Species Identification Manual

Compiled by the staff of the
Fisheries Monitoring and Analysis Division
Alaska Fisheries Science Center
National Marine Fisheries Service
Seattle, Washington

Revised
January 2015
Contents of the Species Identification Manual

- Wanted – List of Species Requiring Confirmation............ (1 page)
- Fish Identification: Methods and Definitions............... (5 pages)
- Key to Jawless and Cartilaginous Fishes...................... (2 pages)
- Key to Families of Bony Fishes................................. (17 pages)
- Key to Selected Sculpins........................................... (3 pages)
- Key to Flatfishes ..................................................... (12 pages)
- Key to Cods................................................................ (2 pages)
- Key to Salmonids...................................................... (3 pages)
- Field Guide to Skates............................................... (15 pages)
- Key to Crabs............................................................... (10 pages)
- Guide to Corals and Other Invertebrates ....................... (7 pages)
- Color Field Guide to Pacific Salmon............................ (4 pages)
- Sex Determination in Fishes ..................................... (6 pages)
- Maturity Determination in Skates............................... (1 page)
- Stomach Sampling Methods ..................................... (2 pages)
- Pollock Maturity Codes.............................................. (2 pages)
- Pacific Cod Maturity Codes....................................... (2 pages)
- Right Whale Identification....................................... (2 pages)
- Albatross Guide......................................................... (2 pages)

*This document is for internal use only, not to be cited or reproduced without permission.*
WANTED!
CONFIRMATION REQUIRED!

The following species have not been confirmed in Alaskan waters or are rare enough to need further confirmation. For confirmation, you must return with a specimen or photographic documentation.

Any species encountered out of range also requires confirmation, including all species not listed in your field guides.

**Rockfishes:**
- Aleutian Scorpionfish
- Blue Rockfish
- Broadbanded Thornyhead
- Copper Rockfish
- Gray Rockfish
- Pygmy Rockfish
- Striptail Rockfish
- Vermilion Rockfish
- Yellowmouth Rockfish

**Flatfishes:**
- C-O Sole
- Curlfin Sole
- Roughscale Sole
- Sakhalin Sole
- Sand Sole*
- Southern Rock Sole**

**Skates:**
- Deepsea
- Roughshoulder

**Others:**
- Arctic Cod
- Atlantic Salmon
- Sturgeon

* Documentation NOT required for sand soles in the Gulf of Alaska
** Documentation required only for SRS in the Bering Sea north of 56°
Fish Identification: Methods and Definitions

The figures and accompanying glossary of terms in the following pages are taken from Miller and Lea’s Guide to the Coastal Marine Fishes of California, and are designed as an introduction and reference to the terminology used in identifying fishes. Although we cannot cover all the terminology used to describe fish anatomy, we have tried to include the most important and commonly encountered terms. The terminology figured here is reasonably standardized among a variety of identification aids that observers may use.

This introduction to terminology is designed especially for observers who have not taken courses in ichthyology. To the extent possible, observers should attempt to familiarize themselves with the methods and definitions presented in the figures prior to the laboratory sessions, and ask the laboratory instructor questions regarding problems with terms and methods during the lecture and lab sessions.

The identification keys that follow the introductory section have been developed by NMFS staff specifically to meet the needs of groundfish observers. These keys are designed to guide observers to the expected level of identification for each species, and to provide all the information necessary to distinguish a specimen in hand from all similar species that are likely to be encountered.

Accurate and consistent identification of fishes and crabs requires a good working knowledge of anatomical characteristics and their terminology, as well as methods of measurement and counting used in field guides and keys. All observer trainees are required to demonstrate a level of proficiency in fish and crab identification by passing an exam prior to deployment. Familiarization with the field identification materials contained in this manual is a necessary step in the development of the identification skills that all groundfish observers need to produce high-quality data.
GUIDE TO THE COASTAL MARINE

GLOSSARY AND INDEX TO ILLUSTRATED GLOSSARY

ABDOMEN: belly, Figure 1.
ABDOMINAL: pelvic fin placement, Fig. 5a.
ADIPOSE: fin, Figure 6f, fatty.
ANADROMOUS: an ocean fish that spawns in freshwater.
ANAL FIN: Figure 1.
ANTERIOR: toward the head.
ANUS: vent, Figure 1.
AXIL, AXILLA: Figure 3.
BAR: A vertical band.
BARBEL: An elongate, fleshy appendage.
BASE: (of fin) Figure 2.
BEAK: Figure 10d.
BELLY: area covering visera.
BIFID: with two points.
BRANCHIOSTEGALS: Figure 3.
BREAST: Figure 4a.
CANINE: (teeth) Figure 8c.
CAUDAL FIN: Figure 1.
CAUDAL PEDUNCLE: Figures 1, 2.
CHIN: Figure 1.
CIRRUS: a thin, usually fringed flap.
COMpressed: (body form) Figure 9d.
CONCAVE: depressed inward. Figure 9c.
CONVEX: bulging outward. Figure 9d.
CONTIGUOUS: adjoining. Figure 6j.
CONTINUOUS: (fins) Figure 6j.
DEEP, DEPTH: (body form) Figure 9d.
DENTIGEROUS: with small teeth.
DEPRESSED: (body form) Figure 9c.
DIAGNOSIS: held down, pressed onto body.
DORSAL FIN: Figures 1, 6a.
EEL-LIKE: (body form) Figure 9a.
ELEVATED: above. Figure 3.
Elongate: (body form) Figure 9a, 9b.
EYE: (orbit) Figures 1, 3.
FILAMENTOUS: threadlike. Figure 3.
FIN: (shapes) Figure 6.
FLAP: a thick extension of skin, Figure 3.
FORKED: (tail shape) Figure 6e.
GILL: rakers, cavity, arch, filaments; Figure 7; membrane Figure 4.
GUIDE TO THE COASTAL MARINE

