

## 2013 Stomach Sampling (scan & collection) In the Gulf of Alaska

Six people associated with REFM's Resource Ecology and Ecosystem Modeling (Food habits lab) Program will be participating in RACE's summer trawl survey in the Gulf of Alaska in 2013. They will **do stomach scans and collect Pacific halibut stomachs on both 1 and boat 2.**

**Species and numbers of stomachs to be scanned on boat 1: see Table 1.**

**Species and numbers of stomachs to be scanned on boat 2: see Table 2.**

**Pacific halibut stomachs to be collected on boat 1: see Table 3.**

**Pacific halibut stomachs to be collected on boat 2: see Table 4.**

**Stomach scan procedure on board boat 1 and boat 2.**

1. At every haul, after the catch has been dumped in the bin and the major species in the catch are evident, choose the species from **Table 1 or 2** (a waterproof copy would be provided and should be put around the Food Habits specimen table). The species should be abundant enough for stomach sampling purposes (about 1 full basket). Set the baskets in a cool, shaded area until the rest of the catch has been processed.
2. Do **eight** stomachs per haul (by following the sampling plan in Table 1 or 2, the numbers needed for each species of each size group in each depth and region). Make a tally (use Excel spread sheet) of what you have done in Table 1 or 2 (by strata, predator species, and the size groups). At the end of your leg, fill in your collections in Table 1 and Table 2 and pass that information onto the next stomach person.
3. Individual fish should be checked for signs of regurgitation (i.e., food items in mouth or gills and/or a flaccid stomach). If the fish is determined to have regurgitated, select another fish from the sample.

4. Record your name, date, predator name, vessel (e.g. 143=Sea Storm), cruise (201301), haul number, and depth.
5. Record specimen numbers: starts from 1 in each haul for each predator species throughout your leg (e.g. pollock specimen numbers, 1-10, Haul 5).
6. Record fork length in whole cm (right-justified).
7. Record sex (1=males, 2=females, 3=Unknown) and maturity (1=spawning, 0=not spawning) on the scan form.
8. Open the stomach from esophagus to pyloric caeca, and note the fullness from 1 to 7 (1=E=empty, 2=Tr=trace, 3=<25% full, 4=25-50% full, 5=51-75% full, 6=76-100% full, 7=distended).
9. Weigh the total stomach content weight to the nearest 0.5 gram. If the stomach appears to weigh more than 3kg, use RACE scales that have a higher capacity.
10. After measuring the stomach content weight, dump the stomach contents into a larger container (e.g. a tub, a beaker, or a Petri-dish) and add enough water to separate individual prey item by using forceps to stir the stomach contents around. (This procedure is important because it will separate most the digested greasy mush from the prey items and let you identify the prey much easier). Some stomachs may contain excess mucous, the sieve can be used to rinse the contents and isolate the solid prey parts. The excess mucous should be included in the total stomach contents weight.
11. Record prey common names on the scan form, add prey code when you have time or when you are back Seattle
12. Weigh prey fish and the commercially important crabs. Enter the weight in the Prey Name column along with the prey name. Convert the prey weight to % volume when you have time.
13. Treat the rest of the stomach content as a 100% sub-sample and estimate the percent volume of each prey

item in the prey name area. Extrapolate these prey volumes after you converted the prey fish and crab weights to % volume, and then record the value in the columns for % vol; these should add up to 100%.

14. Record the state of digestion of each prey item by using code numbers from 1-6 (1=empty, 2=trace, 3=<50% intact, 4=50-75% intact, 5=75-100% intact, 6=no digestion).
15. Record the number of prey fish and commercially important crabs and estimate the number of other prey.
16. Record prey size when possible, for all fish prey and commercially important crabs. Measure standard length for fish, carapace length for King crabs, and carapace width for *Chionoecetes* spp. and Korean horse hair crabs. Measure the mantle length of squids. Use extra lines if there are more than three measurable prey items in the category. If pollock are highly digested and otoliths are found in the stomachs, measure the otolith length with calipers, record it on the form then make a remark in front of the record to remind you that you need to convert the otolith length to the pollock standard length when you get back to the lab in Seattle.
17. Repeat the above steps for each stomach scanned in the haul. Use the back of the form as well, but only for the same species. Use new scan forms for each different species per haul. Put the forms in a three-hole binder.
18. For all the unidentifiable fish, the unidentified commercially important crab and shrimp, give a voucher number in front of the record, preserve the fish by putting it in a stomach bag with a specimen label showing the vessel, cruise, haul, predator name, specimen number, and prey voucher number (write in the comments space). Unidentifiable prey should be preserved individually in Bags. Put these bags in the wax box marked with 'Food habits lab'. Store the wax box in the freezer. These

frozen specimens will be used for "genetic identification".

