic vial	50% alcohol 50% water



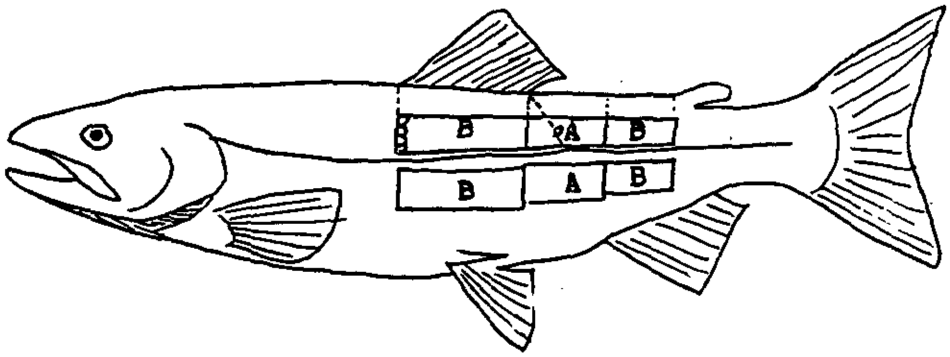
Arrowtooth Flounder
<u>Atheresthes</u> <u>stomias</u>



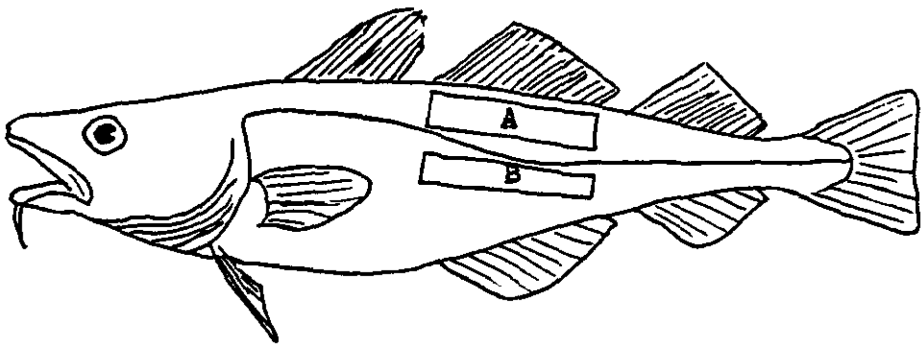
Walleye Pollock
<u>Theragra</u> <u>chalcogramma</u>

Approximate location of the otoliths (sagittal) and the cut for the removal of otoliths from flatfish and roundfish

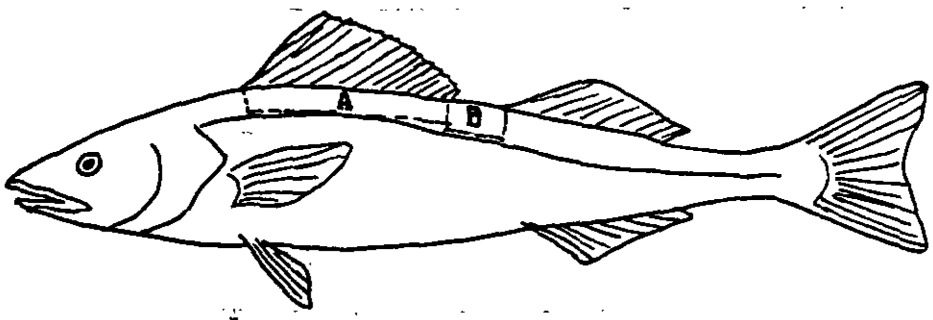
LOCATION OF PREFERRED SCALE SAMPLING ZONES
(Do not take lateral line scales)



SALMON - Follow the diagonal scale row from the posterior insertion of the dorsal fin to the lateral line of either side. Two scale rows up from the lateral line (on the diagonal) are the preferred scales.



PACIFIC COD - Scrape along either side of the back directly below the second dorsal fin.



SABLEFISH (BLACK COD) - If assigned to collect scales, scrape the scales from the dorsal surface directly below the first dorsal fin.

How To Collect Fish

Keep in mind that a large frozen specimen or a specimen collection becomes a piece of luggage so limit the size to what you can handle. Freeze the fish quickly after deciding to collect it. Lay the fish flat and straight to freeze it. Make an identifying label and put it with (in) the fish before freezing. Fill out a Specimen Collection Form and keep that with your paperwork. When the fish is frozen, glaze and reglaze it a couple times. When debarkation is near, pad and package it well. While in transit do your best to keep it frozen.

You can:

A) In Dutch Harbor let your contact person, if any, know you have a frozen specimen to maintain. Maybe your place of lodging will hold it for you in their kitchen freezers.

B) Tell the airlines at check-in that you have a package to keep frozen.

C) In Seattle on a weekend, take it to the Seattle Aquarium if you can't keep it at your lodgings. Their weekend, daytime phone number is: 625-5018 or 625-5019 and their 24-hour phone number is: 625-4359. Tell the aquarium staff you are a NMFS observer, get directions and ask them to hold it for you until Monday. On weekdays bring frozen specimens into our freezer in the wetlab. Tell your debriefer you have a specimen and turn in your form.

SPECIMENS NEEDED FOR TEACHING COLLECTION

(small (20-35 cm) specimens preferred)

I. Gadidae

Pacific Cod, Gadus macrocephalus

II. Flatfishes

Rough-scale Sole, Clidoderma asperrimum
Alaska Plaice, Pleuronectes quadrituberculatus
Longhead Dab, Limanda proboscidea
Rex Sole, Glyptocephalus zachirus
Curlfin Sole, Pleuronichthys decurrens *
C-O Sole, Pleuronichthys coenosus
Greenland Turbot, Reinhardtius hippoglossoides
Arrowtooth Flounder, Atheresthes stomias
Kamchatka Flounder, Atheresthes evermanni
Deepsea Sole, Embassichthys bathybius *
Dover Sole, Microstomus pacificus
Hybrid Sole, Inopsetta ischyra
English Sole, Parophrys vetulus
Butter Sole, Isopsetta isolepis
Slender Sole, Lyopsetta exilis
Petrale Sole, Eopsetta jordani
Flathead Sole, Hippoglossoides elassodon
Bering Flounder, Hippoglossoides robustus *
Arctic Flounder, Liopsetta gracialis *

III. Rockfishes

Longspine Thornyhead, Sebastolobus alascanus *
Darkblotched Rockfish, Sebastes crameri
Harlequin Rockfish, Sebastes variegatus
Redstripe Rockfish, Sebastes proriger
Shortraker Rockfish, Sebastes borealis *
Northern Rockfish, Sebastes polyspinus
Redbanded Rockfish, Sebastes babcocki
Silvergray Rockfish, Sebastes brevispinis
Dusky Rockfish, Sebastes ciliatus
Black Rockfish, Sebastes melanops
Blue Rockfish, Sebastes mystinus

IV. Incidentals

1. Any unusual fish
2. Look especially for:

Dragon poacher, Percis japonicus
Bering Wolffish, Anarhichas orientalis
Sablefish, Anoplopoma fimbria
Flathead Pomfret, Taractes asper
Giant Wrymouth, Delolepis gigantea
Atka Mackerel, Pleurogrammus monopterygius
Oxeye Oreo, Allocyttus folletti
Capelin, Mallotus villosus
Eulachon, Thaleichthys pacificus
Pacific Sandfish, Trichodon trichodon
Prowfish, Zaprora silenus

* = collect any size

Specimen Collection Form

Collector: ______________________ Cruise No.: ______ Vessel Code: ______

Date: ______________ Vessel Name: ______________________________

Haul No.: ____________ Lat. & Long.: ______________________________

Depth: ________ (meters) Water Temp.: ________ (degrees C.)

Collector's Identification: ______________________________________

Length: ________ (cm) Weight: ________ (kg)

Notes on in vivo coloration, unusual scale patterns or spines: ____________

____

Sketch if necessary:

When completed, return this form to a debriefer.

Identification confirmed by: ________________________ Date: __________

Common Name: ________________________________

Scientific Name: ______________________________

Comments: ____

____

Specimen Collection Form

Collector: ____________________ Cruise No.: ______ Vessel Code: ______

Date: ______________ Vessel Name: ______________________________

Haul No.: ___________ Lat. & Long.: ____________________________

Depth: _______ (meters) Water Temp.: ________ (degrees C.)

Collector's Identification: ______________________________________

Length: ________ (cm) Weight: ________ (kg)

Notes on in vivo coloration, unusual scale patterns or spines: ____________

____

Sketch if necessary:

When completed, return this form to a debriefer.

Identification confirmed by: ______________________ Date: ________

Common Name: _________________________________

Scientific Name: _______________________________

Comments: ____

____

Specimen Collection Form

Collector: ______________________ Cruise No.: ______ Vessel Code: ______

Date: ______________ Vessel Name: ______________________________

Haul No.: ______________ Lat. & Long.: ______________________________

Depth: ________ (meters) Water Temp.: ________ (degrees C.)

Collector's Identification: ______________________________

Length: ________ (cm) Weight: ________ (kg)

Notes on in vivo coloration, unusual scale patterns or spines: ____________

____

Sketch if necessary:

When completed, return this form to a debriefer.

Identification confirmed by: ______________________ Date: __________

Common Name: ______________________________

Scientific Name: ______________________________

Comments: ______________________________

____

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

Permit to Import Marine Mammals and Endangered Species
Permit No. 578

The National Marine Mammal Laboratory, Northwest and Alaska Fisheries Center, National Marine Fisheries Service, 7600 Sand Point Way, N.E. BIN C15700, Seattle, Washington 98115, is hereby authorized to import marine mammal specimens, including material from species listed as threatened or endangered, for scientific research and scientific purposes as cited in the Permit Holder's application and subject to the provisions of the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1407), the Regulations Governing the Taking and Importing of Marine Mammals (50 CFR Part 216), the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the regulations governing endangered species permits (50 CFR Parts 217-222), and the Conditions hereinafter set out.

A. Number and Kind of Marine Mammals:

An unspecified number of specimen materials may be imported from:

1. All Cetacean species
2. All Pinnipedia species, except walrus (Odobenus rosmarus)

B. Special Conditions:

1. The specimen material may be imported from anywhere in the world. The material shall have been collected from animals:

   a) Taken in fisheries for such animals in situations where such taking is legal;

   b) killed incidental to fishing or other operations;

   c) found dead floating at sea or beached; or

d) that have died of natural causes.

2. All specimen materials collected under the authority of this Permit shall be maintained according to accepted curatorial standards in bona-fide scientific collections. In the event that fluid tissue specimens are disposed of upon completion of a project, the disposal shall be reported as required by Section B.

3. The Holder must coordinate activities within the United States with appropriate Federal, state and local resource management agencies.

4. The Holder shall submit written notification to the Protected Species Division and the appropriate Regional Director(s) of names of designated agents and the dates which their designation is valid at least two weeks prior to their activity under the Permit. An annually updated list of agents and NMFS personnel authorized to operate under this Permit shall be provided to the Protected Species Division and appropriate Regional Directors.

5. The Holder shall notify the appropriate Regional Director(s) sufficiently in advance of importation or transfer of specimen material. This notification shall include the destination of the specimen materials.

6. The Holder shall submit a report within 30 days of the importation authorized herein listing the items imported and the dates of importation.

7. The Holder shall submit an annual report by December 31 of each year the Permit is valid. The report shall include but is not limited to, a description of each animal from which a specimen was taken including its species, age, size, sex, reproductive condition; date and location of collection; circumstances causing death if known; the date and location of each importation; and the name and location of each institution maintaining specimen materials collected under this Permit.

8. The Holder shall submit a final report within 90 days of the expiration date of the Permit which includes a summary describing the materials that have been imported and their dispostion. All reports shall be submitted to the Office of Protected Species and Habitat Conservation, National Marine Fisheries Service, U.S. Department of Commerce, Washington, D.C. 20235.

9. The provisions of this permit may be amended upon reasonable notice by the Assistant Administrator for Fisheries depending upon the species and circumstances involved.

10. This Permit does not relieve the Holder from the requirement of full compliance with all provisions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). For those species listed on any of the Appendices to CITES valid and appropriate permit(s) authorizing import must be obtained prior to shipment.

11. The authority to collect and import this material shall extend from the date of issuance through December 31, 1991. The terms and conditions of this permit (Sections B and C) shall remain in effect as long as the material imported hereunder is maintained under the authority and responsibility of the Permit Holder.

C. All General Conditions attached as Section C shall apply and are made a part hereof.

William E. Evans
Assistant Administrator for Fisheries
National Marine Fisheries Service

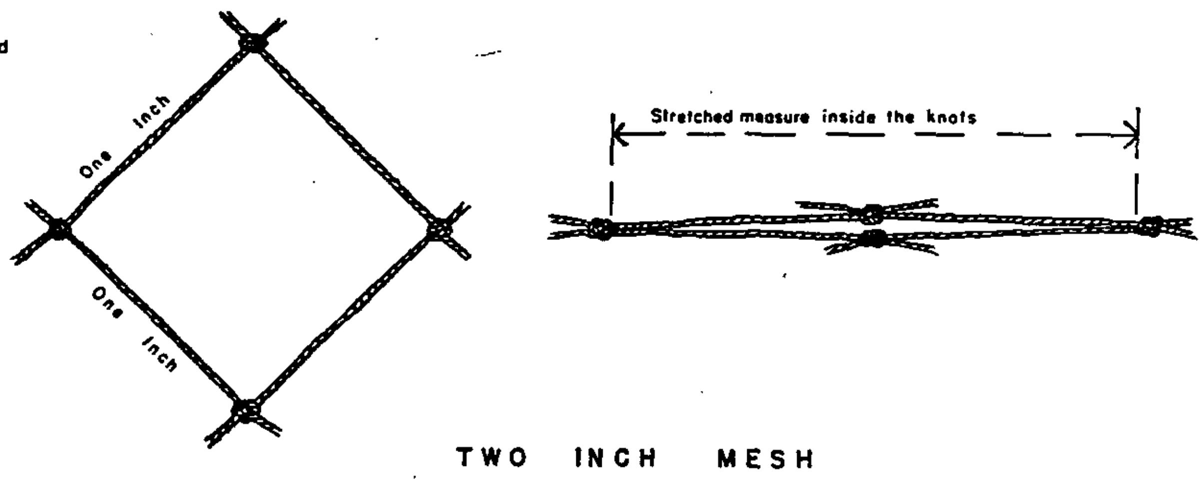
11/6/87
Date

HOW TO MEASURE MESH SIZE

The mesh size measurement requested on the gear diagram is the stretched measure, that is, the distance between two diagonal knots when the mesh is tightly stretched (see second diagram below). In order to obtain this measurement, the net must be empty and the mesh pulled tightly enough so that two opposite knots of the mesh square meet and all four knots are in the same plane; measure the distance inside the two most distant knots in the mesh square.

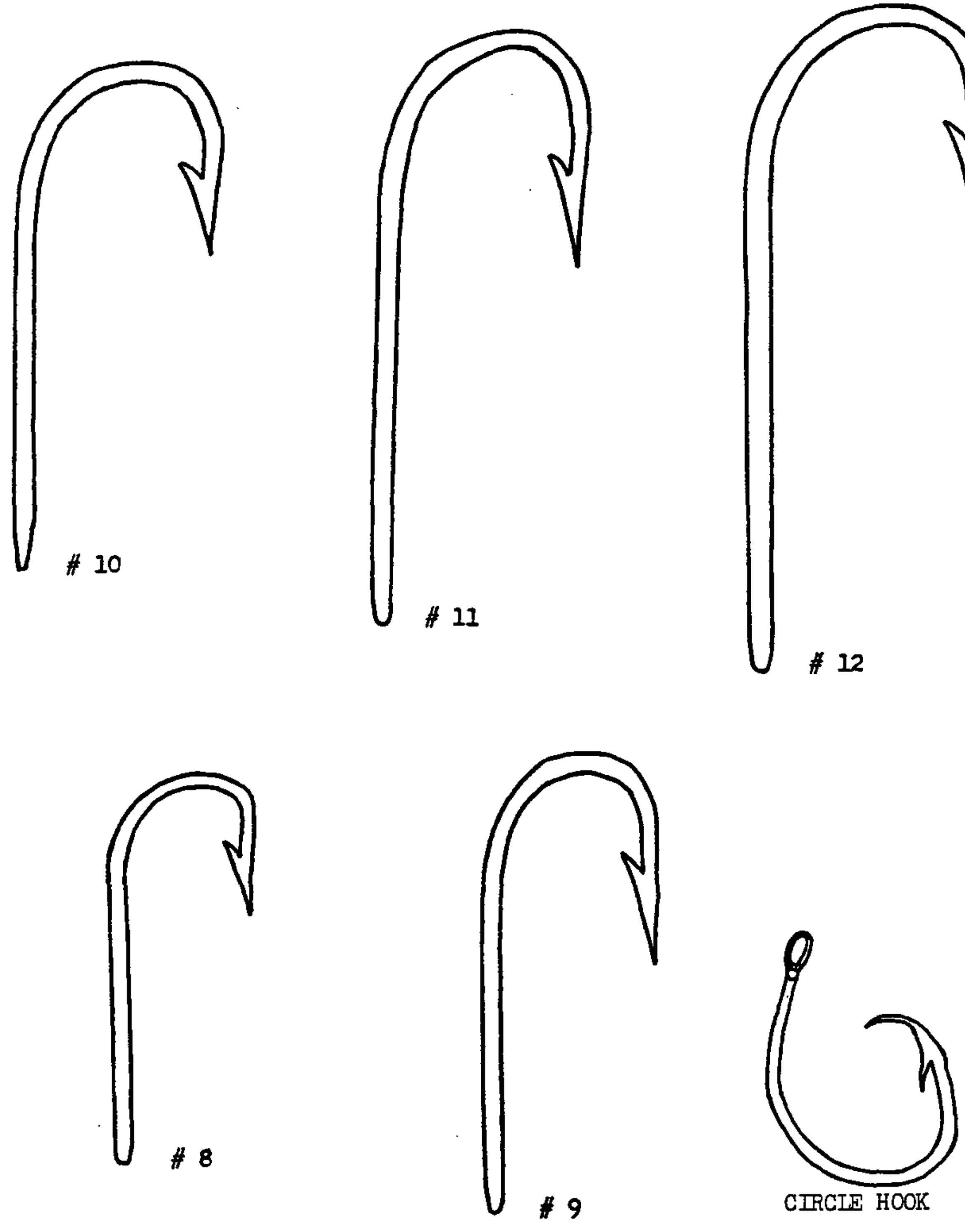
An easier way of obtaining the same measurement (the net does not have to be empty) is to measure the distance between two adjacent knots in a mesh square (the side of a square) and multiply by two. Check several meshes in each part of the net.

W. L. Scofield



A two-inch mesh, open (left) and stretched. This points up variables inherent in web measure and consequent difficulties. Common yardstick is "stretch measure."

HOOK SIZE CHART FOR LONGLINERS



RADIO COMMUNICATIONS

The radios that you will encounter most often are VHF-FM (Very High Frequency Modulation), used for short-range vessel-to-vessel and vessel-to-shore communication, and HF-SSB (High Frequency-Single Side Band), used for communication when the stations are out of VHF range with each other. Both types offer certain special advantages, and each requires a specific operating procedure.

VHF-FM RADIOS

In the United States, the VHF Band is broken up into 71 channels, with a frequency range of from 156.000 to 163.000 MHz, including six WX (Weather) channels. By law, all operating VHF stations are required to have at least three of these channels: channel 6, channel 16, and at least one other working channel.

Channel 6 (156.300 MHz) is the Intership Safety Channel, used for intership safety purposes, search-and-rescue (SAR) communications with ships and aircraft of the U.S. Coast Guard, and vessel movement reporting within ports and inland waterways. This channel must not be used for non-safety communications.

Channel 16 (156.800 MHz) is the International Distress, Safety, and Calling Channel (Intership and Ship-to-Coast). This channel must be monitored at all times the station is in operation (except when actually communicating on another channel). This channel is also monitored by the U.S. Coast Guard, Public Coastal Stations, and many Limited Coastal Stations. Calls to vessels are normally initiated on this channel. Then, except in an emergency, you must switch to a working channel. It is against FCC regulations to conduct business on this channel. In addition, vessels calling must use their assigned call sign at the beginning and end of each transmission.

Channel 22A (157.100 MHz) is the U.S. Coast Guard Liaison Channel. This channel is used for communications with U.S. Coast Guard ships, aircraft, and coastal stations after first establishing contact on channel 16. Navigational warnings and, where not available on WX channels, Marine Weather forecasts are also broadcast on this frequency.

Channels 24,25,26,27 and 28 (also 84,85,86 and 87) are the Public Correspondence channels (ship-to-coast). These are available to all vessels to communicate with Public Coastal stations (Marine Operator). Channels 26 and 28 are the primary public correspondence channels.

Channels 1,3,5,12,13,14,15,17,65,66,73,74,77,81,82 and 83 are channels with special designations (port traffic communications, U.S. government communications, locks and bridges, environmental, etc.), and their use close to shore or to ports should be minimized.

Channels 7,8,9,10,11,18,19,67,68,69,70,71,72,78,79,80 and 88 are commercial and non-commercial working channels that are available for conducting business. The abbreviated format (no call signs) is acceptable on these frequencies. It should be noted that some of these channels may be locally restricted (off the Washington Coast, for example, channel 11 is Tofino Coast Guard Traffic Control for the entry into Juan deFuca Strait, used for reporting ship locations), in which case their use for business should be avoided.

HF-SSB RADIOS

Single Side Band radio is a special version of AM (Amplitude Modulation) radio specifically intended for long-range communication. As a consequence of the "skip" phenomenon (the tendency of a transmitted signal to reflect off the barrier created by the ionosphere), High Frequency skywaves can reach stations up to several thousand kilometers away (depending on ionospheric conditions and other environmental factors). The very nature of the transmitted skywave, however, means a signal very much poorer in quality than a typical VHF or UHF (Ultra High Frequency) signal, and one that is very susceptible to slight atmospheric shifts. HF propagation can vary with time of day, month of the year, sunspot activity, etc., so it becomes extremely important to use more than one frequency to ensure communications under differing conditions.

A number of specific characteristics must be considered when discussing skywaves in an HF-SSB system. One of the most important is the operating frequency of the system. In general, the lower frequencies are used for medium distances, and the higher frequencies for greater distances. As a general rule of thumb for daytime operations, multiply the frequency in MHz by 100 to obtain the approximate skywave coverage distance in miles: 4 MHz equals 400 miles, and 12 MHz equals 1200 miles. At night, these ranges are from 2 to 3 times greater. The nature of the ionosphere is such that its effective position varies with the time of day, tending to move higher up after sundown. This means that the same frequency will reach farther at night, and it is therefore common practice to use lower frequency at night for coverage of the same distance.

RADIO PROCEDURE

Inasmuch as the airwaves are in the public domain, it is the responsibility of the radio station operator to conduct business according to established guidelines and procedures. While on the air, the operator should follow the following format outline:

1. Listen before beginning transmission in order to ensure that you are not interfering with other stations or with emergency radio traffic.

2. Identify your station when calling. On the SSB, a calling station must limit the duration of the hail to not more than 30 seconds. If there is no reply, the hail may be repeated at 2 minute intervals up to a maximum of three times, at which time the calling station must sign off and wait a minimum of 15 minutes before making another attempt. This requirement does not apply in emergency situations.

3. Keep transmissions short and concise, giving the other station a chance to respond, ask questions, or reconfirm an unclear message. A long, complicated message can best be effected in short segments, with breaks in between to ensure that the receiving station has copied each portion of the message correctly.

4. Follow correct radio procedure while on the air. The phonetic alphabet should be learned and used -- spelling unclear words with an extemporaneous phonetic alphabet can lead to misunderstood messages. You should also know and use the radio "punctuation" words ("over","clear","out","roger","words twice","say again","standing by", and "break"). Since most radio communication is only one way at a time, these words can be invaluable for signaling your intentions to the receiving station. Make sure to speak directly into the microphone; speaking loudly, slowly, and distinctly -- but not shouting -- can significantly improve the legibility of radio broadcasts. The use of profanity on the public airwaves is strictly forbidden.

5. Upon completing a transmission, you must sign off by identifying your station and using the words "clear" or "out" (or, if you expect to soon resume contact with the same station, by using the phrase "standing by").

1. Radios are different from telephones in that they cannot transmit and receive simultaneously. Therefore when you have temporarily finished talking and are ready to listen, say "over," and release the button on your microphone. When the other party is ready to listen they will say "over." At the end of your entire message, say "out" rather than "over." Keep in mind that people on other ships can overhear your conversation, so watch what you say.

2. Sounds are easily garbled on marine radios so the phonetic alphabet is used when sailors want to spell something. Here are the words that the Coast Guard will recognize as letters:

A - alpha
B - bravo
C - Charlie
D - delta
E - echo
F - foxtrot
G - gulf
H - hotel
I - India
J - Juliet
K - kilo (keeloes)
L - Lima (Leema)
M - mike
N - November
O - Oscar
P - papa
Q - Quebec
R - Romeo
S - Sierra
T - tango
U - uniform
V - victor
W - whiskey
X - x-ray
Y - Yankee
Z - Zulu

3. Every ship and all Coast Guard stations continually listen to the emergency frequencies. Therefore when you want to talk to someone, call on an emergency frequency. As soon as you contact them, arrange to switch to another channel. It is illegal, impolite, unfair, and dangerous to talk on emergency channels. Sometimes atmospheric conditions are such that the emergency frequencies are the only ones that work. At those times you simply cannot communicate via radio except to report emergencies.

Emergency frequencies are:

FM Channel 16, international distress
FM Channel 13, for ships to use to avoid collisions. You can contact other ships on 13, but not Coast Guard shore stations.
AM 2182, international distress

(Almost certainly as an observer you will only be using FM frequencies.)

4. When you initially contact another station make sure you state what channel you are broadcasting on, since all ships and stations constantly listen to several.

5. Speak in normal tones, using normal conversational pauses and emphasis.
6. Ensure that your messages are brief and businesslike. No chatter.

7. When trying to establish communications repeat the other station's name, and your name, at least twice. A typical message may be as follows:

You - "Any Coast Guard Station, Any Coast Guard Station; this is Uniform Uniform Delta Gulf, the Soviet trawler Danko; this is Uniform Uniform Delta Gulf, the Soviet trawler Danko, on channel 16, over."

C.G.- "Uniform Uniform Delta Gulf, trawler Danko, this is Coast Guard Station Coos Bay, over."

You - "Coast Guard Station Coos Bay, this is trawler Danko, shift to channel 8, over."

C.G.- "Trawler Danko, this is Coast Guard Station Coos Bay, shifting to channel 8, out."

You - "This is the Danko, shifting to channel 8, out."

You - "Coast Guard Station Coos Bay, Coast Guard Station Coos Bay, this is the Soviet trawler Danko on channel 8, over."

C.G.- "Trawler Danko, this is Coast Guard Station Coos Bay, send your traffic, over."

You - "Coast Guard Station Coos Bay, this is the trawler Danko. I am an American observer talking for the captain. A Soviet sailor has broken his leg and needs hospitalization. Can you evacuate the sailor? Over."

C.G. - "Trawler Danko, this is Coos Bay. Affirmative. What is your current position? Over."

You - "Coos Bay this is Danko. Position 44 degrees zero 4 minutes north, 124 degrees, 24 minutes west, over." etc.

8. When you call "Any Coast Guard Station, etc. his first response may be:

"Trawler Danko this is Coast Guard Station Coos Bay, shift and answer on channel 11, out."

This means he doesn't want any more talk on the emergency channel. So without broadcasting again on channel 16, switch to 11 and go through the entire routine on eleven.

9. On your day to return to land, your ship will approach the designated port and wait offshore. The people ashore will wait for your radio call before they send the boat out to get you. A typical message is as follows:

For ships approaching Dutch Harbor:

You - "Mrs. Griffin, Mrs. Griffin. This is Juliet Alpha Oscar Foxtrot. Anyo Maru No. 21, the Anyo Maru No. 21 on channel 16, over."