**Beginning and End of the Leg:**

1. If you are the first one to do the stomach scan, copy Table 1 or 2 (the numbers of the stomachs to be scanned) from a floppy disc (or a CD) to the survey computer on board.
2. At the end of each leg, enter your number of collections (by Species, region, depth, and size groups) to the Excel file in the computer, so the next person knows what he/she should do for the next leg.
3. At the end of the leg, bring back the finished scan forms with you.
4. Bring back the cooler (or wax box) with you. The cooler (or wax box) should be shipped back as a frozen package.
5. Clean and dry the sampling equipment.
6. If you are on the last leg of a survey, refer to the End of Survey Checklist and pack the equipment. The equipment should be brought back with the RACE supply.

**Pacific halibut Stomach collection procedure on boat 1 and boat 2**

1. At every haul, select Pacific halibut as needed from **Table 3** (for boat 1) and **Table 4** (for boat 2).
2. Stomachs will be preserved individually in bags placed in 10% buffered Formalin solution. To make the Formalin solution, add sea water into the 5 gallon bucket about half full, then add one liter 37% of Formalin (i.e. 100% full strength of Formaldehyde) in the bucket. add one rounded 1/8 cup of baking soda per bucket.
3. Individual fish should be checked for signs of regurgitation (i.e., food items in mouth or gills and/or a flaccid stomach) and net feeding (e.g. a prey fish stuck out of the mouth). If no such signs, collect this stomach.
4. If the fish is determined to have regurgitated, select another fish from the sample. If the fish has a truly empty stomach (non-regurgitated), then that sample should be kept.
5. Put the collected stomach in a cloth bag. Each bag should contain a specimen label, which

notes the species, cruise, haul, and specimen number. A specimen form is also filled out for each species sampled at a station which should list species, cruise, haul (and depth), size, and sex, spawning condition, and specimen number of each fish sampled for stomach content analysis (individual fish weight does not have to be taken).

6. Use a pencil to mark what you collected on the plastic-coated tally sheet.
  7. Put stomachs of Pacific halibut in the bucket.
  8. Use the broken lids (used) to cover the bucket each time you add some stomach collections into it. Mark the species name on the broken lids. Seal the bucket (by using the unbroken lid) only till the bucket is full or till the end of the cruise. Use the permanent mark pen to write the species name, vessel, the address (Alaska Fisheries Science Center, Food Habits Lab, Bldg. 4, 7600 Sand Point Way NE, Seattle, WA 98115-0070) on the unbroken lid each time you seal a bucket.
  9. Put the finished specimen forms in a binder. At the end of your leg, bring back the specimen forms to Mei-Sun.
10. At the end of the survey (the end of the 3rd leg), unload collected buckets from the vessel in Ketchikan. If there is space available in the RACE van, load on the van. If there is no space available in the RACE van, contact Geoff Lang to make shipment through Alaska Marine Lines (800-326-8346).

**Equipment to be loaded on boat 1 and boat 2 for stomach collection (for each boat)**

1,000 Specimen labels	1 clipboard
400 Specimen forms	4 knives
25 Five-gallon buckets w/unbroken lids	2 broken lids
7 gallons Formalin	4 cups baking soda
3 wax box (freezer box)	1 measuring cup
plastic bags	4 pair forceps
1,000 stomach bags (200 small, 600 medium, 200 large)	
2 markers	

**Equipment to be loaded on boat 1 and boat 2 for stomach scanning (for each boat)**

500 Specimen labels	1 clipboard
1120 Scan forms (2-sided)	2 knives
300 stomach bags (150 small, 150 medium)	1 sieve (333 micron)
1 magnifying glass	1 sieve (1.0 mm)
4 pair forceps	1 power receptacle
2 permanent markers	2 25' extension cord
4 beakers (500 ml)	2 squirt bottles
10 large Petri-dish	1 electrical tape
10 small petri-dish	2 measuring tape
2 blue plastic tub	2 scalpel handles
1 specimen table	10 scalpel blades
1 digital scale	1 scale screen
1 splicing tape self-fusing	2 caliper
2 hemostats	1 trauma shears
1 outlet adapter	50 plastic bags (small)
1 freezer boxes	1 three-hole binder

**End of the Survey Checklist**

Please do the following things at the end of the survey:

1. Clean and dry all stomach sampling gear, especially pay attention to the electronic scale.  
Pack all sampling gear, store in the tote, and load into the van for transportation.
2. Make sure that all of your frozen samples have been taken care.  
Make shipping arrangement if necessary and contact Geoff.

Table 1. Number of stomachs to be scanned on boat 1 in 2013 GOA RACE summer trawl survey, by 15 strata, and predator sizes

Subareas	Shumagin (170 <sup>0</sup> -159 <sup>0</sup> W)			Chirikof (159 <sup>0</sup> -154 <sup>0</sup> W)			Kodiak (154 <sup>0</sup> -147 <sup>0</sup> W)			Yakutat (147 <sup>0</sup> -140 <sup>0</sup> W)			Southeast (140 <sup>0</sup> -130 <sup>0</sup> W)			Total
	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	
Depth (m)	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	
Expected stations	44	16	12	34	15	4	50	49	11	7	13	4	4	7	10	280
Expected stomachs	352	128	96	272	120	32	400	392	88	56	104	32	32	56	80	2240
<b>Species</b>																
<b>Walleye pollock</b>																
< 30 cm	10	5	5	5	5	0	15	15	5	5	5	0	5	5	5	90
30-44 cm	25	10	5	20	10	5	25	25	5	5	10	5	5	5	5	165
45-54 cm	25	10	5	20	10	5	25	25	5	5	10	5	5	5	5	165
≥ 55 cm	25	10	5	20	10	5	25	25	5	5	5	5	0	5	5	155
<b>subtotal</b>	<b>85</b>	<b>35</b>	<b>20</b>	<b>65</b>	<b>35</b>	<b>15</b>	<b>90</b>	<b>90</b>	<b>20</b>	<b>20</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>20</b>	<b>20</b>	<b>575</b>
<b>Pacific cod</b>																
< 30 cm	20	5	5	10	5	0	20	20	5	5	5	0	5	0	0	105
30-44 cm	25	10	5	20	10	5	25	20	5	5	10	5	0	10	5	160
45-59 cm	25	10	5	20	10	5	25	20	10	5	10	5	0	10	5	165
≥ 60 cm	25	10	10	20	10	5	25	20	10	5	10	5	0	10	5	170
<b>subtotal</b>	<b>95</b>	<b>35</b>	<b>25</b>	<b>70</b>	<b>35</b>	<b>15</b>	<b>95</b>	<b>80</b>	<b>30</b>	<b>20</b>	<b>35</b>	<b>15</b>	<b>5</b>	<b>30</b>	<b>15</b>	<b>600</b>
<b>Atf + Kf</b>																
< 30 cm	30	10	10	25	10	5	30	30	10	10	10	5	5	5	10	205
30-49 cm	30	10	10	25	10	5	30	30	10	10	10	5	5	5	10	205
≥ 50 cm	30	10	10	25	10	5	30	30	10	10	10	5	5	5	10	205
<b>subtotal</b>	<b>90</b>	<b>30</b>	<b>30</b>	<b>75</b>	<b>30</b>	<b>15</b>	<b>90</b>	<b>90</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>615</b>
<b>Pacific ocean perch</b>																
all size	50	40	30	50	40	10	50	50	30	10	40	10	10	10	20	450
<b>Total</b>	<b>320</b>	<b>140</b>	<b>105</b>	<b>260</b>	<b>140</b>	<b>55</b>	<b>325</b>	<b>310</b>	<b>110</b>	<b>80</b>	<b>135</b>	<b>55</b>	<b>45</b>	<b>75</b>	<b>85</b>	<b>2240</b>

Table 2. Number of stomachs to be scanned on boat 2 in 2013 GOA RACE summer trawl survey, by 15 strata, and predator sizes