Her - "Anyo Maru number 21 this is Mrs. Griffin. Shift to channel 8, over."

You - "Mrs. Griffin, this is the Anyo Maru number 21 shifting to channel 8, out."

You - "Mrs. Griffin, this is the Anyo Maru number 21 on channel 8, over."

Her - "Anyo Maru this is Mrs. Griffin. You must be observer Jack Adams, and you must be eager to get off. Where are you, over?"

You - "Mrs. Griffin, we are underway approaching Dutch Harbor. We will be at the pilot point in one half hour, over."

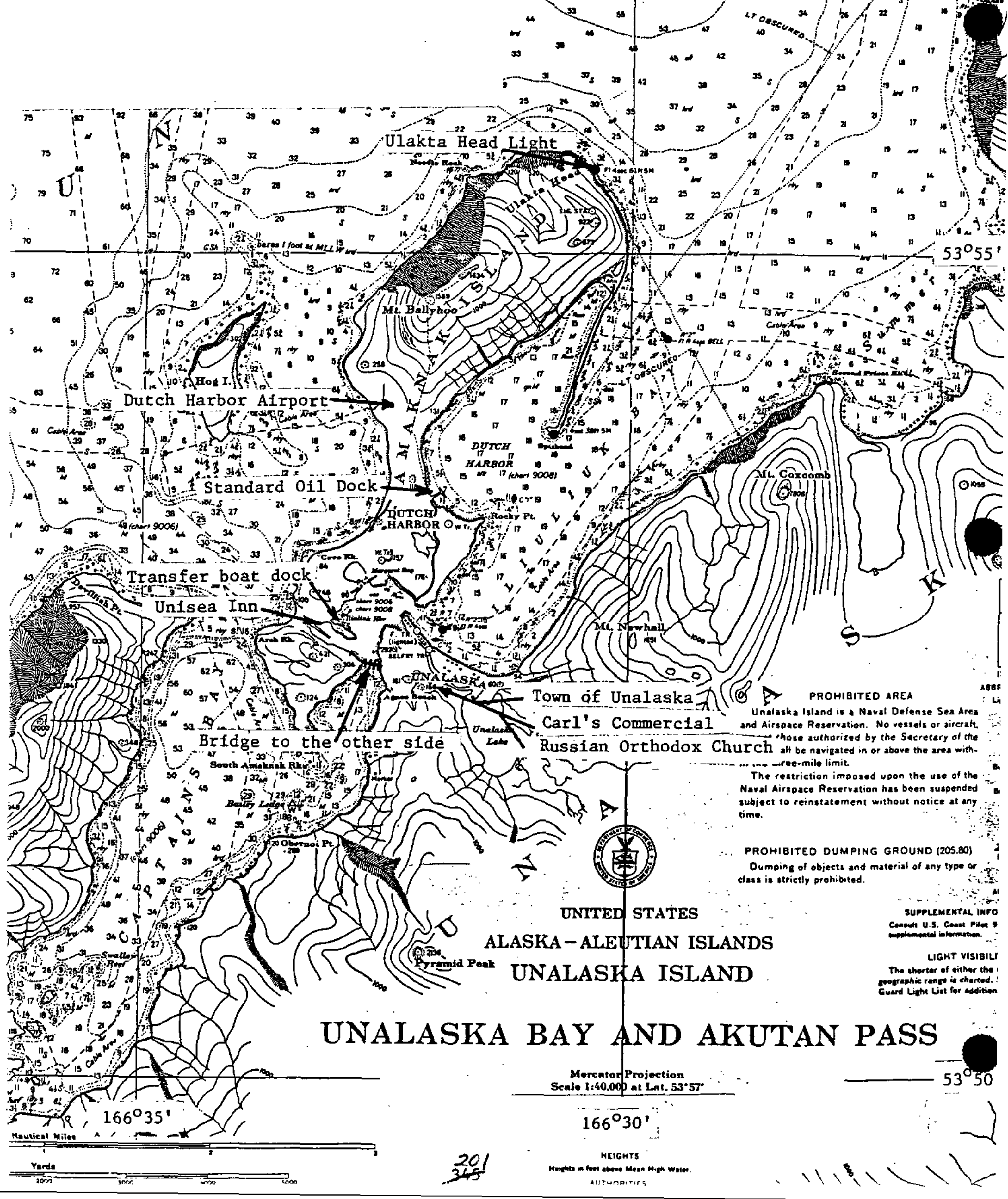
Her - "This is Mrs. Griffin. O.K. I'll have the boat come out to get you. You may have to wait for awhile, over."

You - "This is the Anyo Maru. Roger, we will be waiting. Out."

Her - "This is Mrs. Griffin, out."

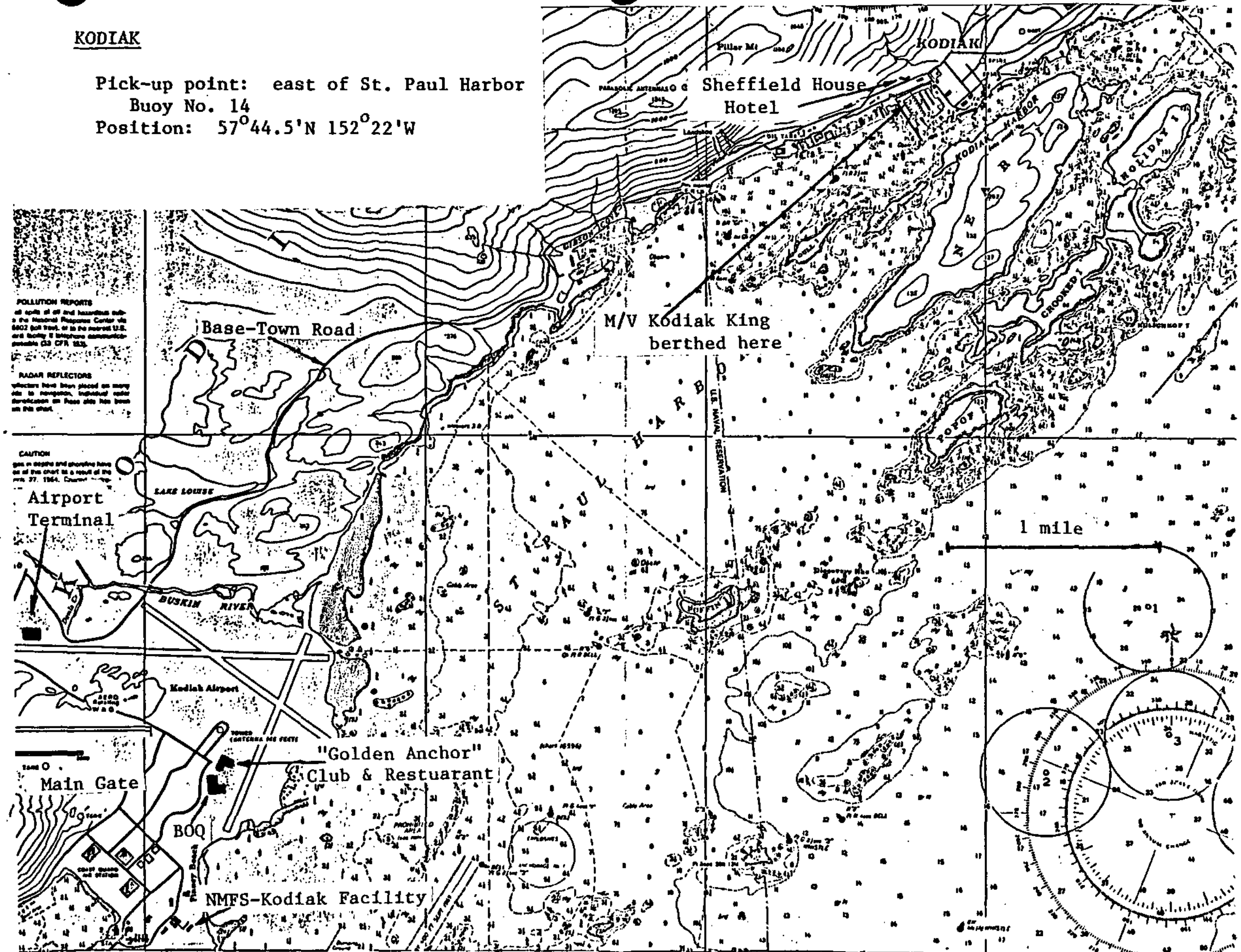
DUTCH HARBOR

Pick-up point: 1 mile east of
Ulakta Head Light
Position: 53°57.5'N 166°28.5'W



KODIAK

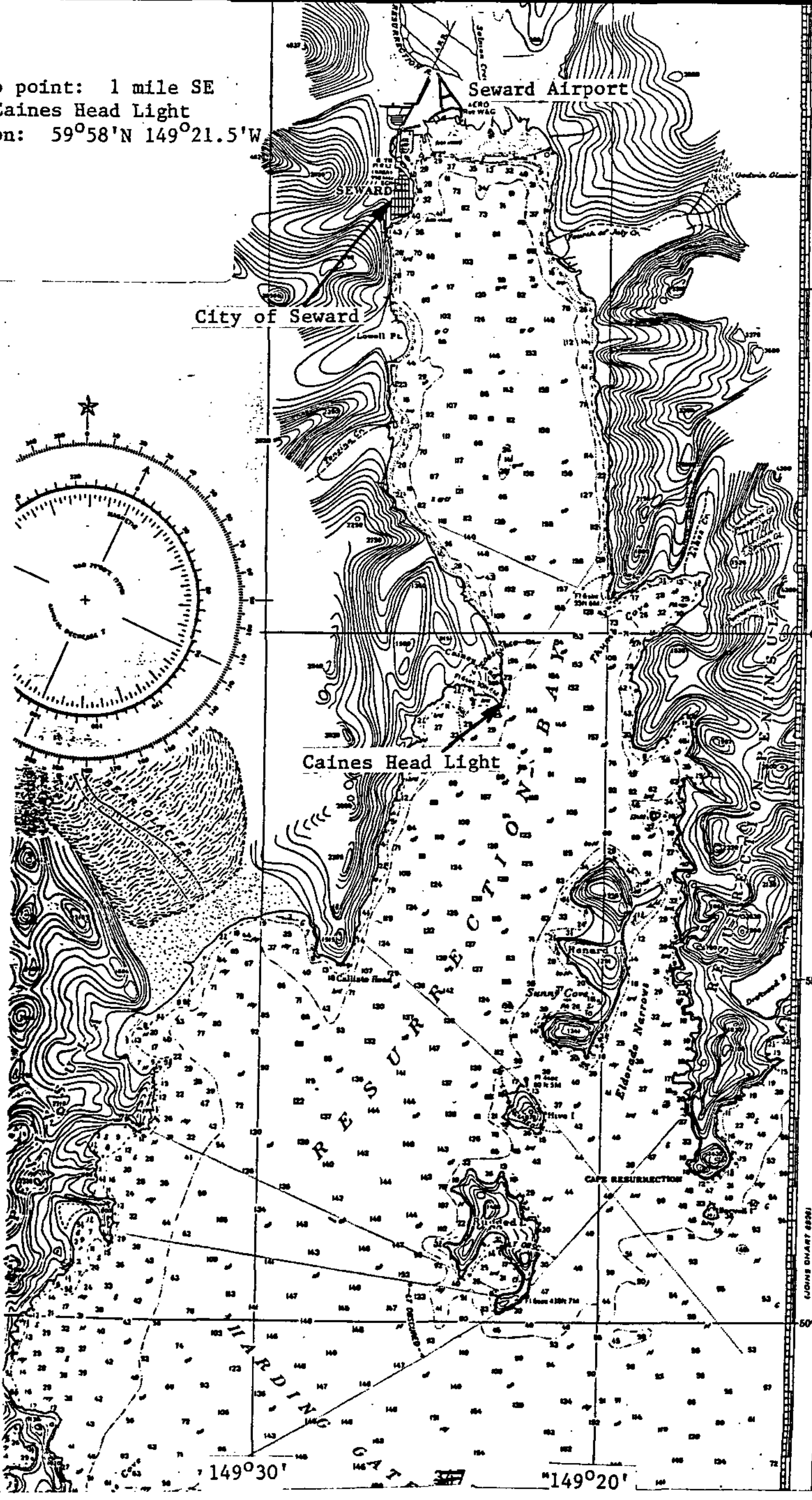
Pick-up point: east of St. Paul Harbor
Buoy No. 14
Position: 57°44.5'N 152°22'W



SEWARD

Pick-up point: 1 mile SE of Caines Head Light

Position: 59°58'N 149°21.5'W



MEDICAL DIAGNOSTIC CHART (MDC)

One of the most important functions an observer can perform during a medical emergency is the collection and maintenance of a medical history. This history and its communication to the Coast Guard is essential to the further treatment of an injured person.

There are two histories to be aware of. The first deals with the patient's bodily make-up and past medical concerns. The second history is a record of the accident or illness and how it is affecting the patient over time. These two pieces of information will give doctors and corpsmen, hundreds of miles away, a greater diagnostic tool of what's happening inside the patient's body and what complications may lie ahead.

The patient's past medical history is the "frame work" for which you will later fill in the "details". The frame work on your "MDC RADIO WORK SHEET AND FLOW CHART", consists specifically of numbers 7 through 13. The information within these numbers begins to paint the picture. For example: 30 yr. old /male/145 lbs./ 5 ft. 7 in. / medium build/ no allergies/ no medications///. [Please note that what is underlined would be in your radio message.] This "framework" information is just as important as the details you are about to fill in.

Without previous training and using what is available, you can observe and record the nature of the accident and the patient's vital signs. Numbers 14 through 18 are observation questions of "what's happened" (#'s 7-13 are to whom), and numbers 19 through 25 are the observation questions of "what's happening now". An example of what's happened might be:

INJURED BY A BROKEN CABLE ON JAN. 24 AT 0300 GMT/PATIENT HAS SUSTAINED A HEAD INJURY/ COMPLAINS OF SEVERE PAIN IN THE UPPER LEFT QUADRANT OF ABDOMEN/ COMPOUND FRACTURE TO RIGHT HAND/ POSSIBLE FRACTURE TO LEFT ARM BELOW ELBOW/ POSSIBLE INTERNAL BLEEDING IN THE ABDOMEN, AREA HARD AND TIGHT, SOME BLOOD IN URINE/ RIGHT HAND AND LEFT ARM SPLINTED, EXTERNAL BLEEDING CONTROLLED///

"What's happening now" is information on the vital signs: level of consciousness, eye reactions, pulse, blood pressure, respiration, skin condition and body temperature. Here is an example of what's happening now:
VITAL SIGNS/ LOC, ALERT/ EYES, E-R/ PULSE, 64 STEADY BUT WEAK/ B-P UNAVAILABLE, DISTAL PULSE PRESENT, CAP REFILL GOOD/ LUNGS, CLEAR AND EQUAL/ RESP, 30 AND SHALLOW/ SKIN PERSPIRATION, NORMAL; COLOR, NORMAL; TEMPERATURE, NORMAL/ BODY TEMPERATURE, 102.2///

Don't forget to have ready, the patient's name, the vessel name and the vessel owner's name and address. All of this extra information is necessary to expedite travel and personnel transfers and to inform family members.

The procedure and interpretation of the worksheet is as follows:

Numbers 1,2 and 3: Contained in the heading of the radio message.

Numbers 4 and 5: Self-explanatory.

Number 6: Very important, don't forget it.

Numbers 7-11: Can be estimated when there is a lack of good communication.

Numbers 12 and 13: Very critical, must be exact!

Number 14: Self-explanatory.

Number 15: Should be self-explanatory, however there are three things to be aware of: 1) the definition of a soft tissue injury; 2) trying to localize abdominal pain; and 3) the various types of bleeding. Soft tissue injuries are injuries related to the organs (ie: eyes, kidneys,testes, etc.). Whenever possible, locate the abdominal pain using the navel as the center point. This will give the doctors and corpsmen a better idea of which organs are traumatized.

Number 16: Fill this out carefully. Bleeding is not only an injury, but also an indicator of further problems and therefore must be observed in greater detail. Identify the type of bleeding as: profuse, shallow, pulsating, steady, and/or internal. Internal bleeding is difficult to identify but can be suspected, if an area such as the abdomen which is normally soft, is now hard and rigid; if that area or another is tender, swollen and/or has a bruised appearance to it. Look for the presence of blood in the eyes, ears, mouth, vomit and urine. Blood in the vomit needs specific identification as to its consistency and color (ie: is the blood fluid-like in appearance or does it appear clumped together like coffee grounds, is it dark red or bright red?). All of these observations are necessary to determine the nature and origin of the bleeding.

Numbers 17 and 18: Self-explanatory, basic observations that shouldn't need further elaboration.

Numbers 19 through 25: The vital signs, these are the indicators of the patient's present physiology. Essentially, to record the vital signs all you need other than your good judgment is a watch with a second hand and a flashlight. Number 19, a patient's Level Of Consciousness (LOC) is generally described in terms of Alert, Vocal, Pain or Unconscious. Determining a patient's LOC is standard. The method used to determine Alertness is "Time, Date, Place Orientation." A person is considered Alert if they can answer simple questions, "What is your name, where are we, what is today's date?" Do not ask questions like, "How many fingers do I have up?" Number skills involve an entirely different set of motor functions in the brain. A person who is incoherent, semi-conscious, or mumbling without direction is considered Vocal. When a patient is unconscious but responsive to Pain (a thin pinch on the bottom of the foot or under the armpit should do the trick) then this should be noted differently than the state of Unconscious, since it denotes a higher state of consciousness.

Number 20: You will need a flashlight for this one. Open both eyes, shine the light into one eye from the side of the face (not directly into the eye from the front of the face), look into the other eye. Both pupils should constrict equally, quickly, and simultaneously. If you have any doubts, repeat this procedure and compare results with those of people around you.

Number 21: Pulse is counted at beats per 30 seconds times 2, and rated per minute. The pulse is best taken at the wrist (follow the thumb down to the beating area...) or at the throat (off to either side of the windpipe, under the jaw). Again, if in doubt, compare. A description of the pulse should follow: strong, weak, bounding, etc.

Number 22: Without a blood pressure cuff, accurate B-P information is unavailable. However, other data you are collecting, the qualitative information on the pulse and skin conditions, will assist in a general qualitative assessment of the B-P. With that, there are two other direct indicators of B-P quality, they are: Distal Pulse; and Capillary Refill. Distal pulse is a pulse taken at a location distant from the heart. The two most common places are: 1) below and behind the ankle; and 2) top center of the foot. The presence and quality of this pulse is your data. (NOTE: these pulses are difficult to find on a healthy person and if you are unable to find them on your patient try to find them on yourself or on someone around you). Capillary refill is your other index of quality. Pinch a little bit of skin on the fore finger and toe. Note how quickly color is lost and then returns. That speed in which skin color returns is your indicator. Capillary refill is diminished by cold.

Number 23: Filling out the information on lungs and respirations should be self-explanatory. In the event that you don't have a stethoscope, then place your ear on the patient's chest, both sides, high and low. With a stethoscope, check the lungs high middle and low on the chest, and high and low on the back. Respirations should be timed and qualified the same way as the pulse is. One word of caution, don't let the patient know that you are monitoring their breath, they will breath differently.

Number 24: Skin perspiration, color and temperature is monitored by sight and touch. This should not present any problems, do not confuse skin temperature with body temperature.

Number 25: Place a thermometer in the patient's mouth or armpit and record your findings. To convert centigrade to fahrenheit use the equation given on the worksheet.

The flow chart which follows is simply an update of Numbers 19 through 25 every 15 or 30 minutes as necessary. For the first half hour it is good to monitor your patient every 10 minutes, every 15 minutes for the next hour and a half, and every half hour after that.

An example of your first radio message should look something like the following, with subsequent radio messages updating the patients condition as necessary.

NOJ DE vessel call sign MSG MDC
TO: COAST GUARD KODIAK
FROM: your name, vessel name, vessel permit number, present lat. and long., time & date

REQUEST MEDICAL ASSISTANCE/ CREWMAN JOE MISFORTUNATE/ 30 YR./MALE/ 145 LBS./ 5 FT. 7 IN./MEDIUM BUILD/NO ALLERGIES/NO MEDICATIONS///

INJURED BY A BROKEN CABLE ON JAN. 24 AT 0300 GMT/ PATIENT HAS SUSTAINED A HEAD INJURY/ COMPLAINS OF SEVERE PAIN IN THE UPPER LEFT QUADRANT OF ABDOMEN/ COMPOUND FRACTURE TO THE RIGHT HAND/ POSSIBLE FRACTURE TO THE LEFT ARM BELOW ELBOW/ POSSIBLE INTERNAL BLEEDING IN THE ABDOMEN, AREA HARD AND TIGHT, SOME BLOOD IN URINE/ RIGHT HAND AND LEFT ARM SPLINTED, EXTERNAL BLEEDING CONTROLLED///

VITAL SIGNS/ LOC, ALERT/ EYES, E-R/ PULSE 64 STEADY BUT WEAK/ B-P UNAVAILABLE, DISTAL PULSE PRESENT, CAPILLARY REFILL GOOD/ LUNGS CLEAR AND EQUAL/RESPIRATIONS 30 AND SHALLOW/ SKIN: PERSPIRATION, NORMAL; COLOR, NORMAL; TEMPERATURE, NORMAL/ BODY TEMPERATURE 102.2///

VESSEL OWNER, JOE SMITH, HOMER, (907) 123-4567///

PLEASE ADVISE BEST COURSE OF ACTION///

MDC RADIO WORKSHEET AND FLOW CHART

(1) VESSEL'S NAME & CALL SIGN ____________________

(2) VESSEL'S LAT. & LONG. ____________________ (3) TIME & DATE ____________________ (GMT)

(4) VESSEL AGENT'S U.S. NAME & ADDRESS ____________________

(5) VESSEL OWNER'S NAME & ADDRESS ____________________

(6) PATIENT'S NAME ____________________ (7) AGE __________ (8) SEX __________

(9) HT. ___ ' ___ " (10) WT. _____ # (11) BUILD __________ (12) ALLERGIES __________

(13) PRESENTLY ON MEDICATIONS Y/N __________ WHAT ____________________

(14) DATE, TIME & NATURE OF INJURY ____________________

(15) TYPE OF INJURIES OR ILLNESS

___ Airway
___ Cardiac Arrest
___ Head
___ Soft Tissue
___ Chest Pain
___ Abdominal Pain (general)
___ Upper Left Quadrant
___ Upper Right Quadrant
___ Lower Left Quadrant
___ Lower Right Quadrant
___ Fracture
___ Burn
___ Poisoning
___ Seizure
___ Psychiatric
___ Swelling
___ Bleeding
___ Alcohol On Breath
___ Other __________
____

(16) TYPE OF BLEEDING

___ Profuse
___ Shallow
___ Pulsating
___ Steady
___ Internal

Blood in the:

___ Eyes ___ Ears ___ Vomit
___ Nose ___ Mouth ___ Urine

(17) LOCATION OF INJURIES

___ Head/Face
___ Neck/Spine
___ Chest
___ Back
___ Upper Extremities
___ Abdomen
___ Pelvis
___ Lower Extremities

(18) TREATMENT

___ Cleared Airway
___ Oxygen
___ CPR
___ Controlled Bleeding
___ Wound Care
___ Splint
___ Neck/Spine Immobilized
___ Other __________

VITAL SIGNS

(19) LEVEL OF CONSCIOUSNESS

___ Alert
___ Vocal (but not alert)
___ Pain (responsive to)
___ Unconscious

(20) EYES

___ Pupils EQUAL & REACTIVE
___ UNEQUAL but reactive
___ Sluggish
___ Dialated (Enlarged)
___ Constricted (Small)
___ NON-REACTIVE

(21) PULSE (#'s & quality)

___ XX Beats per minute
___ Strong
___ Steady
___ Bounding
___ Weak
___ Thready
___ Irregular

(22) BLOOD PRESSURE (B-P)

#'s ___this/that___ Distal Pulse Present Y/N____

B-P Cuff Only Capillary Refill Quality ____ Good ____ Poor

____ Fair ____ Unavailable

(23) LUNGS & RESPIRATIONS

Lung sounds are: Respirations are:

___ Clear ___ Equal ___ XX per minute ___ Short

___ Congested ___ Unequal ___ Deep ___ Irregular

___ Raspy ___ Shallow ___ Strained

___ Weak

(24) SKIN (perspiration, color & temperature)

PERSPIRATION	COLOR	TEMPERATURE
___ Very Dry	___ Flushed	___ Hot
___ Normal	___ Normal	___ Normal
___ Sweating	___ Pale/Ashened	___ Cool/Cold
	___ Cyanotic (blue)	

(25) BODY TEMPERATURE

____

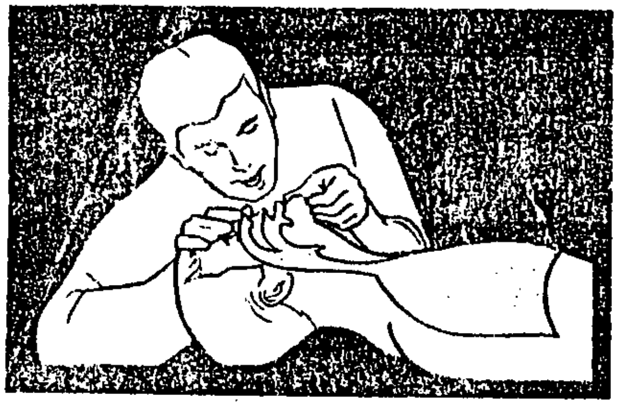
°F = °C x 1.8 + 32

	FLOW CHART				FLOW CHART		FLOW CHART	
TIME (GMT)	19 LOC	20 EYES	21 PULSE & qual	22 B/P	23 RESP (# & qual)	24 SKIN (p-c-t)	25 BODY TEMP	OTHER

Cardiopulmonary Resuscitation (CPR)

SHAKE OR SHOUT TO DETERMINE UNCONSCIOUSNESS

Airway



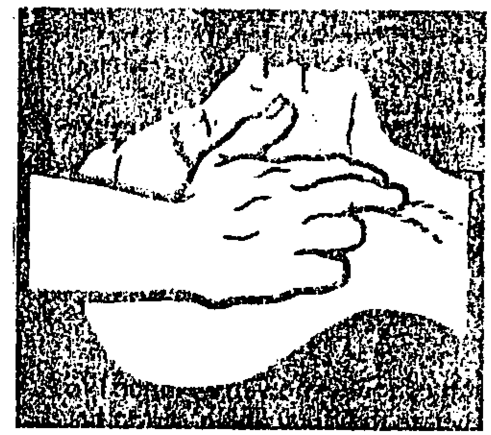
If no response:

TILT head and **LIFT** chin to clear airway of tongue.
LOOK, LISTEN, and **FEEL.**
Look to see if chest is rising and falling.
Listen and Feel at mouth with your ear to determine breathing.