Subareas	Shumagin (170 <sup>0</sup> -159 <sup>0</sup> W)			Chirikof (159 <sup>0</sup> -154 <sup>0</sup> W)			Kodiak (154 <sup>0</sup> -147 <sup>0</sup> W)			Yakutat (147 <sup>0</sup> -140 <sup>0</sup> W)			Southeast (140 <sup>0</sup> -130 <sup>0</sup> W)			Total
	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	
Depth (m)	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	
Expected stations	42	14	9	20	35	18	23	40	15	5	14	18	3	6	8	270
Expected stomachs	336	112	72	160	280	144	184	320	120	40	112	144	24	48	64	2160
<b>Species</b>																
<b>Walleye pollock</b>																
< 30 cm	10	5	5	5	5	5	5	10	5	5	5	5	5	0	0	75
30-44 cm	25	5	5	20	20	5	20	25	5	5	10	5	5	5	5	165
45-54 cm	25	10	5	20	20	5	20	25	5	5	10	5	0	5	5	165
≥ 55 cm	25	5	5	20	20	5	20	25	5	0	5	5	0	5	5	150
subtotal	85	25	20	65	65	20	65	85	20	15	30	20	10	15	15	555
<b>Pacific cod</b>																
< 30 cm	20	5	5	10	5	0	20	20	5	5	5	0	5	0	0	105
30-44 cm	25	10	5	20	10	5	25	20	5	5	10	5	0	10	5	160
45-59 cm	25	10	5	20	10	5	25	20	10	5	10	5	0	10	5	165
≥ 60 cm	25	10	10	20	10	5	25	20	10	5	10	5	0	10	5	170
subtotal	95	35	25	70	35	15	95	80	30	20	35	15	5	30	15	600
<b>Atf + Kf</b>																
< 30 cm	30	10	5	20	25	10	25	30	10	5	10	10	5	5	5	205
30-49 cm	30	10	5	20	25	10	25	30	10	5	10	10	5	5	5	205
≥ 50 cm	30	10	5	20	25	10	25	30	10	5	10	10	5	5	5	205
subtotal	90	30	15	60	75	30	75	90	30	15	30	30	15	15	15	615
<b>Pacific ocean perch</b>																
all size	50	40	20	40	50	30	20	50	30	10	40	30	10	10	20	450
<b>Total</b>	<b>320</b>	<b>130</b>	<b>80</b>	<b>235</b>	<b>225</b>	<b>95</b>	<b>255</b>	<b>305</b>	<b>110</b>	<b>60</b>	<b>135</b>	<b>95</b>	<b>40</b>	<b>70</b>	<b>65</b>	<b>2220</b>

Table 3. Number of Pacific halibut stomachs to be collected on boat 1 in 2013 GOA RACE summer trawl survey, by 15 strata, and predator sizes

Subareas	Shumagin (170 <sup>0</sup> -159 <sup>0</sup> W)			Chirikof (159 <sup>0</sup> -154 <sup>0</sup> W)			Kodiak (154 <sup>0</sup> -147 <sup>0</sup> W)			Yakutat (147 <sup>0</sup> -140 <sup>0</sup> W)			Southeast (140 <sup>0</sup> -130 <sup>0</sup> W)			Total
	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	
Strata																
Depth (m)	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	
Expected stations	44	16	12	34	15	4	50	49	11	7	13	4	4	7	10	280
Species																
Pacific halibut																
< 40 cm	15	10	0	15	10	0	15	15	0	5	5	0	5	5	0	100
40-69 cm	45	30	20	45	30	10	50	45	15	15	25	10	10	15	15	380
≥ 70 cm	25	20	20	25	20	10	25	25	15	15	20	10	10	15	15	270
<b>Total</b>	<b>85</b>	<b>60</b>	<b>40</b>	<b>85</b>	<b>60</b>	<b>20</b>	<b>90</b>	<b>85</b>	<b>30</b>	<b>35</b>	<b>50</b>	<b>20</b>	<b>25</b>	<b>35</b>	<b>30</b>	<b>750</b>

Table 4. Number of Pacific halibut stomachs to be collected on boat 2 in 2013 GOA RACE summer trawl survey, by 15 strata, and predator sizes

Subareas	Shumagin (170 <sup>0</sup> -159 <sup>0</sup> W)			Chirikof (159 <sup>0</sup> -154 <sup>0</sup> W)			Kodiak (154 <sup>0</sup> -147 <sup>0</sup> W)			Yakutat (147 <sup>0</sup> -140 <sup>0</sup> W)			Southeast (140 <sup>0</sup> -130 <sup>0</sup> W)			Total
	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	Shelf	Gully	Slope	
Strata																
Depth (m)	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	<100	100-199	≥200	
Expected stations	42	14	9	20	35	18	23	40	15	5	14	18	3	6	8	270
Species																
Pacific halibut																
< 40 cm	15	10	0	10	15	0	10	15	0	5	5	0	5	5	0	95
40-69 cm	50	20	20	40	45	20	40	50	15	10	20	20	5	10	15	380
≥ 70 cm	25	20	20	20	25	20	25	25	15	10	20	20	5	10	15	275
<b>Total</b>	<b>90</b>	<b>50</b>	<b>40</b>	<b>70</b>	<b>85</b>	<b>40</b>	<b>75</b>	<b>90</b>	<b>30</b>	<b>25</b>	<b>45</b>	<b>40</b>	<b>15</b>	<b>25</b>	<b>30</b>	<b>750</b>

## **Formalin Handling Procedures.**

### **Formalin Handling Protocol**

- Formalin is a relatively hazardous chemical and must be handled appropriately to ensure your safety. You are dealing with a small quantity of formalin and if these guidelines are followed your exposure will be well below established safe exposure levels.
- Read the Material Safety Data Sheet (MSDS) before using formalin to understand its properties.
- ALWAYS wear gloves, rain gear, and goggles/safety glasses when directly using formalin.
- ALWAYS use formalin on an open deck---DO NOT use below decks or in your cabin.
- Inform captain and crew that you have formalin onboard, where it is stored, location of Material Safety Data Sheets (MSDS), potential hazards, and what to do in case of spill.
- IF spilled--this is a small enough quantity to dilute with water and wash overboard.
- Add formalin to bucket that is already half full with seawater, rather than adding seawater to the formalin. This will ensure that the formalin is quickly diluted, and will lessen the chance of getting formalin splashed on you.
- Use extreme caution when adding formalin to bucket with seawater, hold the bucket lid over as much of the bucket as possible while pouring the formalin, creating a 'shield'.
- IF formalin comes into contact with your skin or eyes—rinse immediately, and thoroughly, with water for 15 minutes as per MSDS.
- IF ingested--consume large quantities of water, do not induce vomiting, seek medical attention as soon as possible as per MSDS.
- IF overcome by fumes--move to fresh air, administer oxygen if necessary and available as per MSDS.

### **Where to Keep Formalin Onboard?**

- Formalin should be stored in a well ventilated space. 100% formalin should be stored at or above, below this temperature it will lose its potency as a component of the formalin precipitates from the solution. Pure formalin is considered a flammable material and should be stored in an appropriate flammable storage area until it has been diluted as described above. Once diluted to a 10% solution, formalin can, and should be stored on a weather deck if possible. It won't freeze.
- It is best to store your bucket securely tied to an immobile object. Leave the bucket in place and carry samples to the bucket after you are done with your sampling. This will avoid the potential of spilling formalin in the factory and will keep the formalin away from fish processing operations.
- Do not to submerge your gloves in the formalin when you add samples to the bucket. If the samples float, use a pair of forceps or some other sampling tool to submerge the samples. Rinse with water after formalin contact.
- Anytime formalin gets spilled and/or inadvertently comes into contact with any object other than your samples, flush the object or area with plenty of water.

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## INTERNATIONAL PACIFIC HALIBUT COMMISSION

ESTABLISHED BY A CONVENTION BETWEEN CANADA  
AND THE UNITED STATES OF AMERICA

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To Whom It May Concern:

The Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division (National Marine Fisheries Service) is authorized to capture and retain for scientific purposes up to 800 halibut (*Hippoglossus stenolepis*) per year in each of three areas, using research trawls, handlines, or longlines, during the calendar years 2011 through 2015. The place of and manner of capture will be determined in accordance with the Center's research plans concerning food habits and will include the areas of the eastern Bering Sea, Gulf of Alaska, and Aleutian Islands. Collection may be from research vessels or by research staff aboard domestic commercial fishing vessels. The principal investigator for this study is Dr. Kerim Aydin.

Halibut obtained under this permit may not be retained for purposes other than scientific research and may not be sold. Halibut captured in excess of the limits specified in this permit must be returned to the sea with a minimum of delay and injury.



Bruce M. Leaman, Ph.D.  
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