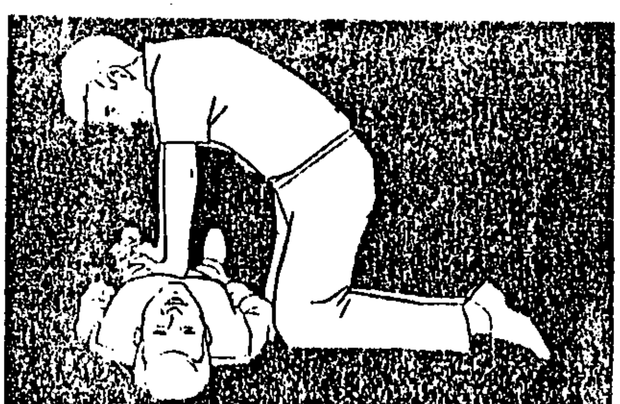
Breathing

If no breathing:

PINCH nostrils.
OPEN your mouth.
TAKE a deep breath.
SEAL patient's mouth with yours.
BLOW four quick, full breaths.
CHECK neck pulse on the side nearest you.
If pulse is present, continue breathing 12 times per minute (1 each 5 seconds).
Child/Infant rate - 20 times per minute (1 each 3 seconds)

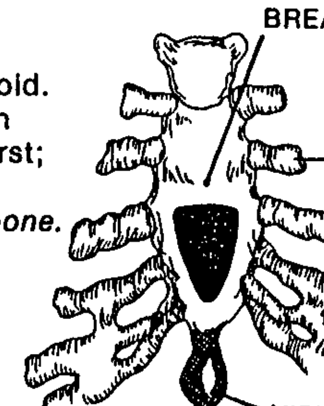


Circulation



If no pulse:

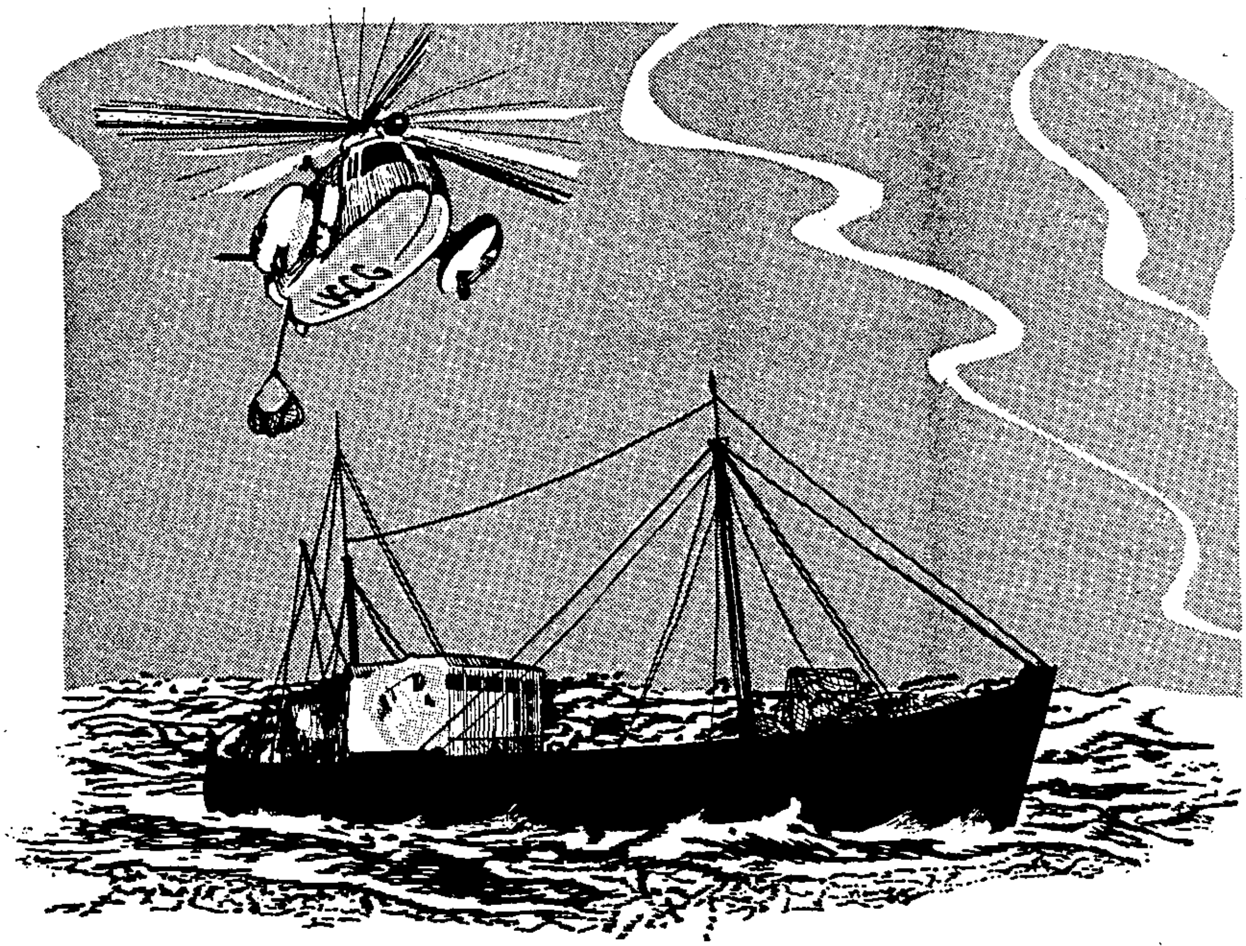
REMOVE obstructive clothing from chest.
FEEL for lower end of breastbone with 2 or 3 fingers on xiphoid.
PLACE heel of one hand just above fingers so that you are on lower one-half of breastbone, **PLACE** other hand on top of first;
KEEP arms straight.
Small child — use heel of one hand at midpoint of breastbone.
Infant — use 2 fingers at midpoint of breast bone.
COMPRESS breastbone straight down 1½ to 2 inches . . .
Child — ¾ to 1½ inches
Infant — ½ to ¾ inch
. . . at a **RATE** of 60-80 times per minute.
Child/Infant 80-100 times per minute.



ONE PERSON — give **2 BREATHS** after **15 CHEST COMPRESSIONS.** Chest compressions are done at a rate of 80 times per minute.

TWO PERSONS — Give **1 BREATH** during the upstroke of each **5th CHEST COMPRESSION.** Chest compressions [illegible] done at a rate of 60 times per minute.

Call for Help.



HELICOPTER EVACUATION

Helicopter evacuation is a hazardous operation and should only be attempted in a life or death situation. The following information provides the capabilities and requirements of the Coast Guard for evacuation at sea.

RANGE:
Helicopters can operate only 100 to 150 miles offshore weather conditions permitting.

REQUEST FOR ASSISTANCE:

▲ Determine patients condition and call the nearest Coast Guard station listed on NMFS Medical Assistance Placard.

▲ Give position, course, speed, weather conditions, type and characteristics of vessel.

▲ Conserve time by heading towards rendezvous point.

PREPARE FOR ARRIVAL:

▲ Stand by on 2182 kHz or specified alternate if not available.

▲ Display distress signal.

▲ Clear hoist area, preferably aft, with maximum horizontal clearance. If area is mid-ships lower antenna and secure running gear.

▲ At night, light area, DO NOT shine lights on helicopter.

HOISTING:

▲ Tag patient, indicate medication given and conditions doctor should be aware.

Keep vessel into wind or with wind about 20° on port bow at 10 to 15 knots.

▲ Hoist instructions will be given by pilot. Allow stretcher or basket to touch deck to discharge static electricity. Wear dry cotton or rubber gloves.

▲ If stretcher is needed it will be equipped with a hoisting bridle.

▲ Conditions permitting, have patient in life jacket, strapped in, face up, and hands clear of sides.

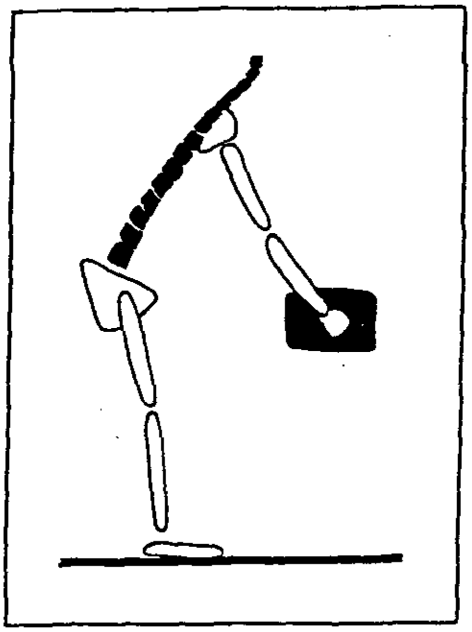
▲ DO NOT secure hoist cable to vessel or attempt to move stretcher without first unhooking cable.

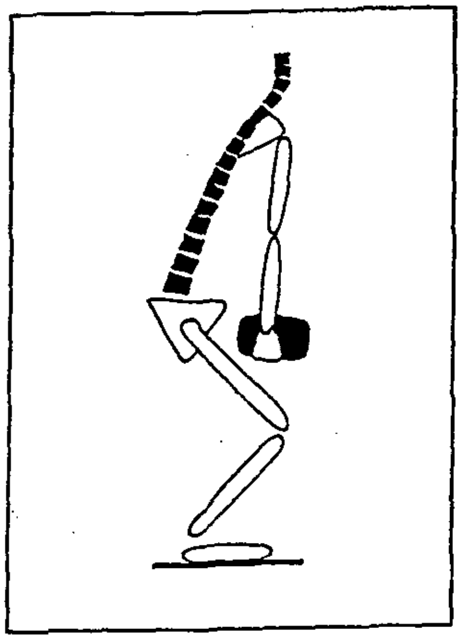
▲ With patient strapped in signal pilot to lower hoist. Steady stretcher.

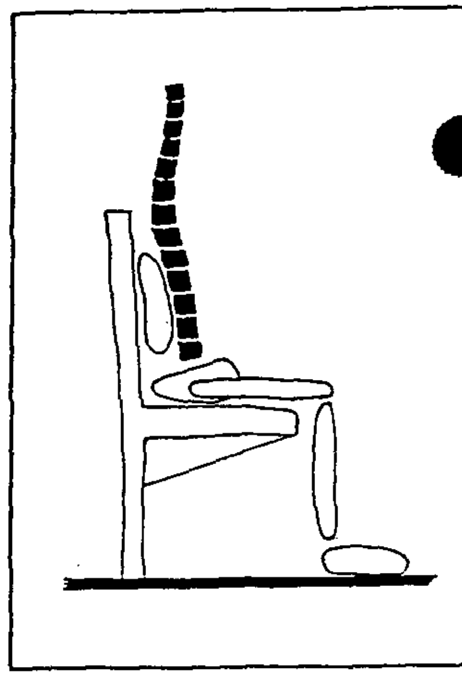
▲ Use trail line to steady stretcher. Make sure line is clear of rigging and crew.

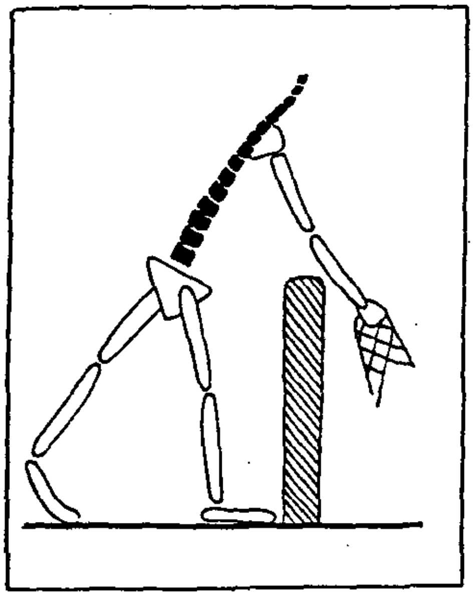
U.S. Department of Commerce, National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Fisheries Extention Service, Northeast Region, Gloucester, Massachusetts

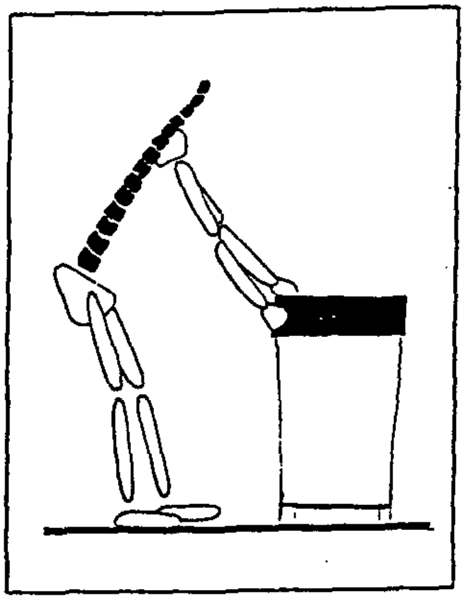
PREVENTING BACK INJURIES

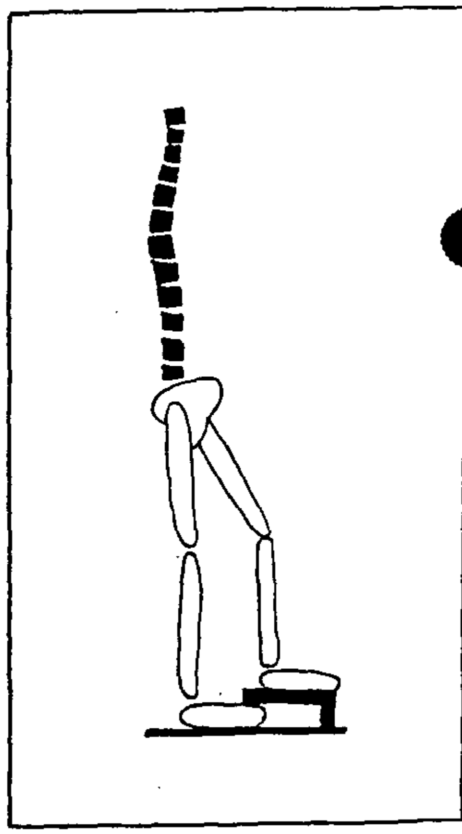












1. The stress on the back is increased when the work is too far away from the body.

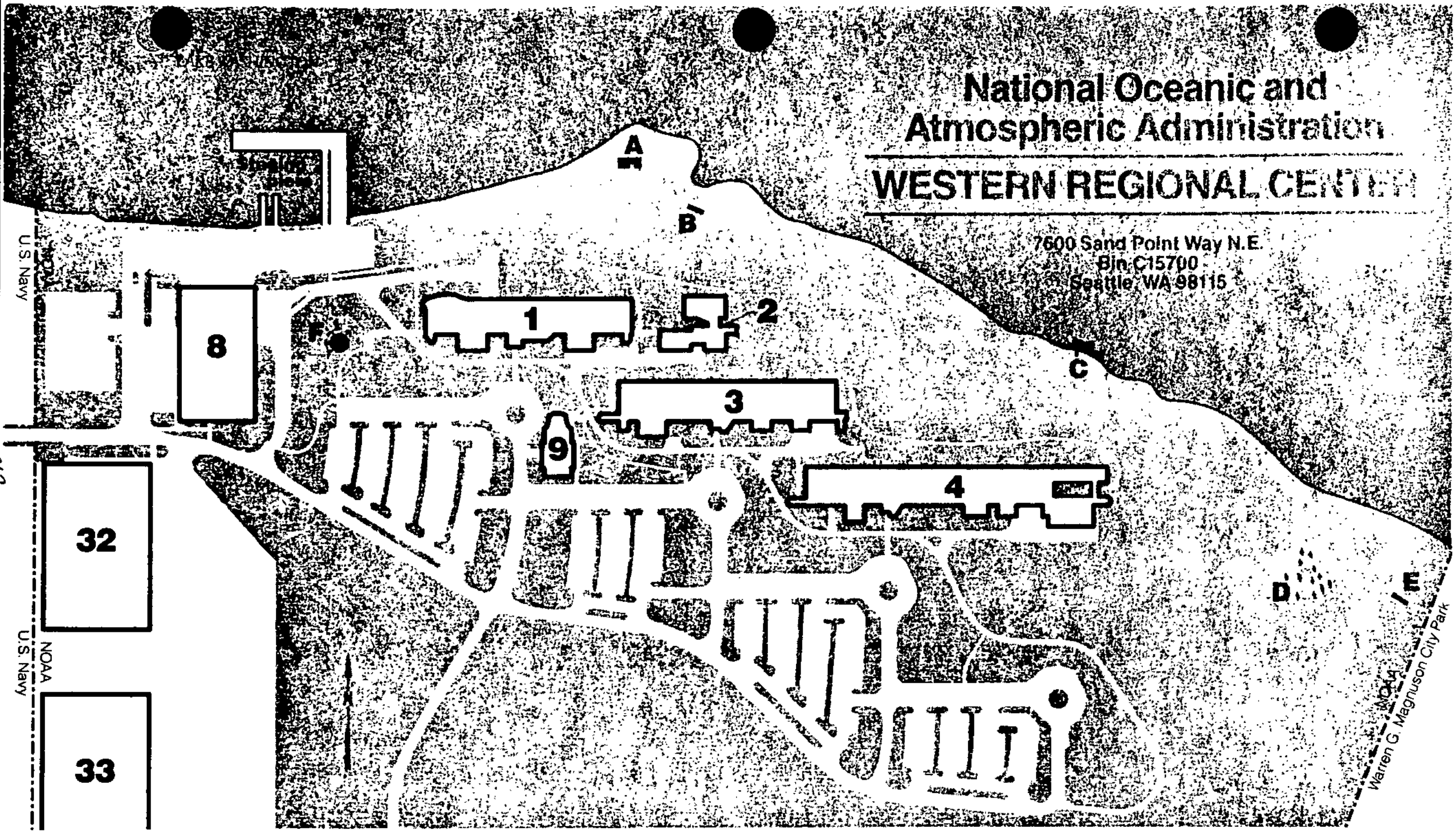
2. Taking the time to get a load directly in front of and close to you will reduce the chance of hurting your back. Always bend your knees and lift with a straight back.

3. If you have to sit for a long period, make sure the seat supports the lower back. If it doesn't, put a rolled-up sweater or towel behind your waist.

4. If you have to reach over something to do a job, put your weight on one leg and stretch the other leg straight out behind.

5. If you have to pull or push an object, take the extra step to get it straight in front of you.

6. If you must stand for a long period, put one foot up on a low ledge or rail.



For safety sake—use sidewalks and paths, and observe speed limits

Building 32
NMFS Resource Assessment and Conservation Engineering

Building 33
Warehouse

Building 8
Pacific Tide Party, PMC.
Western Regional Diving Facility.
Shops.
Warehouse.

Building 1
NW Regional Office, NMFS.
NW Regional Counsel.
NW Ocean Service Center.
Public Affairs.
Office for Civil Rights.
National Weather Service Forecast Office.
Western Administrative Support Center.

Building 2
Cafeteria.
Health care facility.

Building 3
Pacific Marine Environmental Laboratory.
Nautical Chart Branch, PMC.
Library & Information Services Division.
Ocean Assessments Division, NOS.

Building 4
Northwest & Alaska Fisheries Center, NMFS

Building 9
Auditorium and seminar rooms

Artworks
- **A** Viewpoint
- **B** NOAA Bridge
- **C** Berth Haven
- **D** A Sound Garden
- **E** NOAA Bridge
- **F** Knoll for NOAA

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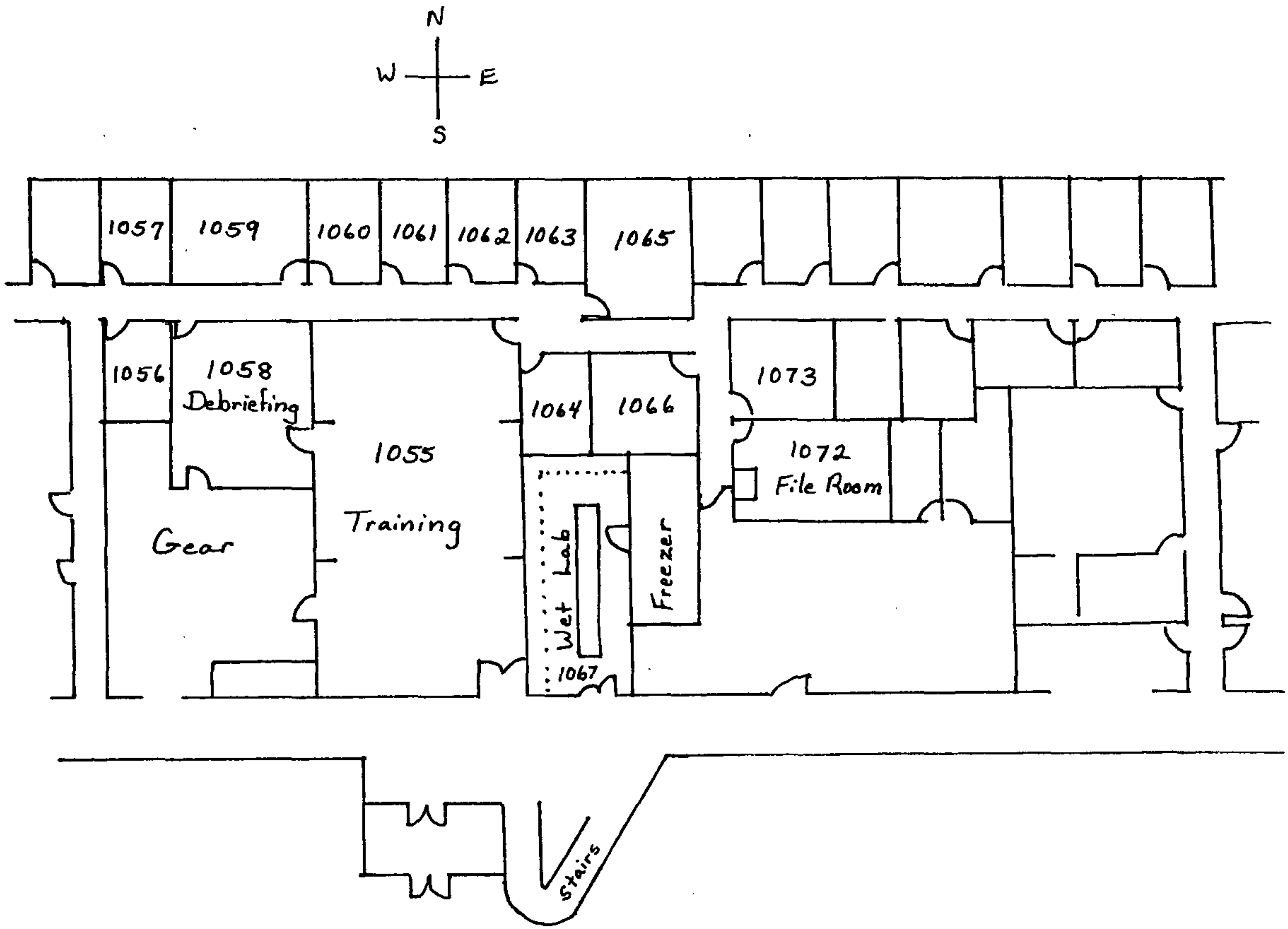

Observer Program Facilities, Building 4 ground floor

Glossary

Aft - towards the stern of a vessel

Benthic - living in direct relation with the bottom

Bin - a large compartment built into a ship for holding fish. Also called live tank, refridgerated seawater tank (RSW tank), lobby.

Bosun - chief of the deck crew

Bottom - 1) ocean floor, or 2) fishing depth, or 3) a ship hull. Which meaning to apply must be taken from context.

Breech - a behavioral characteristic of some marine mammals such as humpback whales, where they rise vertically out of the water, and then with most of their body above the surface, they fall to their back or side.

Chaffing gear - protective carpeting (or strands of nylon forming a carpet pile) on the outer, underside of the trawl net to keep it from catching and ripping on obstacles on the bottom.

Codend - the end "bag" of a trawl net where the majority of the fish are collected and held.

Combing - a low partition that separates the trawl deck from the side pockets.

Compliance - in accordance with the fishing regulations.

Directed fishing - targeting or fishing for a species quota.

Disembark - to get off a vessel.

EEZ - Exclusive Economic Zone. This is the term for the 200 mile jurisdiction zone formerly called the FCZ.

Embarkation - to board a vessel.

Flatfish - fish which are laterally compressed and who orient themselves in the water with their lateral surfaces or sides towards the surface and bottom.

Forecastle - the forward part of a ship where sailor's quarters are located.

Forward - towards the bow of a vessel.

Freezer trawler - a large, catcher/processor vessel whose products are whole fish or parts of fish frozen into blocks.

Fresh weight - the weight of the whole fish (or animal) as it was when alive. Also called round weight, whole weight.

FUS - Fully Utilized Species. FUS is a designation given to bycatch species whose quota has been taken but the fishery was permitted to continue. Fully Utilized Species must be discarded from the catch like prohibited species.

Gallows - the large upright framework that spans the trawl deck; used for suspending or supporting.

Gangen - the leader line, about a meter in length, tied into a longline with a hook tied to it's free end.

Gantry - see gallows.

Gas bladder - a sac filled with air or similar gases in the body cavity. May or may not be attached to the throat by a duct.

Gill rakers - bony toothlike structures on the anterior edges of the gill arches. For protection or straining out food.

Gunnel or Gunwale - the upper edge of the side of a boat.

Hatch - an opening in a deck or bulkhead of a ship.

Haul - a catch of fish from one tow of a net

Joint Venture - a cooperative fishing/processing effort between vessels of different nationalities.

Lee, Leeward - the side protected from the wind,opposite the "windward" side

Master - fishing master and/or captain.

Mothership - an at-sea, floatin processing vessel whose fish come from catcher boats deliveries.

Otterboard - Another name for a trawl door; Refer to net diagram.

Otter trawl - The type of net gear used on stern trawlers; Refer to net diagram.

Peritoneum - the lining of the gut cavity

Pod - a group of marine mammals traveling in association

Pond - see "bin", the Koreans use this term for a fish bin.

Porthole - a window in the hull or the outside bulkhead of a ship.

Radio Call Sign - four letters and/or numbers which are an international identifier of a vessel. The International Radio Call Sign (IRCS) is painted in large letters on the side of each vessel and on the deck of the flying bridge.

Rostrum - a pointed, calcareous, median extension on the anterior end of crab carapaces.

Regenerated scale - a fish scale which has grown in to replace one that was lost. Regenerated scales are useless for aging the fish.

Roundfish - fish that orient themselves in the water with the dorsal side towards the surface and ventral side towards the bottom.

Round weight - the weight of the whole fish (or animal) as it was when alive, synonymous with fresh weight.

Stern trawler - any of various sized fishing vessels which trawl a conical shaped mesh net through the water, haul it up a ramp through the stern of the ship, empty, and process the catch to make a wholesale fish product. These vessels may fish for a month or more at sea without support.

Surimi - minced fish meat paste usually produced from pollock.

Trawl - the towing of a mesh net behind a vessel to catch fish.

Vessel Code - A code used only by the observer program to identify a ship.

Wing - the sides off a trawl net near the opening, usually with larger mesh than the rest off the net.

Zulu - another name for GMT.

A History of Marine Fishery Management

William F. Royce

I. INTRODUCTION*

Since 1950, the production trends of the marine fisheries of the world have disproved the age-old concept that the living resources of the sea are inexhaustible. Alarmed by the trends and by other uses of the oceans, the coastal nations of the world responded with a new "Law of the Sea" (LOS) in the 1970s, which included the principle of conserving the living resources. They have agreed to discover through scientific investigation the sustainable limit of production for each resource and manage the fisheries to that end. But the marine fishers of most of the world reject the national laws that are intended to conserve the fisheries. They continue their traditional livelihoods with the equally age-old concept that the fish** of the sea are owned by no one until they are caught. Those with primitive fishing gear in the lesser-developed countries plan their fishing on the basis of a local consensus about who fishes where and how. Those with the means to invest in better equipment compete more vigorously and constantly seek new and more distant resources. They stoutly support their freedom to fish.

To fishery scientists, fishery management is the application of much of their science by governments. But fisheries have been governed for millenia, and fishery management is only part of their governance, which should be examined as a whole if we are to understand the present predicament of the market fisheries. A broad approach is urgent at this time as coastal countries expect economic development of their fisheries under the new LOS.

Marine fishing technology in the more developed countries began to improve dramatically after introduction of steam-powered trawlers in the 1880s. Total annual production of the world gradually increased to a level of about 20 million tons in the 1930s. Then, between the end of World War II and the mid-1980s, the application of more technology by large efficient businesses probably brought world fish production from the conventional stocks close to the maximum sustainable productivity of about 100 million tons. Equipment is now available for modern market fishing making it easy for catches to exceed 100 tons/fisher/year, and it is being adopted rapidly in many coastal countries. Therefore, less than one million fishers might catch the limit when several tens of millions need to fish for traditional livelihoods, and many millions more want to fish for fun.

The new LOS, the need to achieve conservation of the stocks, and the rapid changes in the world fish business require changes in governance for which nations are ill-prepared. This has resulted in many failures of marine fishery management even in the countries best prepared to marshall the necessary scientific and organizational skills.

This history is an attempt to summarize the interplay of tradition, laws of fishing, governance, and science in order to understand their limitations and how to achieve conservation of the stocks under the new regime.

II. MANAGEMENT BY TRADITION — UNTIL 1950

According to archeological evidence, from perhaps 5000 B.C. the ancient Sumerians regarded the fish in the waters near the Persian Gulf as a divine gift. The fishers, who were free citizens and outnumbered herdsmen, worked for the temples (the government). They traded their catches for other foods and supplies; they paid their taxes with them. The fishers specialized in various kinds of fishing — in fresh- and saltwaters with gear suited to the several kinds of fish. When the supply of wild fish became inadequate due to season or depletion, they farmed fish in ponds or pens.[2]

Their fish were resources of the local communities; this was frequently a major reason for the location of the community. The fishing was part of community traditions and was sometimes associated with religious and seasonal celebrations. Similar fishing persists to the present time among subsistence fishers in remote areas who operate hand-held gear or simple traps without use of boats.

Traditional hunting and gathering people have apparently managed their fisheries by restricting access to the stocks as they have to their agricultural lands and livestock. Recent fishery management strategies by such people have been classified as inadvertent when related to water tenure of families or villages, leasing by village leaders, rituals, taboos, and magic. Intentional strategies have been gear restrictions, closed seasons, and simple steps toward fish farming.[3] Such territorial use rights (TURFS) are still pervasive in more modern but still small-scale fisheries, especially with respect to sedentary shellfish or seaweeds, raft culture, fish pens and cages, fish traps or set nets, beach seine sites, or fish aggregation devices.[4]

When such fishers have operated on large rivers, lakes, or along the sea coast, they have needed boats and have tended

* This report relies partly on material by this author (see Reference 1).

** Fish, fishing, and fisheries are used in their collective sense to include all animals, especially finfish, mollusks, and crustaceans, as well as the plants harvested by the fisheries.

W. F. Royce obtained his B.S. and Ph.D. from Cornell University, Ithaca, New York. Dr. Royce is Professor Emeritus at the School of Fisheries, University of Washington in Seattle.

to go beyond the traditional bounds of their own communities and intercepted stocks migrating through waters of other communities. The consequences of this were recognized during the time of the Roman Empire when feudal laws based on ownership of land were obviously incompatible with ownership of the sea or things in it. The land extended to low-tide level; beyond that it was decided that the fish could be owned only when possessed.[5]

Although many Asian and African countries recognize various kinds of fishing rights, the western nations have sustained the Roman law for their marine fisheries. Fishing the sea has been vital to small coastal communities, but much less important to coastal cities and inland communities. Fishing was, in fact, the magnet for much of the early exploration of North America by Europeans and provided an essential food supply for the first settlers. They brought with them a basic principle of English law, "the public common of piscary", which prevails to the present time.[6]

But the boundary between the area of national authority and the sea remained in dispute until this century, especially because of fishing. The shallow waters, the bays, and the mouths of rivers contain sedentary species of shellfish. High-seas species migrate through those waters to feed or spawn. Any fishery problems have to be decided in relation to the multiple interests of the coastal state in shipping, communications, mining, security, and others.

Near the end of the 18th century it was suggested that the limit of national authority be decided on the basis of military equipment — the distance a cannon could shoot. This idea prevailed for most of the 19th century, but it was largely supplanted by the 3-mi limit after the "Convention of the Hague" in 1883 which was supported by most European nations.[7]

Coastal nations have long managed fisheries within their authority by restricting the fishing to citizens, by assisting their fishers as needed with subsidies, by providing special services such as medical treatment, by exacting duties on competitive imports, and by encouraging fishers to husband the resources through protection of young or breeding individuals.

Coastal fishing communities apparently have almost always required extra attention from their national governments. Many of them rely almost solely on fishing, and because the inshore stocks are so easily depleted, many of them remain very poor. When foreigners intrude on the operation of the fishers, issues of national security may be quickly added to a need to protect such people.

Attempts at such protection have led to conflicts, such as the series of British-Dutch wars in the late 17th century. Fishing at that time was an important part of the English economy and the Scots, especially, were concerned about overfishing off their coast. They blamed some of their difficulties on Dutch and Danish fishers who pursued the stocks of herring off the British coasts and competed in the same European markets. England attempted to extend its authority far beyond the cannon-shot distance and raised the issue of "the honor of the flag". After three wars, the fishery issues remained unresolved.[8]

An example of national attention to the pervasive problems of marine fishers arose in the 1780s that required action by Thomas Jefferson, then the U.S. Secretary of State.[9] The major fisheries out of Massachusetts ports at that time were for cod to be salted and for whales to be reduced to oil, with about 4000 fishers engaged in each (a total more than twice as many as the regular fishers in the 1980 fisheries of Massachusetts). The businesses had suffered during the Revolutionary War and had subsequently encountered heavy duties on their products in Europe, while European fishers were being given generous bounties for fishing. In addition, the Massachusetts fishers had lost the Canadian and Mediterranean fish markets. The cod vessels faced intense competition on the Northwest Atlantic banks where some 665 of them met a similar number of English and French vessels (the Spanish and Portuguese had withdrawn long before).

By the 1780s, the North Atlantic whale fishing was also intensely competitive. The whale fisheries had been started by Europeans in the 15th century; the Americans entered in the early 18th century, and by Jefferson's time, they had spread from the edge of Arctic ice to the south Atlantic. England and France, alarmed by the U.S. competition, invited U.S. fishers to emigrate to their American colonies or to Europe and offered them generous bounties on whale oil if they did so. They also prohibited importation of foreign oil.

Jefferson noted that the fisheries of all these countries had become so poor in themselves that they could not survive without support from national treasuries. He asked the First Congress of the U.S. at its third session in 1791 to find relief for Massachusetts fishers comparable to the subsidies given to European fishers.

Even at the end of the 18th century, the distant-water fishers competed so vigorously for the stocks they knew, and with the equipment they had, that they were in economic trouble. The troubles continued with increased fishing and better knowledge of the resources. Sailing vessels increased rapidly in numbers and competence and, in the late 19th century, began to be replaced by steam. The French built the first steam fishing vessel about 1865. It was followed in the 1880s by many more, including a steam vessel of 1400 tons equipped with refrigerating chambers, and all of the fishing countries of western Europe turned to steam power. This made possible the otter trawl, the impact of which was immediately obvious to traditional fishers who protested vigorously against its use in the 1880s.[10] But steam trawling prevailed; it required hundreds of new vessels, which could keep better schedules and land fish fresh or frozen instead of salted.

A. Concepts of Conservation

Out of the concepts of husbandry, came the early approaches to fish conservation in the more developed countries; some from England were probably typical.[11] Salmon fishing was regulated in 1278 to allow adults to pass up rivers. An act of 1558 was intended to prevent taking of spawn and young fish that were being fed to swine. An act of 1714 required a minimum mesh size in fishing nets intended for all fish except small species such as pilchards, sprats, and sand eels. A convention between Britain and France in 1843 included mesh regulations for many nets.

But in the absence of proof that such measures helped, the ancient principle prevailed that fish in the waters were there to be taken by those first on the grounds and those most skilled. Many of the acts were repealed. The scientist, T. H. Huxley, expressed his views in 1883 at the "Great International Fisheries Exhibition" in London:[12]

> Every legislative restriction means the creation of a new offence. In the case of fishery, it means that a simple man of the people, earning a scanty livelihood by hard toil, shall be liable to fine or imprisonment for doing that which he and his fathers before him have, up to that time, been free to do.
>
> If the general interest clearly requires that this burden should be put upon the fishermen — well and good. But if it does not — if indeed, there is any doubt about the matter — I think that the man who has made the unnecessary law deserves a heavier punishment than the man who breaks it.

At about the same time, the abuse of natural resources for mere economic or political gain, and the desecration of our surroundings, became of much greater concern. In the U.S., where more of the environment remained in a natural state than in Europe, a widespread concern about environmental abuses coalesced in a movement to conserve all natural resources. In England, a flood of natural history books appeared, and natural history societies proliferated.[13] These concerns were about the forests, soils, air, water, birds, and wild mammals, as well as about waste and pollution, all of which were much more important to the ordinary citizen than the fish in the sea.

Before the end of the 19th century, however, regulation of fishing for conservation in the freshwaters of the U.S. became common. Under the Constitution, the states had responsibility for the freshwater regions and coastal fisheries out to 3 mi. Beginning about midcentury, many states restricted the catch and the ingenuity of the fishers, and when that was insufficient, prohibited the sale of many species. Thus, the states gradually established the priority of recreational fishing in most freshwaters of the nation. They also established widespread public support for the concept of fishery conservation based on free access but with limits on more efficient gear. Similar action was taken in Canada and most of Western Europe.

Conservation became a creed in the U.S. after it was given special support during the presidency of Theodore Roosevelt between 1901 and 1909. He provided a moral leadership that embraced a vigorous outdoor life and the importance of using natural resources for the benefit of all the people. These included scenic areas and large parts of the forested land, as well as minerals, waterways, wildlife, fish, soil, and other resources. The national attention quickly led to strengthened conservation commissions in most of the states.[14]

Roosevelt's moral leadership assisted the conservation movement, but it failed to generate support from politicians who recognized local economic interests. Even after a much publicized "Governors' Conference on Conservation" in 1908, the President never gained support from Congress, which refused to appropriate any sums whatsoever from conservation meetings, committees, or reports.[15]

Much more progress in the political support for conservation was developed by President Franklin D. Roosevelt in the 1930s. His administration, faced with an economic depression, successfully promoted soil conservation and the great water projects of the Tennessee Valley Authority and the Columbia River. This clearly identified conservation with long-term economic benefits. He also started an outdoor work program for a Civilian Conservation Corps and strengthened the federal conservation programs of the Army Corps of Engineers, the Bureau of Reclamation, the Forest Service, and the Fish and Wildlife Service.[16]

National action with respect to most of the resources resulted in a strong planning role for the federal and state governments and a control over resource use that was blended with local economic interests, especially in the use of land, water, minerals, and forests. A reasonable political balance has since been maintained in approaches to the dilemmas of consumption vs. future use, public vs. private ownership, and national vs. local interests. The marine fisheries, however, are an exception.

Although conservation has been applied primarily to use of natural resources, it has embraced much broader concepts than public usage. It also has been a sociopolitical phenomenon used with respect to elimination of child labor, elimination of waste, improvement of morals, conservation of manhood, and conservation of the Anglo-Saxon race. President Taft is reported to have said that many people are in favor of conservation, no matter what it means. Many of its aspects clearly belong in the realm of political economy.[17]

B. Beginnings of Fishery Science

Before quantitative fishery science could take shape, the ocean and its life had to be described. The 19th century was an era of naturalists who found support for great expeditions, much of it from the Royal Society of England and from the British Navy which carried naturalists on its ships. Charles Darwin's voyage on the *Beagle* in the 1830s was followed by voyages of naturalists such as Alexander von Humboldt and Alfred Russell Wallace, who laid foundations for subsequent advances in biology, biogeography, and ecology. Among the most famous expeditions was that aboard the British *Challenger* from 1872 to 1876.

Huxley (see Section II.A) was one of these naturalists and a champion of Darwin. During the 1860s, he had visited the Isle of Skye as a member of a Royal Commission inquiring into the fisheries. He was impressed with the poverty among the fishers and with a regulation, apparently promoted by overstocked fish merchants, that prohibited catching a herring during the summer months — their period of abundance — which proscribed heavy fines for any violators. Huxley's efforts resulted in repeal of many fishing regulations in 1868, but by the 1880s steam trawling was doubling the power of the fishers. When he then asserted that the stocks were inexhaustible and fishing regulations unnecessary, the practical fishers, who strongly disagreed with him, insulted him as a theoretical authority and demanded an international conference on the destruction of immature fish — which did not meet until 1937.[18]

During the last 3 decades of the 19th century, research came to be focused much more directly on the fisheries. The U.S. Congress, alarmed by the continuing problems of the fisheries, authorized creation of the U.S. Commission of Fish and Fisheries in 1871 and appointed as commissioner, Spencer F. Baird, a zealous zoologist and naturalist. Among Baird's early actions was the establishment of a marine biological center at Woods Hole, Mass., which he visited almost every summer until his death there in 1887. Permanent facilities were completed in the mid-1880s, including a large laboratory building and wharves adequate for the major new commission vessels which based there occasionally. These were the steamer *Fish Hawk* of 484 tons used as a floating fish hatchery, and the laboratory vessel *Albatross* of 1034 tons used worldwide for biological and oceanographic investigations. Baird made special efforts to encourage private marine scientists, including foreigners, to use the facilities.[19]

Baird's misson was to determine whether the number of food fishes had declined and, if so, to investigate the causes of the decline along with possible government measures to correct the problems. He and his colleagues approached the studies as naturalists, describing the organisms, the ocean conditions, and the fishing. The description of the fishing included a voluminous report, *Fisheries and Fishing Industry of the United States*, prepared and edited by G. Brown Goode. The research would now be described as basic, i.e., intended to gain new knowledge in the fields of marine biology and oceanography.

Similar support for basic marine sciences grew out of the fishery controversies in Europe during the same period. A North Sea Convention of 1882 had produced some cooperation with respect to gear conflicts in the fishing but had provided no basis for agreeing on regulations to improve the stocks. Cooperation in science was essential, and several leading ocean scientists from Great Britain and Scandinavian countries endorsed scientific inquiry as a rational basis for exploiting the sea. They gained the support of several national governments and formed the International Council for the Exploration of the Sea (ICES) in 1902.[20]

Canada also established a small national marine biological station in the Gulf of St. Lawrence in 1898, which was followed by the Go Home Bay station in Georgian Bay in 1901, and permanent stations in New Brunswick and British Columbia in 1908. The Biological Board of Canada was established in 1912.[21]

The marine fishery laboratories preceded the freshwater laboratories by several decades. Few of the latter were organized until after the 1920s when limnological and aquatic biological organizations gradually incorporated fishery studies. A few such laboratories began to emphasize fish culture, especially the problems of nutrition and disease. Fishery technological laboratories concerned with improvement of fish processing and fish products came still later, mostly after the 1930s.

The early approaches to fishery research in both Europe and North America left a broad gulf between the researchers and the fishery managers. The scientific problems were so complex that they had to be approached by basic scientists if progress in understanding was to be made. Applied research was almost lacking, and some basic scientists such as Huxley foolishly condemned the regulations. The managers faced recurring challenges to make decisions about the fisheries with help from few facts. The basic researchers had time and isolation; the managers had deadlines for political decisions.

Although the basic research in marine biology and oceanography progressed remarkably before 1950, little had direct application to marine fishery regulation. The regulations in place were concerned predominantly with public health such as avoidance of oysters from polluted waters, with reduction of conflict between types of gear including prohibition of efficient gear, with protection of spawning fish or young fish, and with avoidance of obvious waste such as gluts in the markets.

The virtual absence of marine fishery regulation for conservation contrasted with its prevalence in the freshwaters of the western countries. There the fishing, in all except the largest waters, was reserved for recreational or subsistence use and not for sale. The regulations were strongly supported by the public as a whole because the universal right of piscary was preserved, few inland people were dependent on catching fish for a living, and unfair ingenuity in fishing was banned. This, to most people, was what fish conservation was all about.

C. Fish Culture

Freshwater fish have been successfully farmed for millenia. A treatise on the culture of Chinese carps was published in 473 B.C., and their polyculture in combination with terrestrial farming has been practiced for centuries.[22] Culture of salmonids in northern Europe was practiced extensively in the 19th century (Livingston Stone gives a bibliography).[23]

Such successes encouraged coastal communities of Europe and North America to attempt a wide variety of husbandry efforts to enhance the fisheries in saltwaters. Although it seemed sensible to shelter eggs, fry, and young fish, it was difficult: fin fish of major importance usually came inshore only briefly during migrations and customarily spawned in the open sea. Attempts at "repopulation" were commonplace through reserves protected from fishing or coastal ponds constructed by dikes and excavated marshes.[24] The efforts included attempts to transplant live fish, either juveniles or spawners, from areas of abundance to areas of former abundance. Spawn was taken form adult fish, the eggs hatched, and the fry stocked without feeding — as on the steamer *Fish Hawk* of the U.S. Fish Commission.

In spite of scepticism on the part of scientists about the efficacy of hatching and rearing saltwater species, the practice had strong political support in Europe and North America until about the 1940s. In New England, cod, haddock, flounder, and lobster eggs were hatched by the billions and planted as unfed larvae in coastal waters from stations at Boothbay Harbor, Maine, and Woods Hole, Mass. In addition, the *Fish Hawk* was used to hatch shad, striped bass, and other species until it ceased operations in about 1925. The large numbers of marine species provided political leverage in the annual reports of the U.S. Division of Fish Culture which commonly began with a statement about "the billions of fish planted in the waters of the U.S."

The challenges of fish culture attracted much scientific attention in Europe and North America after the middle of the 19th century.[23,25,26] The American Fish Culturist's Association was formed in 1870 and named Baird and Samuel Wilmot (who became the Superindendent of Fish Breeding in Canada in 1876) as honorary members. The association broadened its interests in 1884 when it changed its name to The American Fisheries Society.[27] This organization has grown over the past 116 years to become the preeminent professional fishery science organization in the world.

D. Acceptance of Population Theory

During the 1920s and 1930s, the evidence tying the amount of fishing off northern Europe to the decline in fish stocks became more and more conclusive — and thereby accepted by more and more fishers. Practical people began to be convinced by the evidence of a temporary stock recovery during World War I; by the demonstration of the effects of trawl mesh size on catch; by the fact that even though fishing power increased, profits were down; and by scientists, using knowledge of biology and oceanography, explaining more of the practical understandings.

A critical aspect was application of population theories to the accumulated data on changes in stock abundance and the age of fish comprising the stocks. Methods of aging fish from scales or bones had been discovered in the middle of the 18th century by Hederström of Sweden, who argued that they provided a way of identifying the young fish that should be spared from capture.[28] The methods apparently were little used for that purpose until the early 20th century after they were combined by senior scientists in both Europe and the U.S. with the fundamental theoretical work on fish populations by the Russian scientist, F. I. Baranov.[29] During the 1930s, J. Hjort of Norway, M. Graham and E.S. Russell of England, and W. F. Thompson and H. Bell of the U.S., among others, sharpened the mathematics and began to apply it in their research.[18,30]

Little more progress was made until after World War II, when major advances were made on both sides of the Atlantic. W. E. Ricker brought together much of his work on freshwater fish populations in 1948.[31] R. J. H. Beverton and S. J. Holt, working under the direction of M. Graham in England, applied the theory of fishing to the marine fisheries in ways that took into account fishing mortality, natural mortality, number of recruits, age of recruitment, age of capture, fishable life span, and the basic law of growth.[32,33]

But application of the science remained far from being accepted by most fishers. The first international marine fishery conservation agreement to use population theory was the *Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean including the Bering Sea* between Canada and the U.S.

The halibut fishery had developed to a peak production of about 30,000 tons annually from 1912 to 1915 and then declined despite increased fishing and discovery of new grounds.

Negotiations started at a conference in 1918 but were inconclusive, in part because of political opposition in the Washington State legislature.[34] The first convention, signed in 1924, established an independent research staff, but the commission had limited authority. Confidence in the research grew, and a new convention in 1930 allowed the commission to license vessels, close fishing seasons and areas, and specify gear. A 1937 convention gave added authority to control halibut caught incidentally in other fisheries and to schedule departure of the vessels. Still another revision in 1953 finally gave the commission reasonably complete authority over conservation measures.[35] The long period after recognition of the fishery problems before full authority was given to the Halibut Commission indicates the political difficulties.

This convention was notable in other respects. The situation in both political and resource aspects was relatively simple. The fishers on both sides of the border were relatively well known to each other and much of the Canadian market was in the U.S. The vessels and gear were almost identical in both countries. The commission started working with people and vessels dedicated almost solely to halibut fishing. The Pacific halibut are a long-lived species, remaining in the fishery for 10 years or more, therefore, trends in the composition and abundance of stocks are fairly predictable. The research staff, from the beginning, worked closely with the industry, communicated effectively with them, and became relatively independent of politics in both countries.

Still major changes occurred among the halibut fishers. The commission was never allowed to restrict entry. The fishing effort was controlled for conservation, but halibut fishing changed from a full-time livelihood spanning most of the good-weather months in the North Pacific to less than 1 week (in the 1980s) in some areas as the number of vessels increased from a few hundred to several thousand. The fishers have coped by changing gear and participating in several other fisheries.

Two other examples of international conservation conventions in fisheries also occurred in the North Pacific, but these did not depend fundamentally on acceptance of population theories. The fur-seal populations that went ashore to breed on the Russian Commander Islands and the U.S. Pribilof Islands were endangered by pelagic sealing conducted by several countries. In a convention of 1911 based on common-sense husbandry, Canada, Japan, Russia, and the U.S. agreed to prohibit pelagic sealing, to harvest the skins only on land, and to divide the take among them.[35]

A second example arose from problems with the salmon runs to the Fraser River in southern British Columbia, which were shared with the U.S. because part of the salmon migrated through U.S. waters enroute to the river. The runs were seriously reduced after a rock slide partially blocked the river in 1913. A Sockeye Salmon Fisheries Convention was negotiated in 1930 to correct the damage, but it was not ratified until 1937 because of political opposition in the U.S. After long investigation, action to alleviate the blockage was agreed upon in 1944, but complete restoration also required control of fishing on the runs of both sockeye and pink salmon. Sockeye regulation started in 1945, but pink salmon regulation required further agreement that was not reached until 1956.[35]

In retrospect, it is likely that both of the bilateral conventions between Canada and the U.S. reached a stage of effective fishery management for conservation because the fishing practices in the two countries were almost the same and were well known to the fishers in both. The problem was clearly defined; the solution apparently fair and beneficial to both. The independent staffs of both commissions were relatively apolitical, and they communicated effectively with the fishers through the commissions, which always included balanced representation from government and the fishing businesses. Furthermore, both commissions were strongly supported by the press.

Agreement on multilateral conventions among the European countries was much more difficult. They had coordinated excellent basic research programs through ICES, but faced more complex fisheries and had had a long history of bitter disputes. The fishery issues were obscured by issues of the boundaries of the territorial sea and inland waters, and by policing procedures. Conventions which prohibited trawling in the Baltic Sea, and the Straits and Sound between Denmark, Norway, and Sweden, were reached in 1929 and 1932, but effective conservation agreements were not reached. Conferences were held in 1937, 1943, and 1946 without much progress on resolving the increasingly difficult situation. Eventually, a framework was agreed upon at a 1959 conference which established the Northeast Atlantic Fisheries Commission. This depended on ICES for scientific studies but had made little progress toward effective conservation by 1965.[36]

III. EMERGENCE OF MARINE FISHERY CONSERVATION — 1950 TO 1980

Immediately after cessation of hostilities in World War II, the fishing skills of Japan led to a major decision to advance conservation of the marine fisheries of the world. The Japanese had demonstrated their fishing prowess with expeditions to fish for salmon, crab, and bottom-fish off Alaska in the late 1930s. At that time, the value of the U.S. catch as landed in Alaska was more than 10% of the total value of U.S. landings and was exceeded only by the landings in California and Massachusetts.

The west coast fishing industries of both Canada and the U.S. were determined that Japanese fishing near North America should not again threaten their businesses. With vigorous political support from the western U.S. and Alaska in 1956, President Truman proclaimed, "In view of the pressing need for conservation and protection of fishery resources, the Government of the United States regards it as proper to establish conservation zones in those areas of the high seas contiguous to the coasts of the United States wherein fishing activities have been or in the future may be developed and maintained on a substantial scale." The Proclamation made clear that this did not affect rights of navigation and that conservation measures would be negotiable with other countries. Furthermore, the Proclamation did not extend the territorial sea of the U.S., or claim exclusive authority over fishing on any high-seas areas.[37]

This established a principle of marine fishery conservation but the Department of State was not prepared to implement it until after more political pressure from a Pacific Fisheries Conference in the Pacific Northwest and after the appointment in July 1948 of a noted fishery scientist, Dr. W. M. Chapman, as a special advisor for fisheries to the Undersecretary of State. International reaction had come quickly because extension of conservation authority was not clearly separated from extension of sovereignty. Several nations, led by Peru in August 1947, claimed conservation authority or sovereignty over adjacent waters, usually a 200-mi zone.[37]

Chapman immediately began to develop a consensus in support of high-seas conservation among the diverse interests of the U.S. fishing industry. The industry in all parts of the country became involved. The first agreement was the International Convention of the Northwest Atlantic Fisheries of 1949, then the InterAmerican Tropical Tuna Convention of 1950, the International North Pacific Fisheries Convention of 1953, and the Great Lakes Fisheries Convention of 1954.

Only a few other international fishery conservation agreements were reached during the next 20 years. Some were confrontational (as were the ones between Japan and the U.S.S.R.) and more concerned with access to fishing areas than with any scientifically based conservation measures. The proportion of the marine fisheries brought under the science-based conservation agreements of those years was probably less than 10% of the total of the world.

Soon after these agreements were reached in America, the Food and Agriculture Organization (FAO) of the U.N. also began to play a major role in marine fishery conservation through its fishery division. It had assembled some of the best fishery scientists of the world and had begun to publish extensively on the fishery problems. It had also begun annual collection of catch statistics worldwide starting with the year 1948 (plus a single pre-war year, 1938) and gradually became the foremost fishery consultancy in the world. It organized and held in Rome the 1955 International Technical Conference on the Conservation of the Living Resources of the Sea.

The Rome Conference provided scientific background for the first major progress toward a new LOS. It was followed by the Geneva Conference in 1958 which resulted in a Convention on the Territorial Sea and the Contiguous Zone, a Convention on the High Seas, a Convention on Fishing and Conservation of the Living Resources of the High Seas, and a Convention on the Continental Shelf. Many nations ratified the Conventions, but many of those ratifying expressed reservations, and many major fishing nations did not ratify the Convention on Fishing and Conservation.

Second and third conferences were held, each with more than one meeting, until at a meeting in Caracas in 1974, a consensus was reached that resulted in action. The key was agreement on a 200-mi Extended Economic Zone (EEZ) for all coastal countries (EEZs include about 95% of the well-known stocks of fish in the oceans) and definition of boundaries between nations within that zone. Within that zone, the coastal nations' rights and obligations for conservation of the living resources were detailed.[38]

The rights included sovereignty for the purposes of exploring, exploiting, conserving, and managing the natural resources, including the fish. But exercise of the rights over the fish was restrained by obligations for research to determine the status of the stocks and the effects of fishing on them relative to the yield. Another obligation was to allow other nations access to the stocks if the coastal nation did not have the capacity to harvest the allowable catch.

The requirement of management for conservation was detailed to allow the coastal government to license fishers, vessels, and gear; collect statistics on catches; regulate seasons, areas, gear, size, and species; require research programs and report scientific data; allow all or part of foreign catches to be landed in the coastal nation; and place observers on board foreign vessels. Foreign nations also were obligated to assist less developed nations in technology and research.

Coastal nations were also required to collaborate with neighbors on conservation of stocks that migrated across the extended boundaries — as most stocks do. The coastal nation was not given such broad authority over the highly migratory species, such as tunas and marlins, but was required to collaborate with any country harvesting them outside the 200-mi EEZ. Anadromous stocks, also, were given a special status, with the primary interest in them and responsibility for them belonging to the coastal country in which they originated.[38]

Many coastal states quickly claimed extended authority over the fisheries consistent with the new LOS. The U.S. passed the Fisheries Conservation and Management Act in 1976; Canada passed a law almost simultaneously; both became effective in 1977. Other countries, heavily dependent on distant water fisheries such as Japan and the U.S.S.R., resisted for a few years but eventually claimed 200-mi EEZs. The convention was finally signed by most countries in 1982. (The U.S. did not sign because of objections to the provisions for marine minerals, but it has followed the provisions relating to the fisheries.)

A. Burgeoning Technology and Social Stress

During the 3 decades of tortuous progress toward a new LOS, the marine fisheries experienced a revolution in the technology of fishing and processing which led to major changes in marketing and the management of fish businesses. This was accompanied by major socioeconomic changes that seemed neither likely to have been anticipated by the negotiators, who focused on conservation, nor to have been dealt with satisfactorily by most fishing nations.

Fortunately, the Fishery Division of the FAO began operations just in time to chronicle (in the Yearbooks of *Fishery Statistics*) the greatest changes in the world fisheries that have ever taken place. The total world production increased from 21 million tons in 1950, to 40 million tons in 1960, to 66 million tons in 1970, and to 72 million tons in 1980. This rate of increase became possible because of progress in fishing vessel design, in electronic fish-finding equipment, in larger and stronger nets constructed of light-weight and nonrotting artificial fibers, in fish freezing equipment — afloat and ashore, in product development, and in better quality control.

Major changes appear in the statistics based on methods of processing. Fresh-fish sales declined from about one half of the catch in 1950 to about 20% in 1980. Fish cured by drying, salting, pickling, smoking, or fermenting declined in sales from about one fourth of the catch in 1950 to about 15% in 1980. On the other hand, fish-freezing, which had tended to be used in the 1940s as a way of saving fish about to spoil, was improved immensely, and the proportion of fish frozen increased from about 5% in 1950 to about 22% in 1980. Fish reduced to fish meal and oil amounted to less than 10% of the catch in 1950 but increased to about 30% in 1980, in spite of the collapse of the Peruvian anchovy fishery in the early 1970s and the rapid increases in reduction of waste from freezing and canning plants.

The predicament of the fisheries of the world in the early 1980s has been aptly described as a mutation.[39] The average rate of increase in catches, which had been above 6% annually until the early 1970s, had dropped to little more than 1%. The distant water fleets, most of which had fished within the EEZs of foreign countries, had been sharply restrained. Most governments were concerned primarily with fostering large-scale fisheries and were giving little attention to conservation or to the limitations of the resources.

The socioeconomic impacts of these changes have not been chronicled as a whole, but circumstantial evidence from many countries indicates that they must have been even greater than the technological changes.

The production level per fisher in traditional subsistence fisheries, where one person catches fish for family food and barter, has been estimated roughly at 1 ton/fisher/year. Small motor vessels, 10 m long, or group seining of migratory fish can raise that level to 10 tons/fisher/year. Modern offshore trawl operations, which land the fish in major ports after 1- to 2-week trips, can produce more than 100 tons/fisher/year — indeed, they probably must do so to remain competitive. Operations in which catches of schooling species can be delivered almost daily to shore plants or to processing vessels can raise the level to 1000 tons/fisher/year or more.

When vessels and facilities to serve them are built (as in international aid programs), the immediate expectations of the owners are increased returns on investment and increased earnings from a day's work. If the resources are already heavily exploited, the greater returns are short-lived. The fishers with the increased investments have trouble paying off their loans, and the fishers who have not invested face greater competition for the fish as well as the markets. The latter are frequently residents of poor coastal communities, and they have neither the competence nor the opportunity for alternative employment. Thus, improvements in fishing equipment by even a small proportion of the fishers can quickly mean production of much more fish or, if the resource is already heavily fished, socioeconomic troubles for entire communities.

Even if the fishery resources can fully support the new equipment, the increased production becomes economical only when handled by well-managed modern businesses that can maintain quality products in competitive and expanding markets. The traditional local markets for fresh fish depended on consumer confidence in the local operations; the modern national or foreign fish markets depend on quality products designed for and accepted by consumers who have no knowledge of the operations. The scope of change in markets is partially indicated by the trends in international trade reported by the FAO. Such trade increased from about 20% of the catches in 1950 to about 33% in 1980, an increase in volume of about six times.

Some of this trade has been developed by very large transnational corporations; the largest in the world are probably those in Japan, which catches more fish than any other country in the world. Three of these companies were included in 1986 in the Fortune 500 list of the largest corporations in the world outside the U.S.[40] The largest, Taiyo Fisheries, No. 104, had gross sales in its fiscal year ending in January 1985 of $4.7 billion U.S. — almost exactly double the total value of the commercial catch as landed in the U.S. in 1984. The gross sales of such companies include processed fishery products and a small proportion of nonfish products, so they are not directly comparable to the U.S. sale of raw fish at dockside, but they indicate the economic strength of the Japanese fisheries.

Such changes in technology and economic strength of fish businesses mean increased competition with small-scale fish businesses in both quality and price. The effects are being felt in small coastal fishing communities everywhere.

B. Promises—Promises

National governments and international organizations, which had worked so long to reach a consensus on the LOS in the mid-1970s, held out promises of major benefits from national control of the EEZs. Many of these were based on a projection of the overall trends in world catches, which had increased at a rate of about 6% annually from 1950 to 1970 — much more than the rate of population increase. This had happened with virtually no management for conservation, which the new LOS made possible. Just as conservation of water and soil in the U.S. in the 1930s had been politically supported with the expectation of economic benefits, so was fish conservation in the EEZ. The foreign exploiters of the stocks could be controlled, or even forbidden to fish, with expectations of their profits being transferred to the coastal fisheries.

The FAO launched an "EEZ Programme" in 1979. In a promotional brochure, it discussed "a new era in world fisheries" for the 1980s. It asserted "A revolution has occurred in the potential of fisheries to contribute to a new international order." Although cautioning that a plateau in production was approaching, it suggested that developing countries faced a new challenge in the 1980s that would provide them with more food, new employment opportunities, and a greater share in world trade. It also suggested that aid for fisheries would need to be increased tenfold by the end of the century.[41]

Many countries raised the hopes of their fishers. The U.S., for example, described fishery development as "the wave of the future". It contracted for a detailed review of fishery development opportunities and a development plan.[42,43] The opportunities identified included harvest of eight large fishery resources either underdeveloped or fished mostly by foreign fleets which could now be controlled. Developing them to full potential was predicted to create 43,000 jobs and improve the U.S. trade balance by over $1.5 billion annually. Congress passed an American Fisheries Promotion Act of 1980 which provided for increased grants to industry, low-cost loans for fishing vessels, improved intelligence about foreign fisheries, and increased development funds for the National Oceanic and Atmospheric Administration.[44]

IV. FAILURES OF MANAGEMENT

A judgment of failure arose primarily from the widespread disappointment and even the rebellion of fishers under the new regime. After the first euphoria, the realities were discovered. Few of the marine fish resources can sustain additional production, and these are usually either less desirable for the markets or prohibitively expensive to fish. The troubles are almost worldwide, occurring in both developed and developing countries, and they are increasing. The causes are unquestionably related to overoptimism and overinvestment in the fisheries generated by the implications of economic benefits and security from conservation made possible under the new LOS, but another fundamental obstacle is widespread adherence to the ancient right of piscary.

A synopsis of the experiences of 26 fishing countries reported at the FAO Conference on Fisheries Management and Development in 1984 summarized the prevailing difficulties.[45] The conclusions were that coastal states, having larger resources than their local fisheries could harvest, had benefited from reduction of competition for the resources and from increased catches. Distant-water fishing nations had suffered dislocation of their fleets and markets in spite of joint ventures with the coastal nations. The fisheries in all nations had suffered to at least some extent from the rapidly changing economic conditions of the world. But acute social distress had occurred wherever small- and large-scale fisheries had competed for limited inshore resources.

A. Shortcomings of the Sciences

Despite continuing large investments in fishery science by most developed countries, the inability of fishery scientists to forecast the yield of many stocks leaves most fishers sceptical of the science. The simplicity and reliability of biological sciences in support of the conservation of northeast Pacific halibut and Fraser River salmon is lacking for most of the much more complex oceanic stocks. A common difficulty for the scientists is the need to assume equilibrium in the population equations when equilibrium does not happen in nature.

The major stocks of herring-like fishes such as the Peruvian anchovy, the Japanese sardine, the Atlanto-Scandian herring, and the California pilchard have had multimillion ton changes in abundance, the causes of which are not clear. Heavy fishing may have been a major cause, but stocks have declined and recovered independently of the fishing. The abundance of some of these stocks has fluctuated by factors of more than 100:1. Such fluctuations are greater than those observed in most bottomfish stocks, although some of those may fluctuate by factors of more than 10:1.[46,47]

Achieving long-term predictability of the abundance of most oceanic stocks requires a much greater investment in scientific investigation and monitoring, not only of the fish stocks themselves, but also of factors in the ocean environment that influence them. The difficulties are awesome because many major fishery species have temporary pelagic lives as eggs and larvae when they may drift hundreds of kilometers. Some such species produce millions of eggs per female, but the mortality rates of tiny delicate larvae may exceed 10%/day. The causes of such mortality include abiotic factors such as adverse temperature or drift, and biotic factors such as abundance of food or predators. The consequences of such complexity include the absence of reasonable predictability of the relationship between parent stock and abundance of offspring. Furthermore, changes in food, environment, predators, or fishing practices can trigger genetically based behavioral changes that are even less predictable.

The investment in oceanic fishery research, which almost surely will not be economically sound at the beginning, should include basic oceanographic studies as well as additional basic biological studies of the populations. Then, after discovery of the controlling factors, monitoring for the purpose of prediction will be essential.

Lacking such basic knowledge, prediction can only be short-term based on pragmatic studies of the history of each age group as it has been fished. This depends in turn on accurate information on catches by the fishery according to species, size, area, time, and gear. Also, surveys by research vessels can help determine abundance of sizes not taken by the fishery, or the species occurring in areas and times not fished.

Given good basic research and accurate data on the activities of the fisheries, the fishery scientist is still faced with complex applied research challenges. The reliability of predictions and the correctness of management measures must be acceptable to the fishers. Such information should be considered as a refinement of, and an addition to, similar information that is vital to the success of every fishing captain. They are accustomed to making decisions about where and how to fish, on each trip and during each season, according to their experience. They are usually optimistic, and when they feel that government regulation is based on information inconsistent with theirs, they may not accept it. The fishery scientist will never have all of the facts on which to base management decisions, even when oceanographic, biological, economic, and social research results are available. Sensitive applied research, which blends all of the facts and value judgments, is a critical part of the decision process.

B. Shortcomings of the Policies

The marine fishery management policies under the new LOS are clearly to be decided by national governments, either singly for stocks substantially under one jurisdiction or by international agreement for stocks shared with others.

Independent management of most stocks is possible for the U.S. which has long coastal EEZs and extensive continental shelves where many stocks spend their entire lives. Some stocks are, however, shared with Canada, Mexico, or other countries and require international agreements for their management.

In its Fishery Conservation and Management Act of 1976 (FCMA), the U.S. tied its management program almost completely to conservation. The national standards (Section 301) stated essentially that "conservation and management measures" shall prevent overfishing, be based on the best scientific information available, be effective by managing stocks as units, be fair and equitable, promote efficiency in use of the resources, be flexible as required by variation in the resources, and minimize costs. The act established eight Regional Fishery Management Councils, including state officials but with voting rights dominated by federal employees or appointees by the Secretary of Commerce. The principal function of the councils is to develop fishery management plans, which are subject to approval of the Secretary of Commerce. Provisions are also made for control of foreign fishing in the U.S. EEZ through licensing of individual operations and with approval of the Secretary of State.[48]

A much broader effort at fishery management was necessary off northwest Europe, where scarcely any finfish stocks remain within the EEZ of a single country, where international competition for almost all stocks has been intense, and where confidence in fishery conservation has been much weaker. The nations had had broad scientific collaboration through their participation in ICES, and they had begun a limited effort at fishery conservation and management under the Northeast Atlantic Fisheries Commission (NEAFC) after its formation in 1964. They had also included fishery products within the scope of the Common Agricultural Policy (CAP) of the European Economic Community (EEC) which had been formed when the Treaty of Rome became effective in 1958. The CAP policy started with emphasis on the socioeconomic needs of farmers and the farm business; the Common Fisheries Policy (CFP) followed with similar concern for fishers and the fishing industry when it was eventually elaborated and adopted in 1983. This left the implication that the EEC was the forum for talk about the market for fishery products and the structure of the fishing industry and that the NEAFC was the forum for talk about conservation and management.[49]

The basic framework regulation of the CFP set forth some ten objectives related to ensuring the protection of fishing grounds, the conservation of the biological resources of the sea, and their balanced exploitation on a lasting basis and in appropriate economic and social conditions. A more specific regulation set forth several more objectives associated with a balance between EEC technical measures and additional national measures. Another regulation dealt with the fixing of total allowable catches and allocating them fairly among member states. A regulation on enforcement dealt with rules for catch reports, rules for enforcement, and rules for verification.

In addition to such regulations dealing primarily with conservation, other regulations dealt with marketing and the structure of the fishing industry. The marketing objectives included rationality, quality standards, floor prices, and arrangements for trade in fishery products. The structural objectives dealt with equal access to fishing grounds, rational development of the industry, and authorization of financial aid.

These were not the end of the complexities because of other problems related to EEC countries fishing outside EEC waters, non-EEC countries fishing within EEC waters, and new EEC members with large fishing capacity.

Most EEC regulations do not need national approval — they have the same effect as a national law. Therefore, the lobbying efforts of fish businesses have had to shift from national capitals to Brussels, the EEC center. Such authority has required a new bureaucracy in Brussels — numbering about 125 in 1985, with essentially no reduction in the bureaucracy of member states which must prepare position papers for the negotiations in Brussels.[49]

The common fishery problems of the U.S. and the EEC are rooted in the continuing socioeconomic-sociopolitical conflicts that must be addressed on an evolving basis. A review by the recently retired director of the Office of Fisheries Management of the National Marine Fisheries Service points to the continuing conflict of local and national interests.[50] The counterpart in the EEC is even more complex in the conflict of local, national, and EEC interests. All of the contestants turn to manipulation of the political systems for solution of problems related to equity, fairness, and efficiency which can never be solved by management solely for conservation — nor can they be dealt with by national or international fishery organizations without an admixture of nonfishery problems above the local level.

Such sociopolitical problems differ little in principle from those of a large fishery on the river Niger in Mali.[51] During the 19th century before the colonial administration, the village chiefs organized and managed the fisheries, primarily for the benefit of local residents. The colonial administration, starting in 1893, attempted to maintain the traditional local concepts of fishing rights and applied special taxes to strangers. After independence, the waters were made the exclusive property of the Nation, which passed a basic fishery management law in 1963.

The fishery, which produced about 100,000 tons annually around 1960, became a source of great conflict. The number of fishers increased, total production fell (partly because of drought), new gear was judged to be destructive, efficient nomadic fishers competed with traditional local fishers who felt they had historic rights, and the government was unable to control the fishing.

Similar problems occur in the fishery management programs of most of the coastal countries. For example, the small countries along the northwest coast of Africa lack the ability to control foreign fleets, to enforce regulations at national level, and to exercise the authority necessary for implementing management measures elaborated at a regional level among countries. The countries stress their exclusive prerogatives for action, but their basic problem is lack of suitable national institutions that can carry out their responsibilities.[52]

C. Rebellion of the Fishers

Passage of laws and development of administrative procedures do not automatically ensure that fishery management will proceed accordingly. The fishers must accept the new arrangements as being in their interest. After all, most of them fishing outside 3 mi have been operating as their ancestors did — without government restraints. And most of them still operate in an area where they are not observed except occasionally by their fellow fishers, and where government patrol is difficult and expensive.

Most marine fishers in the U.S. supported the concept of an EEZ and the passage of the FCMA as a means of getting rid of foreign fleets on "their" grounds — not as an instrument for regulating their own fishing. Acceptance of the new regime has been especially slow in New England.

After passage of the FCMA, and with some government financial assistance, the New England fleets approximately doubled in their fishing capability within a few years. This was the wave of the future. But New England fishing grounds had been heavily fished just before the FCMA and major stocks were in trouble. The important haddock stock, which had collapsed in the mid-1960s under U.S.S.R. pulse fishing, had not recovered. The FCMA required management for optimum yield, a concept not clearly definable and not acceptable to most fishers. The new regulations were changed 20-odd times in about 14 months.

The result of the trials and errors was rejection by the fishers. They misreported catch data, deliberately violated regulations, and high-graded their catches by dumping thousands of tons of illegal fish in order to land a few valuable sizes or species.[53] Many fishers felt that the regulations favored large corporations and preferred no regulation at all. Those who accepted regulations had almost no agreement on the kind. The closest they came to consensus was 97% opposition to the federal system of quotas or total allowable catches (TACs).[54] The problems have continued; scientists familiar with the procedures in the major ports believe that false landing records and cash payments to captains are commonplace.

Even if the catch statistics are accurate, the scientific difficulties of predicting the abundance of recruits from the abundance of spawners add further difficulties to planning by the fishers. In spite of this, the Atlantic editor of the leading U.S. fishery trade journal recently pointed out that the regulations scorned by the fishers could be no better than the catch statistics they submitted.[55]

Although the extent of similar problems in European ports is unknown, the TACs there create a strong incentive to falsify catch statistics. Entire fishing fleets apparently seek uncontrolled ways to land fish and national management agencies appear to falsely report catches at the TAC level. Scientists trying to analyze the status of the stocks have sought independent data by private arrangements with trusted captains and relied more on extensive surveys by research vessels.[56]

D. Changing Objectives of Conservation

Conservation long has been based on a mixture of idealism and practicality, of short- and long-range objectives, of values and scientific information. Fishery conservation has had all of these aspects, but the dominant one for marine fisheries after acceptance of the early treaties was based on the concept of maximum or optimum sustainable yield. The overall conservation movement, however, has developed a much broader concept of the conservation of nature.

Scepticism about the impact of science on nature was fostered by the publication in 1962 of Rachel Carson's book, *Silent Spring*.[57] Carson, who had been employed by the U.S. Fish and Wildlife Service, had written about the sea and turned her attention to the impact of pesticides on the environment in *Silent Spring*. Pesticides had been developed by chemists and biologists and their use came to be seen as abuse of the environment by scientists for commercial purposes. The ultimate effects on the environment of pesticide use and many other human activities could not be satisfactorily predicted, and some chemicals had effects in quantities that scarcely could be detected.

The increasing concern about environmental problems led to numerous federal actions having impact on the aquatic environment including the series of Endangered Species Acts of 1966, 1969, and 1973; the Clear Water Restoration Act of 1966; and the Federal Water Pollution Control Act of 1974. Although these and numerous acts relating to air, wildlife, migratory birds, and forests were directed predominantly at freshwater and terrestrial problems, they established the preeminence of federal action for most conservation programs.

An overriding federal action was the National Environmental Policy Act of 1969 (NEPA),[58] This required that all Federal Agencies shall:

> "(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment;"
>
> "(B) identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations;"

The act required preparation of a detailed environmental impact statement (EIS) for all federal actions, including fishery regulation under the FCMA. Thus, it explicitly required consideration of "amenities and values" in addition to the scientific information available (including the social sciences). Similar acts were adopted by other countries as its provisions were promoted vigorously by the U.N. Environmental Programme.

Another major U.S. environmental law that impacted directly on many fisheries was the Marine Mammal Protection Act of 1972 as amended in acts of 1974 and 1976. This established almost complete protection for all marine mammals, including whales, porpoises, sea lions, and seals regardless of their impact on fish populations or their interference with fishing. These acts even went beyond prohibition of commercial or sport killing within U.S. waters to prohibition of importing any marine mammal products and prohibition of importing fish products from countries that continued to harvest marine mammals.

As environmental laws proliferated, private organizations became much more militant. The practice of environmental law in the U.S. became a growth industry. The Sierra Club approached environmental problems as a political action. In its *Handbook for Environmental Activists*, it includes statements about the need to restructure society in a conservation revolution, and the need to deal with systems of suppression and oppression.[59]

Quite a different interpretation of the conservation movement appears in the writings of a few who relate it to religion. Some of these have argued that science and technology had its roots in the Christian thinking of medieval Europe. They blame the damage to environment on an expression of Judeo-Christian anthropocentrism and suggest rethinking the Christian tradition perhaps by accepting Hindu, Zen Buddhist, and Taoist ideas of compassion for all living things.[60]

V. SUCCESSES OF MANAGEMENT

The degree of success of government fishery management must be judged by the perceptions of its equity and efficiency as well as by maintenance of the yield of the resources. The ideal is, of course, minimum government intervention and minimum government costs while achieving conservation of the resources.

A. Local Traditions

People have always believed strongly in special rights to their nearby environment. They can communicate with their neighbors, reach understandings, seek immediate solutions, and act jointly against transgressors. Coastal communities, dependent on fishing, probably expanded long ago to a size supported by the stocks within reach, and when other fishers intrude they must expect rejection.

A successful example of relatively long-term local management appears in the U.S. lobster fisheries of Maine. The state sets size limits on the lobsters, which were accepted as wise by the fishers after a long dispute, but the local fishers agree among themselves on where and how many traps will be set. They also establish their own fishing seasons, usually when other employment is not available. The communities defend their fishing areas against outsiders by warnings, followed by destruction of pots or boats if necessary.

Such local arrangements achieve conservation of the resource, and they are regarded as equitable by the local people. State fishery administrators accept the local arrangements, and expect that state efforts to change them would require costly enforcement and probably would be ineffective.[61]

Another example of closed access fisheries occurs in Turkey, where small-scale fishers in some areas belong to cooperatives or similar local institutions. Such institutions have a monopoly on the fishing in a defined coastal area; they control the type of gear and who may fish. They provide a mechanism for achieving consensus among the fishers and conservation of their resource base.[62]

Such arrangements are essentially self-enforcing. The fishers have confidence in them because they have control and know what colleagues are doing. But their effectiveness depends on a continuing involvement of the same people with the same resources. They do not work for fishers who engage in "pulse" fishing — repeatedly decimating one resource and moving to another.

B. The Japanese Experience

Japan, as a nation heavily dependent on the sea, has managed the largest fisheries of any nation in the world during most of the years of this century. Its fleets began to fish in distant waters during the 1930s and have fished in all of the oceans, but it has always relied heavily on its nearby stocks, which currently supply about three fourths of its production. In addition to its production, Japan has been a leading importer of fish products. Its annual per capita consumption (about 125 kg, round weight) is the largest of any major nation in the world.

With such dependence on fish for food and fisheries for employment, its fishery management has received close attention for centuries from the government at all levels.

Japanese fishery management, unlike that of the European and North American nations, always has been based on a system of property rights in fishing or fish farming. The rights have changed gradually from those that existed during the feudal governments of the early 19th century. Beginning in the early 20th century, fishing rights in waters adjacent to villages came to be viewed, and were supported legally, as the property of local fishers' cooperative associations.[63]

After World War II, the fishery laws were reviewed to prevent absentee ownership. The cooperative movement was strengthened, especially to manage the fisheries of designated coastal areas. A licensing system was established for the management of designated fisheries, which are those for migratory species in waters beyond the coastal areas. The licenses are granted by prefectural governments for nearby fishing and by the national government for distant waters. Most licenses are held by individuals or corporations, a few by cooperatives.

The fishery cooperative system has gained major political strength through federations at national and prefectural levels. The local cooperatives, the Gyokyo, totaled 3072 with more than half a million members in early 1985. They operate various services for their members and market at wholesale level much of the fish sold in Japan. Their total annual business activity has recently been equivalent to about $700 million U.S.[64]

A major strength of the cooperatives, however, arises from their federations, the Kengyoren at prefectural level and the Zengyoren at national level. These have active fishery policy departments and participate in prefectural and national negotiations.

The complex fishery management system has survived major technical, resource, and social changes in the fisheries during recent decades. Employment in the small-scale fisheries, which comprises about 75% of the fishery workers in Japan, decreased about 40% from the 1950s through the 1970s. During this same period, the inshore boats changed from almost no motorization to almost all with motors. The rate of increase in household income of the small-scale fishers has been better than that of urban workers, a little less than that of farmers.

Some stocks have declined greatly in abundance to cause more than a 1-million ton reduction in annual catches, and some fleets have been reduced by more than one half. More than 1500 licenses were canceled during the 1970s. Many fishery operations that retained licenses faced increased license fees to help those whose licenses had been canceled.

Perhaps most significantly, during these major changes, the system has managed the social stresses when the largest fishing companies in the world exist alongside flourishing small-scale fisheries that together use virtually every modern kind of fishing gear. Management measures have included many regulations for conservation, and judging by the sustained productivity of the stocks in the Japanese EEZ, the overall conservation of the stocks has been at least as effective as it has under the new regimes in North America and northwest Europe.

C. Limiting the Right of Piscary

The economic irrationality that results from the continued exercise of the common right of piscary by market fishers has been recognized by leading fishery scientists for at least half a century. Michael Graham of England, who reviewed the European experiences after the 1880s, observed that "fisheries become unprofitable, sooner or later, as the fishing effort increases; and stay unprofitable, so long as the fishing effort is free, and urged on by competition." He called it the "Great Law of Fishing".[18]

In the U.S., within a few months after the formation in May 1942 of the Atlantic States Marine Fisheries Commission (the first such interstate commission authorized by congress to deal with marine fishery conservation), a meeting was held to discuss the "seriousness of overcompetition in the fishing industry in normal times."[65] The economic theory was elaborated in 1954,[66] and this was followed in 1962 by a landmark economic study of the Pacific halibut fishery.[67] In the latter, it was pointed out that the economic potential made possible by the halibut conservation program could be realized only by a reduction in the number of fishing units and restriction on further entry (see Section II.D).

One of the first moves to limit major fishery investment was made by South Africa, even though scientific evidence to formulate conservation policies was not available. There, the exploitation of the large pelagic stocks off the Atlantic coast began during World War II and expanded rapidly in 1947 to 1949. The government refused to license additional fish-processing factories in 1949. Then in 1953, the fishers, aware of the continuing influx of outsiders, agreed to limits on the numbers and hold capacity of the fishing vessels. Some additional capacity was allowed as additional species began to be harvested, as fish meal plants were needed, and as fish-processing ships began to operate outside national waters, but a judgment in 1973 was that the industry had had much more resilience to deal with fluctuating catches and prices than it would have had without the restraints.[68]

Little progress was made toward limiting entry in established fisheries elsewhere until after the 1960s, but entry to a new fishery in Australia was limited in 1963 on request of the participating fishers. The rock lobster fishery off Western Australia had burgeoned in the 1950s after foreign markets had been developed, and the sustainable catch had apparently been reached after a large increase in the number of boats and pots in use. After limited entry, the annual catches did not increase, but prices and profits rose as quotas were reached in much shorter seasons.

Another example of restricted entry in Western Australia occurred in a remote prawn fishery where only two processing companies had begun limited operations. In an effort to assist them, the government offered them exclusive rights in 1963 and limited the number of vessels. Similar assistance was tendered to another prawn fishery in 1965 and to a third in 1971.

Prevention of overinvestment in the lobster and prawn fisheries was justified partly on the basis of their valuable export products. The objectives of Australian management included economic viability of both fishing units and processing establishments, as well as conservation of the resource.[69]

Numerous limited-entry programs have been started on relatively small fisheries in North America with mixed and modest success in most. The slow progress is unquestionably related to the complex mixture of social, cultural, economic, and political variables. Many issues arise because of perceptions such as windfall profits for a few, reduction of the opportunity to fish alternative stocks, concentration of licenses in processing companies, equity of original license grants, favoritism to a cultural group, interference with traditional use by native peoples, inability to benefit from increases in abundance of fish stocks, inability to transfer a license to a family member, and, last but not least, the legality of the programs.[70]

A major shortcoming of limiting entry is the continuing effort by all fishers to become more efficient. Larger vessels, better gear, and better knowledge of the fishing can dramatically increase catches. A program was introduced in the British Columbia salmon fisheries in 1968 with the objectives of increasing the incomes of fishers to the average regional wage, reducing the level of overcapacity in the fleet, and improving the management of the resource. The fleet of salmon vessels was almost 7000 vessels larger than that needed to harvest the resource. Many were bought by the government. After 10 years, it was clear that overcapitalization had not been prevented, an elite club of wealthy fishers had been formed, the balance among gear types had been irrevocably changed in favor of large efficient purse seiners, and the resource management had not been facilitated.[71]

Such issues need to be solved by a political process, and perhaps the most successful example in North America is the limited entry program of Alaska. The state started a program in 1971, and its legislature enacted a bill in 1973 which put 29 fisheries (almost all for salmon or herring) under a limited number of licenses. Since the fisheries had been a major industry in the state for many years, many legislators were familiar with the fisheries and were concerned about them. More importantly, a large number of independent fishermen believed in limited entry and actively lobbied the legislature in support of it.

The act prohibited possession of more than one permit for a specific fishery with a specific gear in a specific area. The licenses were initially issued to individuals for a nominal charge on the basis of a ranking system according to the individual's economic dependence on fishing and past participation in the fishery. After receiving a license, the owner could sell it or transfer it to a family member. The act resulted in bitter controversies but survived a referendum for repeal in 1976 by a 2 to 1 vote; nevertheless 39 lawsuits were pending against the Commercial Fisheries Limited Entry Commission in 1978.[72]

The suits were settled, and experience to date has quieted most of the controversy. The state management of its fisheries generally has been excellent and is widely trusted by the fishers. A violator of regulations is likely to be severely criticized by other fishers, so the regulations are much easier to enforce. The catch of salmon has increased to all-time record levels, perhaps due in part to favorable weather conditions, but unquestionably due also to good management. The price of the few licenses for sale has risen to more than $50,000 in most fisheries, and to more than $300,000 in at least one.

An expansion of limited entry is taking place in Australia, where the first experiences had been easy because the fleets had not become too large and where the commonwealth was anxious to encourage export of valuable products. Now the plans are to reduce overinvestment in several established fisheries. The commonwealth is starting with formation of a Fishing Industry Policy Council and with extensive discussion among industry representatives and fishery ministers from states and the commonwealth. Reduction in fishing fleets is expected to be necessary, but the government expects to assist by buying vessels or licenses.[73] It then expects to require the remaining fleet, protected by limited entry, to pay a large share of the management costs.[74] In some fisheries, it is expected that limited entry will be extended to limited catches, owned in the form of individual transferable quotas (ITQs).

New Zealand is also moving rapidly toward policies similar to those of Australia. Like Australia, it is undertaking nationwide consulting with interested groups. The basic fishery management act became effective in 1983. It provides for declaration of fishery management areas, after which the first consultation is with user groups and public authorities, then the appointment of a fishery management advisory committee for each area consisting of representatives of fishery businesses, recreational fishing organizations, consumers, and native peoples. *After* preparation of a preliminary plan, the scientists become involved.[75]

VI. A LOOK AHEAD

No one can possibly think that reorienting the ocean fishing policies of the world will be easy. The people most concerned, the fishers, cling to familiar concepts in fear of changes beyond their control. National governments, after espousing for centuries the common principle of freedom to fish the marine resources, cannot suddenly decree that the resources shall be conserved by elaborate regulations that restrain the fishers and maintain the same freedom to fish without major social change.

For millenia, fishery management has been a political process guided by public concepts expressed in local customs, laws, and public institutions. Its vitality is not in the sciences, so recently added, but in the political experience. The new scientific principles can be applied only after their acceptance by the public at large and by development of laws and institutions acceptable to the fishers.

A. Constraints on Change

1. Economic Role of Market Fishing

Market fishing has declined to a tiny part of the economy in almost all of the developed countries of the world. No member country of the EEC has employment in fisheries exceeding 3% of the working population, or a fisheries contribution to the Gross National Product (GNP) greater than 0.7%.[49] Yet Norway has refused to join the EEC because of the possible impact on its fishing (already heavily government subsidized), and the recent entrance of Spain with its large fleets has caused major difficulties within the EEC.

In the U.S., employment in fishing, fish processing, and wholesaling is about 220,000, or only about 0.4% of the working population. The gross value of total catches, recently about $2.6 billion, divided among the fishers results in an average less than $12,000 each.[76] Perhaps one half of this is the average take-home pay after payment of vessel, gear, fuel, and other expenses. Since some fishers clearly make much more money, many others must either live in poverty or fish only part-time and supplement their income by other employment.

When the complex political problems of the fisheries appear in national legislatures, they are likely to be accompanied by nonfishery problems and be traded in unexpected ways. This leaves the fishing business people with few options except to compete in the lobbying for political attention.

2. Growth and Participation in Recreational Fishing

Recreational fishing has been growing rapidly in the industrialized countries of the world. It is now a sport for about 25% of the Canadian and U.S. populations, and their numbers have been increasing about twice as fast as the populations as a whole. They have major political strength in all developed countries because of their organization into local and national federations. Their strength is enhanced because they pay for much of the fishery management services through special taxes and license fees and because they strongly support the popular cause of conservation of all natural resources.

The recreational fishers also generate large economic activity. Their gross expenditures for licenses, equipment, and services in the U.S. is roughly five times the total value of the commercial catch as landed. Although about two thirds of the angling is in freshwaters, marine recreational fishing alone generates economic activity at least equal to the commercial catch plus processing.[77]

These fishers cherish their common right of piscary. They began a century ago in North American to force removal of freshwater stocks from commercial use, and recently they have been increasingly successful in having marine fish stocks reserved for their use. Since they outnumber the market fishers (by 200 or 300:1 in Canada and the U.S.) their beliefs are likely to have a major influence on attempts to give any exclusive rights to market fishers.

3. Growth of Fish Farming

Farmers who own or have secure leases on their production facilities have a great advantage over market fishers who face the political problems of using the commons. Farmers using ponds to grow much of the fishes' food can increase production rates from the natural range of 10 to 200 kg/ha/year to a range of 2000 to 10,000 kg/ha/year. Farmers feeding fish in raceways and cages can raise production rates to 500,000 kg/ha/year. Farmers also have an advantage in their ability to provide desirable market sizes and to maintain quality by quickly killing after capture and immediately processing in land-based facilities.

The fish-farm production of the world increased at an annual rate of about 7% between 1975 and 1980[78] and probably has since been increasing at a faster rate. The increasing supplies, which are commonly of excellent quality and available during off-seasons of the capture fisheries, are putting strong economic pressure on market fishers, many of whom have attempted to politically block expanded fish farming.

4. Changes in the Fish Trade

Traditional small-scale market fisheries in most countries of the world are in trouble because of competition for markets, if not additional competition for the resources. According to FAO statistics on international trade in fishery products, the value of imports increased from $3.3 billion in 1970 to $15.3 billion in 1980, a rate of increase much greater than the rate of inflation. The significance of this lies in the development of new products of reliable quality and penetration of distant markets — activities generally beyond the capability of traditional fisheries. Seattle, Washington, for example, which has long been considered the salmon capital of the world, now has restaurants featuring Norwegian or New Zealand salmon. Australia, which pioneered limited entry programs in a few of its export-oriented fisheries, now imports more than 60% of its food fish supply and licenses foreign fishing on some of its resources.

5. Limitations of Science in Policy Making

Fishery science has focused almost exclusively on the bioecological problems of the resources and has made clear the economic problems of unlimited entry to the market fisheries. Scientific programs have been almost entirely in support of conservation as the primary goal of fishery management, and they have been vigorously financed by governments which have expected economic gains to result. Only recently has fishery science begun to include studies of the changing social condition of the market fisheries. Little scholarly attention, however, has been given to comprehensive evaluation of fishery management systems; especially to underlying problems of policy change, institutional development, or to the need for continuing adjustment of fisheries to rapidly changing socioeconomic conditions.[79]

Part of the distrust of fishery science probably arises from the extensive involvement of fishery science with aquatic environmental policies. The latter commonly include consideration of "amenities and values" and the public debate about them is commonly on a political level with little consideration of the scientific "facts". Furthermore, the attention of many environmental scientists has shifted away from conservation for economic benefits to preservation of unquantifiable values.

6. Incongruence of Local and National Policy

Local policies, based primarily on tradition and local understandings, have guided the development of almost all oceanic fisheries until the last decade or so. Fishers have made their operational plans, their investment plans, their career plans, and plans for their family on the basis of them. Unfortunately for many coastal fishing communities, the fishers can no longer obtain an adequate income from fishing, and the communities have no alternative occupation.

The new LOS pertains to national, not community, provincial, or state, authority over the marine resources. This authority comes at about the time of peak production potential of the resources as a group. Conservation is, therefore, a national priority because of the condition of fishery resources, because most marine fishery resources cross local if not international boundaries, and because of widespread public belief in conservation of all resources. Maintenance of efficiency and equity in fishing operations is a local priority that cannot be dealt with effectively by national governments because of the diversity of the fisheries among regions, their complexity, and the minor role of fisheries in national economies.

Furthermore, some national policies may directly conflict with traditional fisheries. One example is the U.S. law protecting all marine mammals regardless of their interference with fishing. Other laws in the U.S. and Canada reserve certain fisheries for native peoples only.

7. Ephemeral Opportunities

Fish stocks and fisheries are highly changeable. Now with almost all conventional stocks heavily fished, new opportunities created by displacement of a foreign fleet in favor of domestic interests or a surge in abundance of a stock are always ephemeral. Banks have learned to require rapid repayment of loans on floating equipment — hence the frequent pressure from fishers for government assistance. The fishers who have prospered previously have usually been the ones ingenious enough to repeatedly discover new stocks, new efficiencies, or new markets. They are proud of such abilities, but when there are no more stocks to discover, when competition builds for shares of existing stocks and markets, and when governments no longer subsidize them, they are in economic trouble with no monetary value in a fishing right that they might sell.

B. Directions of Change

If we try to judge the best approach to marine fishery management on the basis of a recent comprehensive conference on the issues, we find a consensus only on the seriousness of the situation and that some form of owned rights is desirable. We have agreement that long-term goals should include conservation, economic efficiency, and equity, but the problems are how to break with the past and how to make the transition.[80]

Any successful system must have widespread public support, have support of the local fishers, allow continuing change in the fisheries to accommodate resource and market fluctuations, and, in the long-term, be financially viable — not permanently subsidized by governments. Achieving this is a complex problem in the politics of policy change that must accommodate the national concern for conservation and the local concern for equity and efficiency. As a political issue, appropriate change should be expected only when the alternatives are widely and correctly understood by the public.

The political strategy required for change will differ with every country, perhaps with each major fishery, so perhaps a key government role is first to provide adequate background information for a political evolution. In the U.S., this might involve identifying each of the hundred or so major marine fisheries that are relatively separate from each other in terms of the fishers, the markets, and the stocks. Then, instead of reporting on the fisheries of the U.S. largely in overall geographic terms of landings, processed products, imports, exports, total supply and prices, employment, craft, and plants, report also on each fishery primarily in terms that reflect socioeconomic changes and trends. This might include emphasis on the number of vessels entering and leaving the fishery, changes in vessels and shore facilities, new or abandoned products and markets, enforcement actions, numbers of fishers relying on unemployment insurance, and government costs of services and subsidies to each of the fisheries. An especially useful report might be a continuing index of the economic health of each fishery in addition to the conservation status of each stock.

A pragmatic review of the fishery management experience that appears to be most successful points to the widespread program in Japan and parts of the fragmentary programs in Australia, New Zealand, Canada, and the U.S. Their legal and institutional structures deserve comparative study with the objective of designing suitable structures tailored for other fisheries. And last but not least, temporary national financial assistance will undoubtably be required during any period of change.

A critical element is confidence on the part of the fishers in the information on which conservation regulations are based. Despite the fishers' scepticism about the national program in the U.S., they want sensible management and are beginning to form institutions to gather substantive fisheries data to be shared with the government for their own benefit.[55]

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Condition of groundfish resources in the Bering Sea-Aleutian Islands Region as assessed in 1988

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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OVERALL SUMMARY

by
Loh-Lee Low

This resource assessment document (RAD) for Bering Sea/Aleutian Islands groundfish resources is compiled from contributions by various authors of the Northwest and Alaska Fisheries Center, National Marine Fisheries Service. In this RAD, the status of the stocks and their acceptable biological catches (ABCs) are described. The ABC values, together with socio-economic considerations were used by the North Pacific Fishery Management Council (NPFMC) to determine total allowable catches (TACs) and other management strategies for the 1989 fishery.

Management Areas and Species

The Bering Sea-Aleutian Islands management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Fig. 1). International North Pacific Fisheries Commission (INPFC) statistical areas 1 to 5 are also illustrated. INPFC areas 1 and 2 make up the EBS. The Aleutian region is INPFC area 5.

Four categories of finfishes and invertebrates have been designated for management purposes (Table 1). They are (a) prohibited species, (b) target species, (c) other species, and (d) non-specified species. This RAD describes the status of the stocks in categories (b) and (c) only.

Historical Catch Statistics

Catch statistics since 1954 are shown for the EBS (Bering Sea subarea) in Table 2. In this region, the initial target species was yellowfin sole. During the early period of these fisheries, total catches of groundfish reached a peak of 674,000 metric tons (t) in 1961. Following a decline in abundance of yellowfin sole, other species were targeted upon, principally pollock, and total catches rose to 2.2 million t in 1972. Catches have since varied from 1.2-1.9 million t as catch restrictions and other management measures were placed on the fishery.

Catches in the Aleutian region have always been much smaller than those in the EBS and target species have generally been different (Table 3). Pacific ocean perch (POP) was the initial target species and during the early years of exploitation overall catches of groundfish reached a peak of 112,000 t in 1965. With a decline in abundance of POP, the fishery diversified to other species. Total catches in recent years have been about 100,000 t annually.

Recent Total Allowable Catch

Amendment #1 to the Bering Sea/Aleutian Islands groundfish FMP provides the framework to manage the groundfish resources as a complex. The MSY of this complex was originally estimated at 1.8 to 2.4 million t. The OY is set at 85 percent of the MSY range, or 1.4 to 2.0 million t.

Total allowable catches (TAC) established by the NPFMC since implementation of extended jurisdiction under the Magnuson Fishery Conservation and Management Act in 1977 are given in Table 4. The sum of TACs equals optimum yield (OY) for the groundfish complex, which is currently constrained to a range of 1.4 to 2.0 million metric tons (t) by its Fishery Management Plan (FMP). Optimum yield for all species combined has increased steadily from 1.4 million t in 1977 to 2.0 million t in 1984-88.

Acceptable Biological Catch Levels for 1989

The estimates of ABC for 1989 are based upon status of stock assessments made in 1988 and projections through 1989. There has also been an attempt to standardize the calculation of ABCs in this RAD based upon the Fmsy and $F_{0.1}$ population dynamics exploitation principles (ICES 1984). Tables 6 and 7 provide summaries of the estimates of MSY and ABC.

The sum of individual species MSY's has been estimated to be 3.5 million t. The sum of ABC's for the groundfish complex has increased from 2.88 million t in 1988 to 2.97 million t in 1988. This increase resulted from a combination of two key factors--(1) real increases in the abundance of some stocks (primarily flatfish species) and (2) an addition of 230,000 t to the pollock ABC in the EBS for a component of the pollock resource that was not previously estimated.

Walleye Pollock:

EBS	1988 ABC = 1,500,000 t	1989 ABC = 1,340,000 t
Aleutians	1988 ABC = 160,000 t	1989 ABC = 117,900 t
Area 515	1988 ABC = N/A	1989 ABC = 250,000 t

EBS	Projected 1989 exploitable biomass = 5.3 million t Exploitation = 25.3 percent; F0.1 rate
Aleutians	Projected 1989 exploitable biomass = 471,700 t Exploitation = 25 percent; F0.1 rate
Area 515	Projected 1989 exploitable biomass = 1,000,000 t Exploitation = 25 percent; F0.1 rate

Abundance has declined slightly from 1987. This stock has been exploited lightly between 10% and 18% in the past.

There is limited information on the distinction of Aleutian Basin (including Bogoslof area) pollock and those of the EBS. Catches in the Bogoslof fishery are currently counted against the TAC for the EBS which may result in underutilization of EBS pollock. Based upon an initial estimate of exploitable biomass of 1 million t near Bogoslof and a 25% exploitation rate, a separate ABC of 250,000 t may be feasible for this fishery in 1989.

The "donut hole" area of the Bering Sea has become an important fishing ground for foreign pollock fisheries since the early 1980s. The 1987 catch has reached 1.25 million t, almost as high as taken in the U.S. EEZ. It is not known if this level of catch would have an appreciable impact on the stock harvested within the U.S. EEZ. Any impact through contributions in recruitment and migration, however, are not expected to be detected on the EBS shelf/slope region for 4-6 years after the fishery in the donut area. If this lag time is correct, it may be deduced that donut hole catches of 200,000 t in 1984 and 340,000 t in 1985 did not appear to have had impacted the biomass in the EBS shelf/slope region. It is not known if the higher catches in excess of 1 million t in 1986 and 1987 would have downstream impacts on the EBS resource.

<u>Pacific Cod:</u>

1988 ABC = 385,300 t　　　1989 ABC = 370,600 t

Projected 1988 exploitable biomass = 1.19 million t
Exploitation = 31.1 percent; Fmsy rate

An age-structured model was used to simulate the structure and dynamics of the EBS cod population. The 1989 biomass was projected and ABC was calculated based on the MSY exploitation rate. In the past 7 years, exploitation has only been 5-18 percent, with actual catch substantially less than ABC. The current biomass has remained very high and is projected to be so in 1989 and later.

<u>Yellowfin Sole:</u>

1988 ABC = 254,000 t　　　1989 ABC = 241,000 t

Current exploitable biomass = 1.53 million t
Exploitation = 15.8 percent; F0.1 rate

The slight decrease in ABC reflected the results of an age-structured model that estimated population levels and a lower exploitation rate with the F0.1 fishing strategy. Exploitable biomass has been projected to increase from 1.4 million t in 1988 to 1.53 million t in 1989. Exploitation for 1989 is approximately 16 percent of current exploitable biomass. The rate used for 1988 was 18%.

<u>Greenland Turbot:</u>

1988 ABC = 14,100 t 1989 ABC = 20,300 t

Projected 1989 exploitable biomass = 375,800 t
Exploitation = 5.4 percent; F0.1 rate

The exploitable biomass of Greenland turbot is probably below average level, and declining. As such, a low F0.1 exploitation rate (5.4%) was again applied to calculate ABC for the species in 1989. Poor recruitment has been observed throughout the 1980s which indicates that abundance of the adult population is expected to decline well into the 1990s. Because of this poor recruitment pattern, forecasts for all conservative fishing strategies (including no fishing) show projected declines in biomass through 1993, or later.

Arrowtooth Flounder:

1988 ABC = 109,500 t 1989 ABC = 163,700 t

Current exploitable biomass = 528,200 t
Exploitation = 31 percent; Fmsy rate

The resource continues to be in excellent condition and biomass continues to be high and stable, if not increasing. This trend is again confirmed from the 1988 summer trawl survey. Because of higher estimation confidence, the current exploitable biomass was estimated to be at the mid-point of it's 95% confidence range (528,200 t), instead of it's lower confidence limit for 1987 (414,000 t). The MSY exploitation proposed (31%) is essentially similar to the rate used last year (29%). The small difference is the result from updating model parameters.

Rock Sole:

1988 ABC = 166,000 t 1989 ABC = 171,000 t

Current exploitable biomass = 1,277,900 t
Exploitation = 13 percent; Fmsy rate

For the first time, rock sole is separated out from the "other flatfish" category for management purposes. Trawl surveys confirm that the biomass of rock sole is high and continuing to increase. The resource is in excellent condition and biomass is above the level that produces MSY. Therefore, the MSY exploitation is applied to calculate ABC for the species. The slight decrease in the 1989 ABC estimate from 1988 reflects a lower exploitation rate used this year (13% versus 15.5%), rather than a decrease in biomass.

Other Flatfishes:

1988 ABC = 165,900 t 1989 ABC = 155,900 t

Current exploitable biomass = 1,187,060 t

Exploitation = 13 percent, Fmsy rate for flathead sole and Alaska plaice.
Exploitation = 15.5 percent, Fmsy rate for miscellaneous flatfishes.

Biomass for this category of flatfishes is high and increasing. It is above the level capable of producing MSY; thus their MSY exploitation rates are used to estimate ABCs. The increase in the 1989 ABC reflects an increased abundance of the stocks.

Sablefish:

EBS	1988 ABC = 3,400 t	1989 ABC = 2,800 t
Aleutians	1988 ABC = 5,800 t	1989 ABC = 3,400 t

EBS — Current exploitable biomass = 25,300 t
Exploitation = 11%; F (equilibrium biomass) rate

Aleutians — Current exploitable biomass = 68,000 t
Exploitation = 5%; F (equilibrium biomass) rate

The ABC for 1989 is reduced from 1988 due to an overall decrease of the biomass in the EBS. The 5% exploitation rate corresponds to the F(eq) rate--the rate that is expected to keep the biomass in equilibrium.

Pacific Ocean Perch:

EBS	1988 ABC = 6,000 t	1989 ABC = 6,000 t
Aleutians	1988 ABC = 16,600 t	1989 ABC = 16,600 t

EBS — Current exploitable biomass = 101,100 t
Exploitation = 6 percent; F0.1 rate

Aleutians — Current exploitable biomass = 276,500 t
Exploitation = 6 percent; F0.1 rate

In general, POP stocks continue to remain low but relatively stable compared to biomass levels of the early 1960s. No new data is available to change the 1989 ABC levels from the estimates for 1988. The F0.1 exploitation strategy at 6% is expected to provide for some rebuilding of the POP complex of stocks.

Other Rockfishes:

EBS	1988 ABC = 400 t	1989 ABC = 400 t
Aleutians	1988 ABC = 1,100 t	1989 ABC = 1,100 t

EBS — Current exploitable biomass = 7,100 t
Exploitation = 6 percent; F0.1 rate

Aleutians — Current exploitable biomass = 18,500 t
Exploitation = 6 percent; F0.1 rate

Maintenance of ABCs at 1988 levels continue to reflect the relative stability of the stocks. As with the 1988 estimates, the mean biomass derived from recent years' trawl surveys were used to estimate ABCs. Because there are insufficient data for this complex, the exploitation rate was based on the F0.1 exploitation strategy derived for POP. Also, like the POP complex, this strategy is expected to promote rebuilding for the "other rockfish" category.

Atka Mackerel:

1988 ABC = 21,000 t   1989 ABC = 21,000 t

Current exploitable biomass was not determined
Exploitation based on F0.1 strategy

The status of stocks for Atka mackerel is difficult to assess because surveys that cover its range in the Aleutian region are conducted only once every 3 years. The latest survey in 1986 indicate that biomass decreased 74% from 1983 and was even lower than the estimate from 1980. The absolute level of biomass, however, cannot be accurately estimated. As such, estimation of ABC using F x Biomass cannot be applied. Instead, the F0.1 concept of exploitation from catch-at-age analysis using recent trends (1982-86) in weak recruitment was used to estimate ABC. This analysis, performed last year, estimated the 1988 ABC at 21,000 t. Since new information is not available to re-analyze the data, and catch trends in 1988 indicate that the stock has probably not changed appreciably from last year, the 1989 ABC is again recommended to be 21,000 t.

Squid:

1988 ABC = 10,000 t   1989 ABC = 10,000 t

There is insufficient information to determine abundance and appropriate exploitation rates for squid stocks. The estimate of ABC is based on historical catches and is conservative.

Other Species:

1988 ABC = 49,500 t   1989 ABC = 59,000 t

Current exploitable biomass = 673,600 t
Exploitation = 9 percent = Historical rate

The change in ABC from 1988 to 1989 reflects the change in biomass determined from trawl surveys. The biomass has essentially remained relatively high.

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Table 1.-- Species categories established for management of Bering Sea-Aleutian Islands groundfish fishery.

Prohibited species(a)	Target species(b)	Other species(c)
FINFISHES		
Salmonids	Walleye pollock	Sculpin
Pacific halibut	Pacific cod	Shark
Pacific herring	Yellowfin sole	Skate
	Greenland turbot	Smelt
	Arrowtooth flounder	
	Rock sole	
	Other flatfish	
	Sablefish	
	Pacific ocean perch	
	Other rockfish	
	Atka mackerel	
INVERTEBRATES		
King crab	Squid	Octopus
Snow (Tanner) crab		
Coral		
Shrimp		
Clams		
Horsehair crab		
Lyre crab		
Dungeness crab		

(a) Species when caught must be returned to the sea.
(b) Total allowable catch established for each species.
(c) Aggregate total allowable catch established for the group as a whole.
(d) A nonspecified species category is also established to cover all other species not listed in categories (a)-(c).

Table 5.--Bering Sea/Aleutian Islands groundfish apportionments and foreign allocations in metric tons, 1985-88.

	1985	1986	1987	Sept. 1988
ABC	2,149,330	2,199,000	2,245,780	2,876,100
TAC	2,000,000	2,000,000	2,000,000	2,000,000
DAP	137,210	243,849	336,723	708,520
JVP	697,850	1,155,863	1,484,110	1,282,784
Reserve	1,345	10,121	46,471	8,696
TALFF	1,163,595	590,167	132,696	0
Japan	861,332	455,439	101,446	0
ROK	239,872	112,177	29,900	0
West Germany	0	0	0	0
Portugal	600	0	0	0
Poland	35,295	8,043	0	0
USSR	10,782	0	0	0
China	0	4,920	1,350	0
Unallocated	15,714	9,545	0	0

Table 6.--Estimates of maximum sustainable yields (MSYs) and comparisons of acceptable biological catches (ABCs) for 1988 and 1989 for groundfish in the eastern Bering Sea (EBS) and Aleutian Islands.

Species/Region	MSY (t)	ABC (t)	
		1988	1989
Pollock			
EBS	2,300,000	1,500,000	1,340,000
Aleutians	245,000	160,000	117,900
Area 515	unknown	N/A	250,000
Pacific cod	323,300	385,300	370,600
Yellowfin sole	150,000	254,000	241,000
Greenland turbot	22,500	14,100	20,300
Arrowtooth flounder	55,300	109,500	163,700
Rock sole	112,500	166,000	171,000
Other flatfish	123,300	165,900	155,900
Sablefish			
EBS	2,200	3,400	2,800
Aleutians	8,800	5,800	3,400
Pacific ocean perch			
EBS	7,400	6,000	6,000
Aleutians	18,900	16,600	16,600
Other rockfish			
EBS	500	400	400
Aleutians	1,300	1,100	1,100
Atka mackerel	38,800	21,000	21,000
Squid	> 10,000	10,000	10,000
Other species	59,000	54,000	59,000
Total all species	3,478,800	2,873,100	2,950,700

Table 7.--Summary of stock abundance and ABC estimates for groundfish in the eastern Bering Sea (EBS) and Aleutian Islands (AI) for 1989.

Species/Region		Biomass (t)	Annual Exploitation (%)	ABC (t)	Abundance and trend
Pollock	EBS	5,300,000	25.3	1,340,000	Moderately high, moderate decline
	AI	471,700	25	117,900	Moderately high, stable
	Area 515	1,000,000	25	250,000	Unknown
Pacific cod		1,190,000	31.1	370,600	Very high, stable
Yellowfin sole		1,530,000	15.8	241,000	Very high, stable
Greenland turbot		375,800	5.4	20,300	Average, declining
Arrowtooth flounder		528,200	31	163,700	Very high, stabilizing
Rock sole		1,277,900	13	171,000	Very high, increasing
Other flatfishes		1,187,100	15.5	155,900	Very high, stable
Sablefish	EBS	25,300	11.2	2,800	Average, declining
	AI	68,000	5	3,400	Average, declining
Pacific ocean perch	EBS	101,000	6	6,000	Below average, slow increase
	AI	276,500	6	16,600	Below average, slow increase
Other rockfish	EBS	7,100	6	400	Average, stable
	AI	18,500	6	1,100	Average, stable
Atka mackerel		--	--	21,000	Below average, trend unknown
Squid		--	--	10,000	Unknown
Other species		673,600	9	59,000	High, stable
Groundfish complex		>14,030,700		2,950,700	High, stable

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Historical Trends in Abundance and Current Condition of Walleye Pollock in the Eastern Bering Sea

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ABSTRACT

Bakkala, R.G., Wespestad, V.G. and Low, L.-L., 1987. Historical trends in abundance and current condition of walleye pollock in the eastern Bering Sea. *Fish. Res.*, 5: 199-215.

Walleye pollock (*Theragra chalcogramma*) is an important commercial species throughout much of its range around the rim of the North Pacific Ocean. Along the North American coast, the largest concentrations occur in the eastern Bering Sea, where catches of pollock in 1981-1985 averaged ~1.0 million metric tons (t).

Cohort analysis indicates that the biomass of pollock may have increased substantially in the eastern Bering Sea, from <5 million t in the early 1960s to a peak of >13 million t in the early 1970s. This increase appears to be the result of the recruitment of a series of stronger than average year classes originating in 1965-1969. The increase in abundance coincided in timing with the development and peak years of the pollock fishery, with catches reaching a maximum of 1.9 million t in 1972. Abundance then declined and remained relatively stable at a moderately high level of 7.6-9.0 million t in 1976-1980, before increasing to ~10.0 million t in 1981 and 1982, as a result of the recruitment of the strong 1978 year class. Abundance in more recent years has again declined to ~8 million t in 1985, but moderately good recruitment is anticipated to arrest this decline.

Hypotheses to explain the observed fluctuations in abundance of pollock, including cannibalism, replacement by pollock of environmental niches occupied by other species and temperature anomalies were discussed. Environmental conditions would appear to be the most likely cause of variation in year-class strength and population abundance.

INTRODUCTION

Walleye pollock (*Theragra chalcogramma*) is primarily a semi-demersal species that inhabits waters of the continental shelf and slope along the rim of the North Pacific Ocean, from central California to the Southern Sea of Japan. It is an important commercial species along both the Asian and North American coasts, with world catches reaching 6.0 million metric tons (t) in the mid-1970s. Catches have since declined to ⩽5.0 million t in the early 1980s (Fish-

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ing News International, 1985). In this later period, however, pollock was the single most important species in the world fish catch by weight.

Along the North American coast, the largest concentrations of pollock occur in the eastern Bering Sea, where annual catches have ranged as high as 1.9 million t (in 1972). Recently (1981–1985), annual catches have averaged ~1.0 million t and during this 5-year period, exceeded those of all other species of groundfish (946 000 t) in waters from California to the Bering Sea.

Besides its value to commercial fisheries, pollock is also an important component of the ecosystem. It represents 67% of the total biomass of groundfish in the eastern Bering Sea, based on survey data in 1979 (Wakabayashi and Bakkala, 1985) and serves as a food source for a wide variety of other species of fish, marine mammals and birds (Smith, 1981).

This report presents information on the stock structure, fishery and historical and current trends in abundance of eastern Bering Sea pollock.

RELATIONSHIP BETWEEN POLLOCK IN THE EASTERN BERING SEA AND OTHER REGIONS

Eastern Bering Sea pollock are considered to be an independent population for management purposes, even though there may be some degree of mixing with pollock from adjoining regions. The primary source of intermixing may come from adult pollock which occupy waters over the deep Aleutian Basin (Fig. 1). These adults, the biomass of which was estimated to be 1.3 million t in 1979, are found pelagically throughout the basin at low densities, mainly between depths of 20–130 m from the surface (Okada and Yamaguchi, 1985). This is in sharp contrast to behavior over the eastern Bering Sea shelf, where adult pollock form schools 5–20 m in vertical extent within 60 m of the bottom (Traynor and Nelson, 1985). Basin pollock range in length from 33 to 58 cm, but are primarily between 40 and 52 cm, representing ages 5–7 years. The absence of young fish indicates that the basin pollock originate from other areas, presumably from one or more of the continental shelf areas surrounding the basin. The relationship between the basin and those on the eastern Bering Sea shelf is unknown, but they may contribute to the reproduction of the eastern Bering Sea shelf population. Some of the basin pollock have been found to spawn in the southeastern corner of the basin (Okada, 1986), where known current patterns could carry eggs and larvae onto the eastern Bering Sea shelf. Size at age of the basin pollock has been found to be distinctly smaller, indicating substantially slower growth than for shelf pollock (Traynor and Nelson, 1985). These differences in growth suggest that no interchange occurs between the populations, except possibly during early life history stages.

Pollock also range through the Aleutian Islands area and, although the relationship between pollock in the eastern Bering Sea and Aleutians is unknown, they are considered to be separate populations for management purposes.

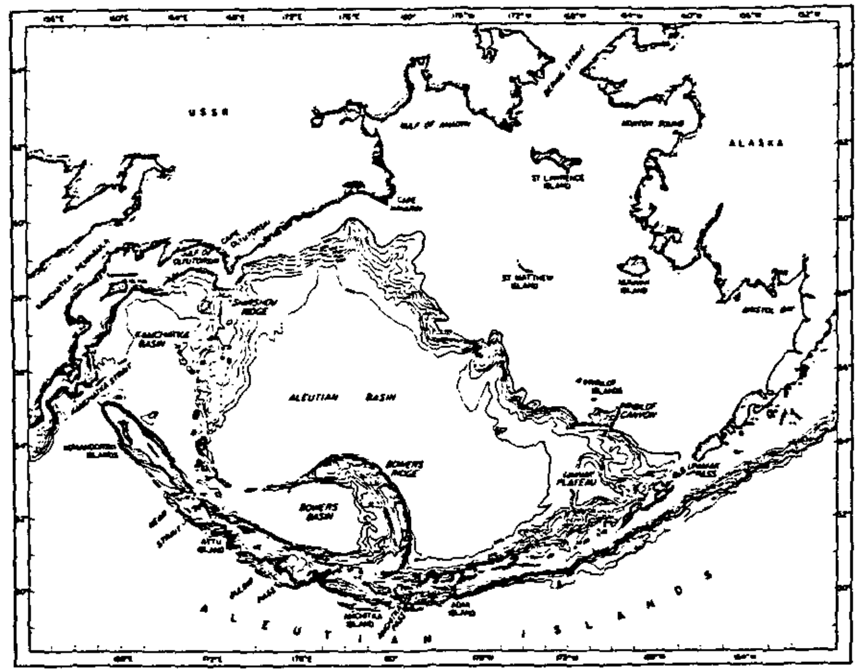


Fig. 1. The Bering Sea, giving place names mentioned in the text (Kinder, 1981, from a figure prepared by Noel McGary for the atlas by Sayles et al., 1979).

In the eastern Bering Sea, the existence of at least two populations have been hypothesized, based on observations of isolated spawning aggregations southeast and northwest of the Pribilof Islands (Maeda, 1972). Other differences have been detected in pollock between these regions, such as significant differences in larval growth (Walline, 1983) and feeding and growth of adults (Dwyer et al., 1986b). However, biochemical genetic studies of Grant and Utter (1980) gave no evidence of genetically distinct populations in the eastern Bering Sea.

COMMERCIAL FISHERIES

Pollock became a target species in the eastern Bering Sea in 1964, following Japan's development of shipboard methods for producing *surimi* (minced flesh). Catches by distant water fleets from Japan increased rapidly thereafter. Japanese fleets were later joined by those from the U.S.S.R., the Republic of Korea, Taiwan, Poland, the Federal Republic of Germany and the U.S.A. Japanese fisheries have historically dominated the catches, taking ≥80% of the

TABLE I

Annual catches of pollock (t) in the eastern Bering Sea

Year	Japan	U.S.S.R.	ROK[a]	Taiwan	Poland	F.R.G.[b]	Joint ventures[c]	U.S.A.	Totals
1964	174 792								174 792
1965	230 551								230 551
1966	261 678								261 678
1967	550 362								550 362
1968	700 981		1200						702 181
1969	830 494	27 295	5000						862 789
1970	1 231 145	20 420	5000						1 256 565
1971	1 513 923	219 840	10 000						1 743 763
1972	1 651 438	213 896	9200						1 874 534
1973	1 475 814	280 005	3100						1 758 919
1974	1 252 777	309 613	26 000						1 588 390
1975	1 136 731	216 567	3438						1 356 736
1976	913 279	179 212	85 331						1 177 822
1977	868 732	63 467	45 227	944					978 370
1978	821 306	92 714	62 371	3040					979 431
1979	749 229	58 880	83 658	1952	20 162				913 881
1980	786 768	2155	107 608	4962	40 340	5967	10 479		958 279
1981	765 287		104 942	3367	48 391	9580	41 938		973 505
1982	746 972		150 525	4220		1625	52 622		955 964
1983	654 939		170 007			10 038	146 467	912	982 363
1984	626 335	12 268	167 887		46 900	8304	230 314	6727	1 098 783[d]
1985	585 263	1504	160 983		22 696		370 257	39 084	1 179 787

[a]Republic of Korea.
[b]Federal Republic of Germany.
[c]Joint ventures between U.S. fishing vessels and ROK, Japanese, Polish, F.R.G. and U.S.S.R. processors.
[d]Includes 48 t taken by Portugal.

total. In most recent years, catches by joint venture fisheries, in which U.S. catcher boats deliver catches to foreign processing vessels, have increased (representing 31% of the total catch in 1985, Table I). They are expected to continue to increase.

Commercial catches of pollock increased rapidly during the late 1960s and reached a peak in 1970–1975, when catches ranged from 1.3 to 1.9 million t annually, with total removals over this period of 9.6 million t (Table I). Following the peak catch of 1.9 million t in 1972, catches were steadily reduced (because of evidence of declining stock abundance) as a result of U.S. bilateral discussions with nations having fisheries for pollock. Beginning in 1977, the U.S.A. extended its fishery jurisdiction to 200 miles off its coast through the Magnuson Fishery Conservation and Management Act of 1976 (P.L. 94-265) and assumed management control of the fisheries resources in the eastern Bering Sea. The North Pacific Fisheries Management Council, the management body for this region, has estimated optimum yields in 1977–1985 to range from 950 000 t to 1.2 million t (Bakkala, 1985). Catches during this period ranged from 914 000 t to 1 180 000 t.

HISTORICAL TRENDS IN ABUNDANCE

Eastern Bering Sea pollock have been exploited commercially by directed fisheries for a relatively short period of time, spanning only the past two decades. The period of relatively good assessment data is even shorter, with the better data only available since the late 1970's. Thus, trends in abundance of the resource were not adequately monitored until after the fishery had peaked in 1972. Wespestad and Terry (1984), however, used cohort analysis (Pope, 1972) to provide annual estimates of absolute abundance for pollock throughout the history of the fishery. In this present report, the catch-at-age data used by Wespestad and Terry (1984) were reassessed and improved and a new cohort analysis conducted. Some early U.S.S.R. survey data and later Northwest and Alaska Fisheries Center (NWAFC) survey data are also used to evaluate the trends in abundance shown by the cohort analysis.

Methods used in the cohort analysis

Previous cohort analyses conducted at the NWAFC on eastern Bering Sea pollock have used catch-at-age data for the years 1964–1972, as reported by Chang (1974) and Wespestad and Terry (1984). These data were based on age readings from scales which have been shown to produce a truncated age distribution in comparison to age readings from otoliths (Bakkala et al., 1985a); otoliths are currently the accepted age structure for pollock. To provide better catch-at-age data for 1964–1972, pooled age–length keys for the years 1978–1983 (when otolith samples were collected) were applied to the catch and length–frequency data from these early years. Although there may have been growth differences or changes in age composition of pollock between 1964 and 1972 and 1978 and 1983, which may produce some error in the catches-at-age, these errors are believed to be smaller than those produced from the age–length keys derived from scales.

There may be other errors in the data from the 1964–1972 period that could bias the results from the cohort analysis. Catch and length–frequency data were from foreign reported statistics and the accuracy and representativeness of these data are unknown. Catch-at-age data for the period 1973–1977 were also based on foreign reported catch data, but the length and age composition data used were collected by the NWAFC Foreign Fishery Observer Program. In 1977–1983, annual biological and catch data collected by the Observer Program were used to estimate catches-at-age.

Numbers-at-age in all years were calculated by nation-vessel class, statistical area, quarter year and sex (catch data were only available by sex after 1972) and then combined for annual estimates. Numbers of pollock caught in each of these strata were estimated by dividing the stratum tonnage by the average weight of pollock in the catch. Average weights were obtained from mean lengths using the length–weight relationship, $W=0.0075L^{2.977}$. Age-specific values of natural mortality (0.45 for age 2 and 0.30 for ages 3–9) were used in the analysis.

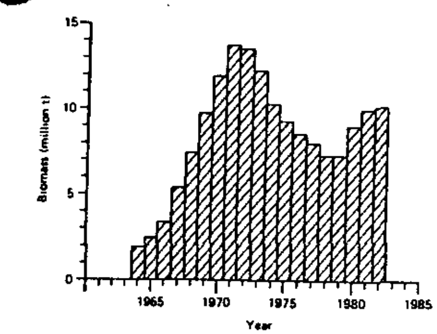
The cohort analysis was 'tuned' using auxiliary information from NWAFC acoustic and bottom trawl surveys in 1979 and 1982. Results from these surveys were combined to obtain estimates of population age composition, which were used to estimate age-specific instantaneous fishing mortalities (F) in the terminal year. It was assumed that age-specific natural mortality (M) was constant and the survey age composition was a true measure of the age composition of the population. The cohort analysis was initiated with a set of arbitrary terminal age-specific F values which were then varied iteratively until the estimated terminal year age composition matched the survey age composition. The vector of terminal F values was then adjusted until the ratio of numbers of pollock in 1979 to numbers of pollock in 1982 was the same as the ratio of the 1979/1982 fishery CPUEs. The terminal F values derived by this method for ages 2–9, respectively, were 0.0, 0.07, 0.13, 0.19, 0.14, 0.05, 0.02 and 0.03. The F for the terminal age (age 9) in years prior to the terminal year was computed as the average of ages 7 and 8, assuming that catchability was similar for these ages. Estimates of average weight-at-age from Smith (1981) were used to convert numbers to biomass.

Abundance trends and year-class strength 1964–1975

Results of the cohort analysis indicate that the eastern Bering Sea population of pollock underwent a major increase in abundance during the 1960's peaked in the early 1970s and then declined in the mid-1970s. Estimates of biomass (ages 2–9) in the early and mid-1960's ranged below 5 million t, increased to a peak of ~ 13.8 million t in 1971 and then decreased to 9.3 million t in 1975 (Fig. 2).

The increase in abundance during the 1960s appears to have resulted from improved recruitment (Fig. 3). Recruitment of age-2 pollock, as shown by the cohort analysis, was far below average in the early 1960s, but improved in subsequent years, with an apparent series of five stronger than average year classes produced in 1965–1969.

The decline in abundance after 1972, despite the recruitment of the strong 1972 year class, was apparently caused by the declining abundance of the strong



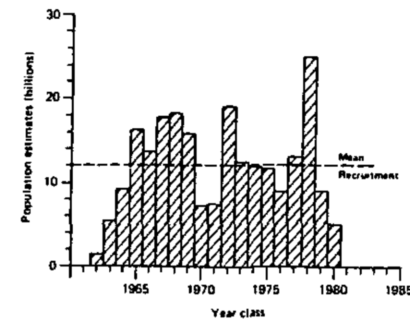


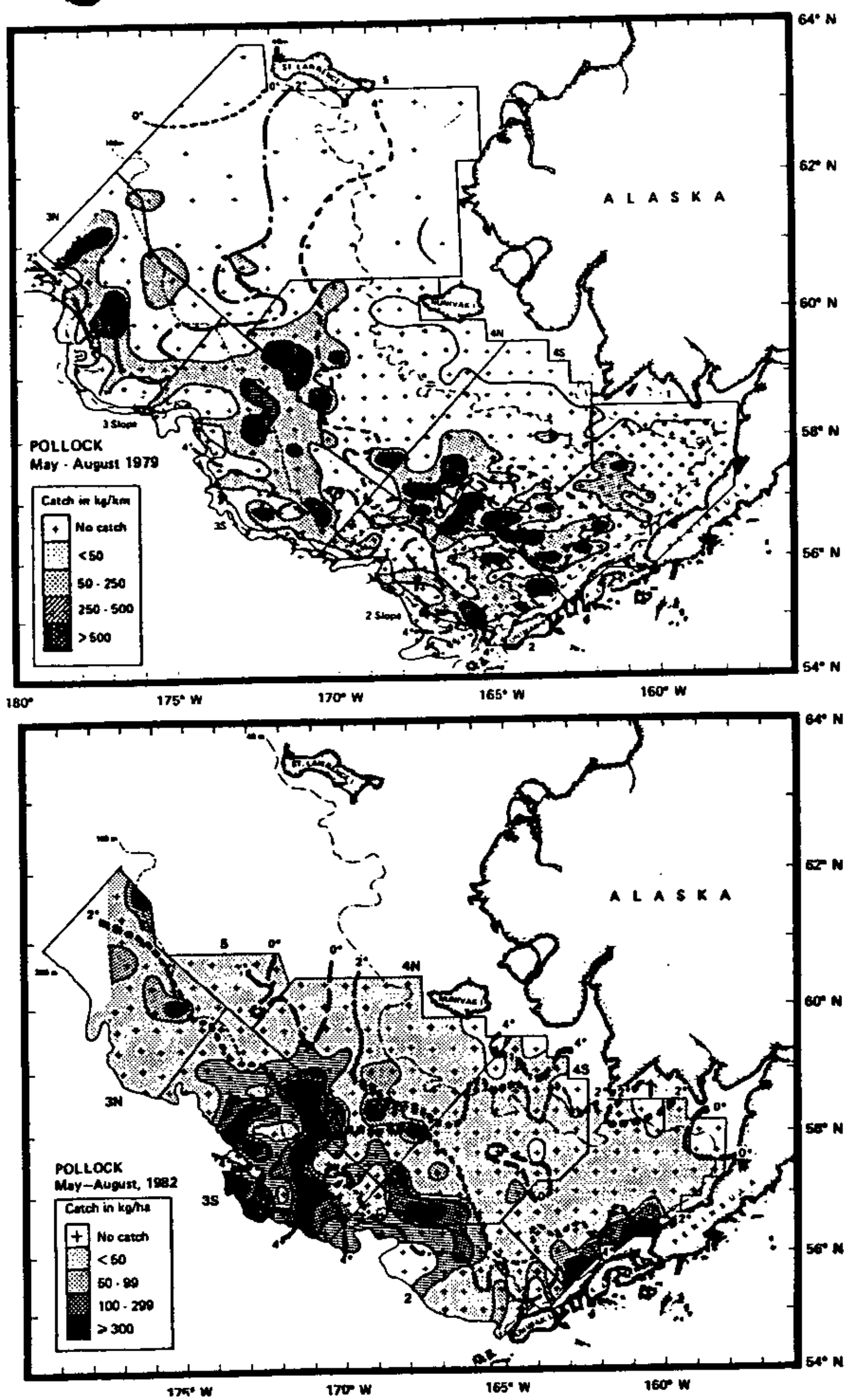
Fig. 2. (Left) Variation in abundance of walleye pollock in the eastern Bering Sea during 1964-1982, based on cohort analysis.

Fig. 3. (Right) Recruitment of age-2 walleye pollock (10^9) in the eastern Bering Sea, based on cohort analysis.

1965–1969 year classes, the poor recruitment of the 1970 and 1971 year classes and the accumulative removals by the fishery in 1970–1975 (which totaled 9.6 million t).

A means of evaluating results from the cohort analysis for 1964–1975 is provided in a report by Smirnov (1980), who compared results of U.S.S.R. investigations of eastern Bering Sea groundfish in the late 1950s with those from NWAFC surveys in the mid-1970s. As the author points out, however, data from the 1957–1959 U.S.S.R. and 1975 NWAFC surveys are not directly comparable. Sampling by the U.S.S.R. research vessels was not as extensive as that by NWAFC research vessels in 1975. Smirnov (1980), therefore, only provided U.S.S.R. survey data from ~ 35% or 162 000 km^2 of the 465 000 km^2 sampled by the NWAFC vessels in 1975. Moreover, trawls differed, as undoubtedly did the methods of processing catches and data collection. Nevertheless, the compatability of the data is assumed to at least reflect major changes in abundance of pollock.

The biomass estimate for pollock from the portion of the eastern Bering Sea shelf adequately sampled by the U.S.S.R. vessels was 114 100 t (Smirnov, 1980). The biomass estimate derived from this same area in 1975 from sampling by NWAFC vessels was 471 400 t, suggesting a 4-fold increase in abundance of pollock between 1957–1959 and 1975. The change in abundance shown by the cohort analysis between 1964 (1.9 million t) and 1975 (9.3 million t) was nearly a 5-fold increase. However, based on NWAFC survey data, the proportion of the overall population of pollock occupying the shelf area sampled by the U.S.S.R. vessels has varied from 19% in 1975 to 41% in 1983. These apparent changes in distribution are believed to be caused mainly by variations in environmental conditions. In years of cold bottom temperatures, a greater pro-



portion of the pollock population occupies outer shelf waters; in years of warmer water temperatures, greater numbers of pollock intrude into inner shelf waters (Fig. 4). Joint hydroacoustic and bottom trawl surveys have also shown that a greater proportion of older than younger age groups occupy near-bottom waters and are, therefore, more vulnerable to bottom trawls. Thus, environmental conditions and age structures of the populations existing during the two survey periods, in addition to the factors mentioned earlier, may have influenced the results.

Despite these limitations of the survey data, they support the cohort analysis results indicating that the pollock population underwent a major increase in abundance during the 1960s.

Interestingly, in that they perhaps corroborate results from the fishery and survey data, Swartzman and Haar (1983) noted that the percentage volume of pollock in the stomach contents of northern fur seals in the vicinity of the Pribilof Islands was consistently high in 1973–1974 (>48%), while in years prior to 1968, pollock comprised a variable and usually low percentage of the seals' diet (<20% in 8 of the 11 months sampled).

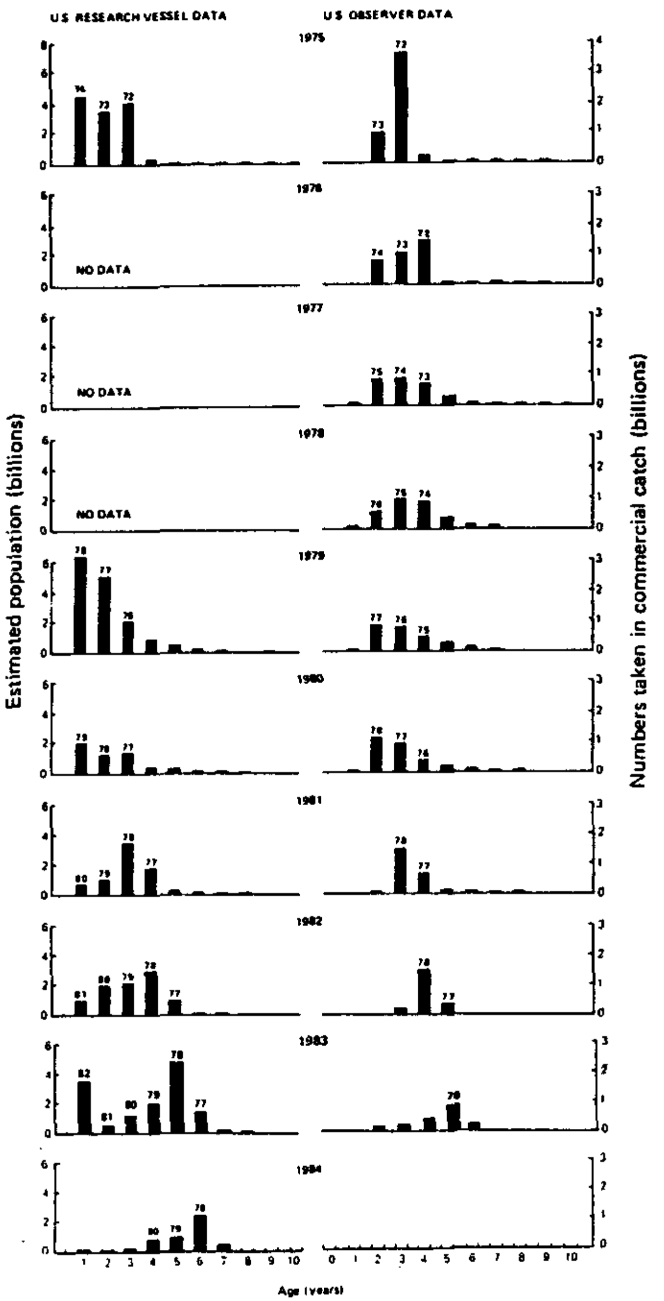
Increases in the abundance of pollock during the 1960s may have been a fairly widespread phenomenon. Alton et al. (1987) present survey data to indicate a substantial increase in the abundance of pollock in the Gulf of Alaska between 1961 and the early 1970s. Kachina and Sergeyeva (1981), cited by Vasil'kov and Glebova (1984), produced evidence of an increase in abundance, during the 1960s of the west Kamchatka shelf population in the Okhotsk Sea, one of the largest populations in the North Pacific.

Abundance trends and year-class strength 1976–1982

Better assessment data became available for pollock during this period. Extensive sample collections of length and age data from the fishery were initiated by the NWAFC Foreign Fishery Observer Program, the NWAFC expanded its survey activity to encompass a major portion of the eastern Bering Sea continental shelf (see lower panel of Fig. 4 for the area usually sampled) and in some years, off-bottom concentrations of pollock were assessed acoustically in conjunction with the bottom trawl surveys. Thus, the quality and quantity of data from the fishery were improved and comprehensive fishery-independent assessments of the population were initiated.

Almost all the evidence suggests that the period from 1976 to 1982 was one of relative stability in the abundance of pollock. Results from the cohort analysis (Fig. 2) indicate that the biomass declined moderately from ~8.5 million

Fig. 4. Density distribution of walleye pollock relative to bottom temperature isotherms as shown by Northwest and Alaska Fisheries Center bottom trawl survey data in 1979 and 1982 (Bakkala and Alton, 1986).



t in 1976 to 7.6 million t in 1978–1979 and then increased to ~10 million t in 1981–1982. Near-average recruitment for most year classes (1973–1977) apparently resulted in the stability of abundance during the 1976–1979 period. The 1978 year class, which appears to be the strongest year class yet observed (Fig. 3), resulted in the increase in abundance between 1979 and 1981–1982. Catch per unit effort (CPUE) estimates from the fishery and surveys were in general agreement with trends shown by the cohort analysis reflecting a rather stable condition in 1976–1982 (Bakkala et al., 1985b).

Biomass estimates from combined results of the bottom trawl and acoustic surveys showed a decline from 11.0 million t in 1979 to 8.8 million t in 1982. However, there was an unusually high abundance of age-1 fish in 1979 (from recruitment of the strong 1978 year class), which accounted for 1.9 million t of the 1979 acoustic–bottom trawl estimate, but which were not included in the estimates from the cohort analysis. Thus, considering only age-2 and older fish, the biomass estimates from the acoustic–bottom trawl survey data indicate stability in abundance between 1979 and 1982, rather than the increase shown by cohort analysis.

CURRENT CONDITION OF THE POPULATION

The population of eastern Bering Sea pollock appeared to be in a period of transition from 1982 to 1984. There was a substantial change in age composition and recruitment was poor, suggesting that the population was entering a period of decline. Age composition data prior to 1982 showed a relatively consistent pattern of principal ages in catches from NWAFC surveys and the fishery (Fig. 5). Survey catches were composed primarily of age groups 1–4 and the fishery catches of ages 2–4 with age-3 pollock usually dominating in the fishery. The abundance of age-5 and older pollock was much lower than that of these younger ages, in both survey and fishery catches during this period. In 1982–1984, this pattern changed because of the strength of the 1978 year class, (which continued to dominate fishery and survey catches through 1983 and 1984 at ages 5 and 6) and the apparently poor recruitment of most year classes since 1978 (Fig. 5).

Data collected during an acoustic and bottom trawl survey in 1985 indicate some (not substantial) decline in abundance after 1982 and some improvement in recruitment. Preliminary estimates from this latest NWAFC acoustic–bottom trawl survey indicate that the population biomass in 1985 was ~8.0 million t. Recruitment of age-1 pollock during 1979–1985, based on bottom trawl survey data, has been as follows:

Fig. 5. Age composition of pollock in the eastern Bering Sea as shown by data from Northwest and Alaska Fisheries Center bottom trawl surveys and by data collected from the commercial fishery by the Center's observer program (Bakkala et al., 1985b). Numbers above the bars indicate the principal year classes.

Year	Year class	Population number estimates (billions)
1979	1978	8.7
1981	1980	1.0
1982	1981	0.9
1983	1982	3.6
1984	1983	0.4
1985	1984	4.5

These preliminary results from 1985 indicate that the population biomass is still relatively high and that the improved recruitment from the 1984 year class may moderate the decline or stabilize the abundance in the immediate future.

CAUSES OF YEAR-CLASS VARIATION

The data presented in this report suggest that the pollock population of the eastern Bering Sea experienced a major increase in abundance during the 1960s and has remained at a high level through the early 1980s. This high level of abundance appears to have resulted from the emergence of a number of strong year classes in the mid- and late 1960s and near or above average recruitment in most years through the 1970s. The reasons for this improved recruitment are unknown, although some hypotheses can be explored as possible causes. Ecosystem modeling (Laevastu and Favorite, 1976; Laevastu and Larkins, 1981), early life history studies (Walline, 1983) and trophic studies (Francis and Bailey, 1983; Dwyer et al., 1986a) have suggested that cannibalism may be important in the regulation of pollock abundance. Dwyer et al. (1986a) have shown that a large portion of the 0-age pollock in the eastern Bering Sea may be removed by cannibalism.

Cannibalism appears to be a logical hypothesis to explain the trends in abundance and year-class strength observed from results of the cohort analysis (Figs. 2 and 3). It might be assumed that the near virgin stock in the early 1960s was dominated by older pollock which, through cannibalism, could have limited the size of incoming year classes. It could be further assumed that as the fishery developed during this period, the abundance of older pollock was reduced, resulting in less cannibalism, the emergence of strong year classes such as those spawned in 1965–1969 (Fig. 3) and an increase in overall population abundance. During the 1970s, the population was dominated by younger (age 2–4 years) fish, which might be less cannibalistic than older pollock. This reduction in the average age of pollock would be assumed to result in a generally more favorable environment for the survival of pollock year classes in the 1970s than during the 1960s and to maintain the overall population abundance at a high level.

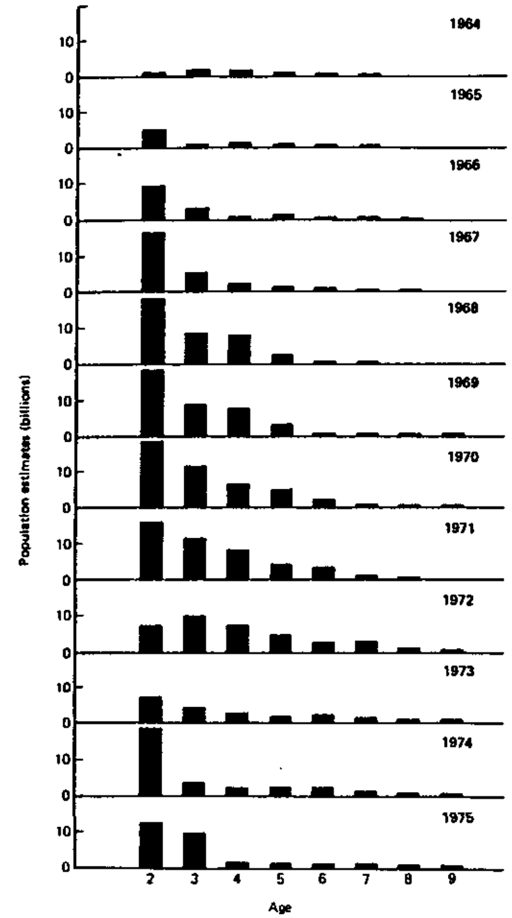


Fig. 6. Population estimates by age group for walleye pollock in the eastern Bering Sea based on cohort analysis, 1964–1975.

Results from the cohort analysis, however, do not indicate that older age groups (4–9-year fish) were abundant in the early 1960s (Fig. 6). Abundance of older pollock was apparently much higher in the late 1960s and early 1970s following the recruitment of the strong 1965–1969 year classes to these age groups. Thus, a reduction in abundance of the older cannibalistic pollock by the early fishery would not appear to explain the increase in abundance of the overall population in the 1960s. Some caution should be taken in rejecting this hypothesis, however, because the reliability of data from this early period is unknown.

Another possible hypothesis to account for the increase in abundance of pollock during the 1960s is that they took up a niche in the ecosystem vacated by other species. Species having similar environmental niches to pollock and showing a major decline in abundance during this period were Pacific herring (*Clupea harengus pallasi*) and Pacific ocean perch (*Sebastes alutus*). Wespestad and Fried (1983) reported that the abundance of herring decreased from ~1.7 million t to 250 000 t between 1963 and the mid-1970s, while Ito (1985) estimated that the abundance of Pacific ocean perch declined from ~200 000 t to 30 000 t in the eastern Bering Sea and from 450 000 to 40 000 t in the Aleutian Islands area between the mid-1960s and mid-1970s. The sum of this decrease in biomass for these two species and regions amounts to ~2.0 million t, whereas, the increase in biomass of pollock may have been as much as six times that amount. Thus, the magnitude of the decline in Pacific herring and Pacific ocean perch would not appear to account for the increase in the pollock population through replacement of niches previously occupied by these two species.

Most of the stronger than average year classes of pollock since the early 1960s were produced in years of positive temperature anomalies in the eastern Bering Sea. Temperature anomalies (Pola-Swan and Ingraham, 1984) were positive in the late 1960s, when the strong 1965–1969 year classes were produced and in the late 1970s when the strong 1978 year class emerged. However, the anomalies were negative when the strong 1972 year class was spawned. Furthermore, strong year classes were not produced in other years of positive anomalies, such as 1979–1981.

Bailey et al. (1986) concluded that temperature alone could not explain recruitment variability in pollock. They suggested that a favorable set of physical factors involving reduced wind mixing leading to a shallow highly stratified mixed layer and a timely phytoplankton bloom may have been responsible for producing the strong 1978 year class. These conditions, in turn, were hypothesized to result in the production and concentration of copepod nauplii corresponding in time with the initial feeding of larval pollock in the spring of 1978. These conditions did not exist in spring 1979, when a lower than average year class was produced. These authors concluded that gross environmental factors may not be successful predictors of recruitment success and that studies of environmental features on a finer scale may be needed to discover causes of year-class fluctuations.

Of the three hypotheses discussed, environmental conditions would appear to be the most likely cause of variable recruitment in pollock. As pointed out by Bailey et al. (1986), however, the role and specific mechanisms of the environment in controlling year-class strength are still to be defined.

DISCUSSION

The systematic collection of assessment data for walleye pollock began in the late 1970s, when the U.S.A. extended its fishery jurisdiction to 200 miles and assumed management of the resource. The approach in assessing the population has been to conduct annual bottom trawl surveys and to incorporate acoustic survey techniques every third year to provide overall assessments of the population at regular intervals. The value of bottom trawl assessments are limited because of the semi-demersal distribution of pollock. However, data from the annual bottom trawl surveys are also used to assess a variety of other species of groundfish and crabs. The acoustic surveys are conducted only every third year in the Bering Sea because of commitments of the NWAFC acoustic program to assess other regional resources in intervening years. In addition, fishery data are used to provide independent assessments of the population through indices of relative abundance and estimates of absolute abundance from cohort analysis.

There appears to be reasonably good correspondence in the magnitude of biomass estimates from the acoustic–bottom trawl surveys and fishery data based on the 2 years of observations available thus far, although a longer time series of survey and fishery assessments is needed to evaluate this properly.

Results of the cohort analysis suggest that year-class strengths and population biomass can fluctuate widely. The strength of year classes at age 2, as shown by the cohort analysis, has varied by a factor of 5 in the recent period of 1977–1982. The analysis also shows that there may have been a similar order of change in overall population abundance. The biomass may have increased from <5 million t and perhaps from as low as 2 million t, at the beginning of the fishery, to >13 million t in the early 1970s. Investigations currently being undertaken at the NWAFC, including those on ecosystem dynamics, early life history and trophic relationships, should help in gaining a better understanding of the dynamics of this important resource.

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Changes in the Abundance and Distribution of Walleye Pollock (*Theragra chalcogramma*) in the Western Gulf of Alaska (1961–1984)

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ABSTRACT

Alton, M.S., Nelson, M.O. and Megrey, B.A., 1987. Changes in the abundance and distribution of walleye pollock (*Theragra chalcogramma*) in the western Gulf of Alaska (1961-1984). *Fish. Res.*, 5: 185-197.

Changes in the abundance and recruitment of western Gulf of Alaska walleye pollock (*Theragra chalcogramma*) during 1961-1984 were examined. Bottom trawl survey CPUE estimates increased between the early 1960s and early 1970s. Independent biomass estimates from acoustic surveys and catch-at-age analyses of foreign and joint venture fisheries indicate that another increase in abundance occurred during 1978-1981, but that stock size has declined since 1981 or 1982. Biomass was estimated at 950 000 metric tons (t) in 1973-1974, 2.3-3.8 million t in 1981 and 1.8 million t in 1984. The fluctuations in stock size reflect substantial changes in year-class strength. These include the occurrence of strong year classes in 1967, 1970, 1972 and 1975-1979. Weak year classes apparently occurred in 1980-1982. Based on spawner-recruit estimates since 1976, pollock recruitment may be strongly density dependent.
It is believed that there has been a shift, since 1977, in the abundance of pollock from the Kodiak-Chirikof area, westward towards the Shumagin Islands.

INTRODUCTION

The objective of this paper is to review the changes that have occurred in the abundance and distribution of western Gulf of Alaska walleye pollock (*Theragra chalcogramma*) since 1961. This species has a continuous geographical distribution that extends from off California, northward to Alaska and westward to waters off the U.S.S.R., Japan and Korea (Bakkala et al., 1986). Stock boundaries over the range have frequently been based on statistical reporting areas rather than on population distinctions. We have defined the 'western Gulf of Alaska' as the region between the Fox Islands and the Kenai

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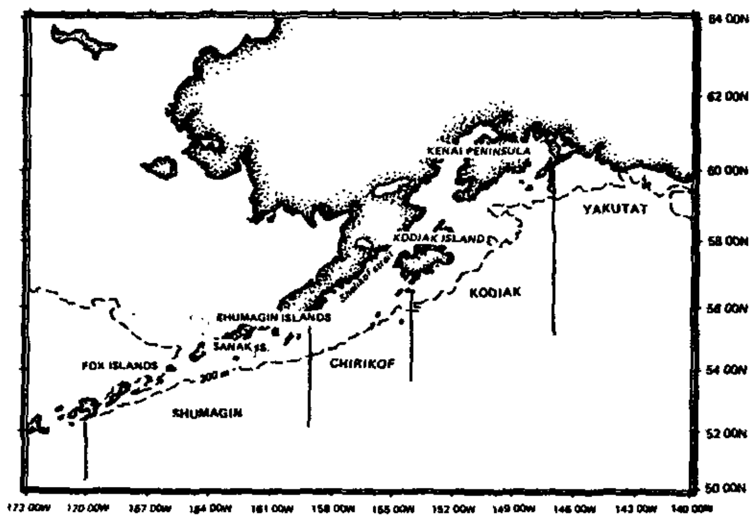

Fig. 1. Western Gulf of Alaska showing INPFC statistical areas and geographical locations.

Peninsula (Fig. 1) and have assumed that pollock within this region can be treated as a single stock.

The information presented in this paper is based on reports by Hughes and Hirschhorn (1979), Alton and Deriso (1983), Nelson and Nunnallee (1985) and Megrey (1986) and on further examination of fisheries and research vessel survey data on the western Gulf of Alaska pollock resource.

CATCH STATISTICS

Prior to 1982, Gulf of Alaska pollock was primarily harvested by fisheries from Japan, the U.S.S.R. and other foreign nations. The most complete time series of reported pollock catches is from the Japanese fisheries, which began in the Gulf of Alaska in 1963. As a member of the *International North Pacific* Fisheries Commission (INPFC), Japan reported annual catches of its fisheries in a prescribed manner — by species, month, gear type and vessel tonnage size for statistical blocks of 1° longitude × 1/2° latitude. When the Magnuson Fisheries Conservation and Management Act was passed in 1977, all foreign nations were required to report their catches by INPFC standards. Before 1977, the U.S.S.R. and other nations, excluding Japan, had reported their catches in the Gulf of Alaska in an inconsistent manner. In fact, there are no adequate estimates of the U.S.S.R. pollock catch for the years 1964–1971 when U.S.S.R. trawl fisheries were very active in the Gulf of Alaska.

In addition to the foreign nations' annual reports, the U.S. Observer Program, which began in 1978, provides estimates of the annual foreign catches of pollock and other groundfish by broad INPFC areas (Fig. 1). These estimates are determined using procedures described by Wall et al. (1981).

Pollock catches by U.S. vessels were of little consequence until the 1980s, when joint ventures[1] began to intensify in the Gulf of Alaska. Estimates of the pollock catch in such fisheries come from the U.S. Foreign Fisheries Observer Program.

LENGTH AND AGE COMPOSITION OF CATCHES

Length and age data come from U.S. observer sampling of foreign and joint venture catches and are available for the years 1976–1984. Length measurements are taken by the observer, when pollock is the target species, from a random sample of ~ 150 fish per day. However, only one age sample is obtained per observer cruise (which usually lasts 1–2 months). This sample consists of otoliths removed from a maximum of five fish per sex per 1-cm length interval. The length and age sampling procedures are described in detail by Nelson et al. (1981b). Following procedures described by Allen (1966), an age–length key assembled from the length-stratified age sample is used to convert length frequency samples to age compositions. Otoliths are read by the ageing unit of the Northwest and Alaska Fisheries Center using methods described by LaLanne (1975).

Estimates of the catch in numbers at age were obtained in a step-wise manner, beginning with weighting the age composition of samples from a specific nation, vessel class, sub-area and time period by the catch and then summing as required to obtain the annual catch at age by the nation and sub-area (Alton and Deriso, 1983).

RESEARCH SURVEYS

In the early 1960s, the International Pacific Halibut Commission (IPHC) conducted bottom trawl surveys throughout the Gulf of Alaska to obtain estimates of the abundance of halibut relative to other bottomfish in order to estimate the impact of a bottom trawl fishery on the halibut stock (International Pacific Halibut Commission, 1964). U.S. commercial trawlers of 200–300 horsepower were chartered for the survey and all used a commercial type trawl (400-mesh eastern). Trawl stations were pre-determined and systematically arranged for depth and area coverage. The duration of trawling at each station was 1 h. Only data from the 1961 surveys are used in this report because the

[1]A joint venture is an arrangement between U.S. and foreign interests, in which U.S. vessels catch and sell fish to foreign processing vessels operating in the fishery conservation zone (FCZ).

coverage by season and area that year was comparable to that of surveys conducted by the National Marine Fisheries Service (NMFS) during 1973–1975.

The 1973–1975 NMFS surveys were confined to the western Gulf of Alaska and were aimed at assessing the abundance of pollock and other bottomfish (Hughes and Hirschhorn, 1979). These surveys were conducted using the NOAA research vessel "John N. Cobb", a vessel similar in size and horsepower to the trawlers used for the 1961 IPHC surveys. Trawl stations were selected randomly within broad bottom-depth strata (~100-m intervals from 50 to 450 m). The same type of trawl used during the earlier IPHC surveys was employed. However, trawling duration was 1/2 h rather than 1 h as in the IPHC surveys.

Acoustic and midwater trawl surveys (hereafter referred to as acoustic surveys) of pollock in the western Gulf of Alaska began in 1980, following recognition of the unusually large aggregation of spawning pollock in Shelikof Strait (Nelson et al., 1981a). These surveys, which are designed to estimate the biomass and age composition of spawning pollock in the Strait area, continued in 1981, 1983 and 1984. In 1983 and 1984, acoustic surveys were also conducted outside Shelikof Strait in an attempt to locate other pollock spawning areas in the western Gulf. The design of the surveys and the methods of collecting and analyzing the acoustic and biological data are described by Nelson et al. (1981a), Nunnallee et al. (1982) and Nelson and Nunnallee (1985). All echo-integrator data on the Shelikof pollock have been scaled to estimates of density, using an average target strength of -31.3 dB kg^{-1}. This estimate is based on Bering Sea pollock target strength measurements reported by Traynor and Williamson (1983). Biomass estimates were obtained by multiplying average density per unit surface area by the area surveyed. Age-specific biomass and population estimates were calculated using length frequency data, survey-specific length–weight relationships and age–length keys.

STOCK DELINEATION

The actual relationships among Gulf of Alaska pollock stocks and between Gulf and Bering Sea stocks are not clear. Biochemical genetic studies by Grant and Utter (1980) revealed some distinction between pollock of the Bering Sea and those sampled off the Kenai Peninsula and in the eastern Gulf of Alaska. One sample of pollock from the Shelik of Strait area showed more affinity with Bering Sea pollock than with fish from off the Kenai Peninsula and the eastern Gulf of Alaska. These results suggest an east vs. west separation of pollock in the vicinity of Kodiak Island. This is in agreement with Hughes and Hirschhorn (1979), who also found evidence of such a separation based on regional differences in recruitment and mean size at age for two year classes. However, we have treated the pollock of the western Gulf of Alaska as one stock because of evidence from acoustic surveys (Nelson and Nunnallee, 1985) and ichthyoplankton surveys (Dunn et al., 1984) that most pollock of the region spawn in one locality, Shelikof Strait.

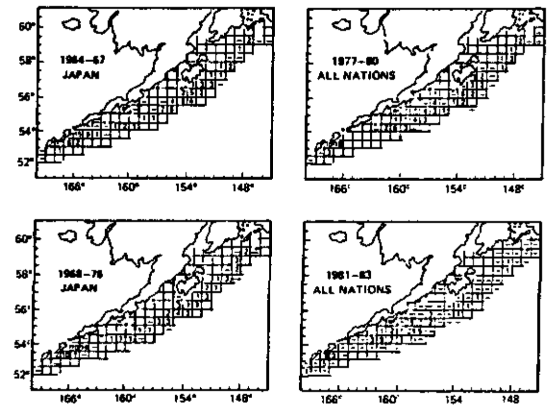

Fig. 2. Geographical distribution (percent of total removals) of pollock catch by the foreign nations trawl fisheries in the western Gulf of Alaska, 1964–1983. A dash refers to < 1% of total removals.

RESULTS

1961–1976

Between 1962 and 1971, foreign trawlers in the Gulf of Alaska targeted mainly on rockfish, particularly Pacific ocean perch (*Sebastes alutus*); pollock were a minor part of the total catch until 1972. Rockfish apparently were an important component by weight in the bottomfish community during the 1960s, as indicated by the results of bottom trawl surveys (Alverson, 1968) and by their importance in the foreign fisheries (Chikuni, 1970). Since the distributions of *adult Pacific ocean perch and pollock overlap, we assume that much of the* pollock taken by the fisheries in the 1960s was by-catch. The average annual pollock catch by Japan during the peak years of the rockfish fisheries was ~5000 t. Japanese fishing was concentrated in the Chirikof–Kodiak region and south of the Fox Islands, where pollock by-catch was highest (Fig. 2). The size of the pollock by-catch in the intense U.S.S.R. rockfish fishery prior to 1971 is unknown.

The 1972 catch of pollock by foreign fisheries was almost four times larger than the 1971 catch (Table I). Whether this was because of a declining rockfish resource or due to an increase in pollock abundance is not known. The annual pollock catch continued to increase through the 1970s.

TABLE I

Catch (1000 t) of pollock in the Gulf of Alaska, by fishery category, 1971–1984[a]

Year	Fishery category			
	Foreign	Joint venture	Domestic	Total
1971	9.5	0	?	9.5
1972	34.1	0	?	34.1
1973	36.8	0	?	36.8
1974	61.9	0	?	61.9
1975	59.5	0	?	59.5
1976	86.5	0	?	86.5
1977	117.8	0	0.2	118.0
1978	96.3	0	1.0	97.3
1979	103.8	0.6	2.0	106.4
1980	113.0	1.1	0.9	115.0
1981	130.3	16.8	0.6	147.7
1982	92.6	73.9	2.2	168.7
1983	81.4	134.1	0.1	215.6
1984	99.3	207.1	0.3	306.7

[a]Sources: Foreign and joint venture catches: Berger et al., 1986. Domestic catches 1978–1980: Rigby, 1984. *Domestic catches 1981–1984*: Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, 305 State Office Building, 1400 SW Fifth Avenue, Portland, OR 97201, U.S.A.

NMFS surveys of 1973–1975 revealed that pollock was a dominant species in the bottomfish community of the western Gulf of Alaska and that its abundance was significantly higher than indicated by IPHC surveys conducted 12–14 years earlier (Ronholt et al., 1978). As indicated in Table II, the 1973–1975 catch per standard tow was 4 to 24 times greater than that of the earlier IPHC surveys in 1961, even without correcting for the difference in tow duration between the two survey periods.

The 1973–1975 surveys provided a crude first estimate of the exploitable biomass (age 3 and older) of pollock in the western Gulf of Alaska. A range was estimated by assuming that the catchability coefficient of the survey trawl was 1.0 for a minimum value of biomass (0.95 million t) and 0.5 for a maximum value (1.90 million t) (Alton and Deriso, 1983). The 1973–1975 surveys also indicated that the 1967, 1970 and 1972 year classes were relatively more abundant than the 1968, 1969 and 1971 year classes (Hughes and Hirschhorn, 1979).

1977–1984

The estimates of the exploitable biomass derived from the 1973–1975 survey results provided a basis for determining a corresponding range of equilibrium yield of 152 000–305 000 t (Alton and Deriso, 1983). The annual allowable catch for 1977 was conservatively set at the lower value. In that year, the catch rose sharply *to 118 000 t, as foreign trawlers intensified their efforts on pollock* (Table I).

TABLE II

Comparison of pollock catch rates between 1961 International Pacific Halibut Commission and 1973–1975 NMFS *research trawl surveys. Catch rates are only from those stations that were* located at bottom depths between 100 and 300 m

Region	Period	Number of *stations*	Catch per standard haul (*kg*)[a]	*F* (df)
Kodiak				
(151°–154° W. long)	July–Sept. 1961	16	123	4.7* (1,35)
	July–Sep. 1973	21	494	
Chirikof				
(154°–159° W. long)	June–July 1961	46	37	4.3* (1,71)
	June–July 1975	27	417	
Shumagin				
(159°–167° W. long)	July–Aug. 1961	44	19	10.7* (1,78)
	July–Aug. 1974	36	454	

[a]For the 1961 surveys a standard tow was 1.0 h in duration and for surveys in 1973–1975 the duration was 0.5 h.
*Significant at the 95% level.

In 1981, the pollock catch approached the allowable catch of 152 000 t. Although there were relatively few years of catch-at-age data (1976–1981), *Alton and Deriso (1983) performed a catch-at-age analysis using a modified* version of the method described by Doubleday (1976). The model provided a good fit between observed and predicted annual catch at age and indicated that exploitable biomass and surplus production had increased sharply between 1978 and *1979 and continued to increase in 1980 and 1981. Average annual exploit*able biomass for the period 1976–1981 was estimated at 1.040 million t.

When 1982 data became available and included in the catch-at-age analysis, poor correspondence between observed and predicted catch at age resulted. This was attributed to changes that had occurred *in age-specific selectivity* during 1982. Changes in selectivity were also found by Megrey (1986) when 1983 data were included in a later analysis. Megrey (1986) applied three different catch-at-age models to 1976–1983 catch-at-age data. Results were similar for all models and showed the same sharp *1979–1981 rise in pollock* abundance found by Alton and Deriso (1983). However, abundance declined in 1983. This decline is also reflected in independent biomass estimates taken from acoustic surveys of pre-spawning and spawning fish in Shelikof Strait in

TABLE III

Changes in biomass (million t, age 3 and older) of western Gulf of Alaska pollock as estimated by (1) catch-at-age analysis using two values of natural mortality (M) (Megrey, 1986) and (ii) acoustic trawl surveys (Nelson and Nunnallee, 1986)

Year	Estimates from catch-at-age analysis with 95% confidence interval		Acoustic trawl survey estimate with 95% confidence interval
	$M=0.32$	$M=0.40$	
1976	0.74±0.07	0.95±0.09	
1977	0.64±0.07	0.80±0.09	
1978	0.96±0.14	1.12±0.17	
1979	1.65±0.30	1.85±0.35	
1980	2.08±0.39	2.17±0.43	
1981	2.46±0.50	2.29±0.48	3.77±0.91
1982	2.63±0.54	2.23±0.47	No survey
1983	2.23±0.49	1.71±0.39	2.43±0.74
1984			1.84±0.63

1983 and 1984 (Table III). The decline did not appear to result from a change in distribution, because surveys outside the strait during the same period in 1983 and 1984 did not detect any substantial concentrations of pollock. The decline of pollock is attributed, in part, to the fact that the 1980 year class was below average in abundance. As 4-year-olds, this year class was poorly represented in samples from both the commercial catch and the acoustic survey in 1984 (Alton, 1985; Nelson and Nunnallee, 1985). This was the first time that 4-year-old fish were a relatively minor component in the Shelikof pollock fisheries (Fig. 3). In addition, findings from the 1985 acoustic survey (Nelson and Nunnallee, 1986), indicated that the 1981 and 1982 year classes were poorly represented in the population.

The results of catch-at-age analysis (Megrey, 1986) and acoustic survey estimates (Nelson and Nunnallee, 1985) show that pollock biomass had increased substantially, starting in 1979, peaked in 1981 or 1982 and is currently declining (Table III). The increase in abundance is attributed to a succession of five abundant year classes (1975–1979) that followed the weak year classes of 1973 and 1974. The population estimates of age 3 fish for these exceptional year classes range from 1.2 to 2.1 billion, 4–10 times the estimated number of 3-year-olds from the 1973 and 1974 year classes (Megrey, 1986). The 1980 year class is considered comparable in size to the weak 1973 and 1974 year classes. In 1984, the pollock biomass in the western Gulf of Alaska was comprised of mainly fish of the 1978 and 1979 year classes.

The rise in pollock abundance since 1978 has coincided with changes in the geographical distribution of the foreign pollock catch. Before 1977, catches were primarily from the Fox Island and Chirikof–Kodiak regions. During

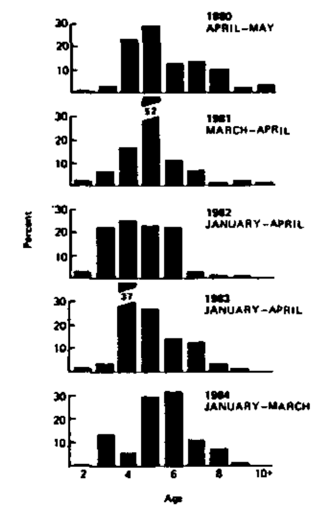

Fig. 3. Age composition of pollock in joint venture catches from the Shelikof Strait region, 1980–1984.

1977–1980, catches south and east of Shumagin Islands increased and by 1981–1983, ~75% of the total foreign pollock catch came from there (Fig. 2). Preliminary fisheries information for 1984 suggests that the Chirikof–Kodiak grounds are resuming their importance in the foreign pollock fisheries. Most of the foreign pollock catch is taken in the late summer and autumn.

Coincident with this geographical shift of the foreign pollock harvest, has been the development of joint venture fisheries targetting mainly on pollock. Such fisheries have been centered in Shelikof Strait on pre-spawning and spawning pollock during January–April. In 1983 and 1984, the joint venture fisheries catch exceeded that of the foreign fisheries (Table I).

DISCUSSION

It is apparent that since 1961, five important changes have occurred with respect to the western Gulf of Alaska pollock resource. These are: (i) the substantial increase in stock size between the early 1960s and 1973–1975, which resulted largely from the success of the 1967, 1970 and 1972 year classes, (ii) the succession of five abundant year classes (1975–1979) that caused an exceptional increase in pollock abundance during 1978–1982, i.e., to a level about four times that of the mid-1970s. (iii) the abundance decline observed since