GILL COVER: Figures 1, 3, 4a.
HEAD: Figure 3.
HYPERAL: (bone in tail) Figures 2, 6k.
INCISED: notched. Figure 3.
INCISOR: (teeth) Figure 8d.
INDENTED: (tail form) Figure 6a.
INFERIOR: (mouth form) Figure 10c.
INNER: (fin ray placement) Figure 5c.
INSERTION: posterior attachment of a fin to body. Figure 1.
ISOLATED: not connected by a membrane.
ISTHmus: Figure 4.
JAWs: Figure 10.
KEEL: Figure 6k.
LATERAL LINE: Figure 1.
LENGTH: Figure 2.
LIPS: Figures 3, 10c, f.
LONGITUDINAL: lengthwise, horizontal.
MANDIBLE: lower jaw. Figure 8b.
MAXILLARY: upper jaw. Figures 1, 10.
MULTIFID: With many points.
NAKED: without scales or rays. Figure 6k.
NOSSRIL: Figure 3.
OBSELETE: nearly gone or missing. OPERCULUM, OPERCLE: Figs. 3, 7.
ORBIT, ORBITAL: Figure 3.
ORIGIN: anterior attachment of a fin to body. Figure 1.
OVATE: (body form) Figure 9c.
OVERHANGING: (snout form) Figure 10c.
PALATINE: (bone and teeth) Figure 8a.
PAPILLAE: short, broad-based fleshy protuberances.
Pectoral: (fin and girdle) Figures 1, 5c.
PELVIC: (fin and girdle) Figures 1, 5.
POINTED: (tail form) Figure 6f, g.
PORE: a sensory organ in skin.
POSTERIOR: toward the tail.
PROJECTING: ahead of. Figure 10a.
PYLORIC CAECAE: fleshy appendages attached to posterior end of stomach.
RAYs: (in fins) Figure 2.
Rounded: (tail form) Figure 6b.
SCUTE: thickened, hardened scale on midline of belly.
SHIELD: thickened, hardened scale on lateral line or sides.
SHOULDER: (girdle) Figure 5c, pectoral.
SIMPLE: not divided.
SNOUT: Figures 3, 10b, c.
SOFT-RAY: Figure 2.
SPINE: Figures 2, 3.
Spose: Figures 2, 3.
SPODODE: with minute spines on hoofs or scales.
SQUArE: (tail form) straight. Figure 6d.
STRIATED: with close-set lines or grooves.
STRIPE: lengthwise or horizontal line.
SUBORBITAL STAY: Figure 3.
TAIL: Figures 1, 6.
TERMINAL: at the end. Figure 10e.
THORACIC: (fin placement) Figure 5b.
TONGUE: Figure 8b.
TRUNCATE: Figure 9c.
TUBULAR: (snout form) Figure 10b.
UNITED: joined. Figure 4b.
UPPER JAW: Figure 8a.
VENT: Figure 1.
VENTRAL: lower surface, pelvic fin.
VERTICAL: upright, as bar or band on sides.
VOMER: (bone, teeth) Figure 8a.
WIDTH: (body form) Figure 9d.

FISHES OF CALIFORNIA

FIGURE 1. A spiny-rayed fish, Sebastes, naming fins and general body areas.
GUIDE TO THE COASTAL MARINE

FISHES OF CALIFORNIA

TOTAL LENGTH: to tip of longest caudal lobe (pinched together)

To tip of longest jaw or end of snout, whichever is terminal (mouth closed)

FORK LENGTH: is to center of fork

BODY LENGTH: is to end of flesh on tail

STANDARD LENGTH: is to center of fork ending at hypural bone

To end of upper jaw or snout

FISHES OF CALIFORNIA

This 1st DORSAL SPINE is elevated, extended, prolonged, or elongated, and is filamentous at tip

Length of HEAD is measured from tip of upper jaw or snout to end of opercle, including flap or spine if present

Length of ORBIT or eye Diameter

CIRRUS on rim of ORBIT

The FIN MEMBRANE between the 3rd and 4th spines is deeply incised or notched

NOSTRILS

NASAL SPINE

Bony SUBORBITAL STAY (under skin)

End of OPERCULUM or GILL COVER

SNOUT LENGTH

LOWER LIP

MAXILLARY BONE

SPINE ON UPPER EDGE OF PREOPERCLE BONE

PUPIL

LOWER RAYS OF PECTORAL FIN

FLAP

AXIL OR AXILLA is in the area behind or within fin base

BRANCHIOSTEGALS are the bony supports of the Gill Membrane

LOWER LIPS

GILL MEMBRANES free, not joined to isthmus or to each other

GILL MEMBRANES joined to each other or UNIFIED, but not joined to ISTHMUS

GILL MEMBRANES joined to ISTHMUS

FIGURE 2. Tail area of a rockfish, Sebastes, showing lengths, fin ray construction, and other structures.

FIGURE 3. A hypothetical sculpin showing some head and fin structures.

FIGURE 4. Gill membranes and their attachment (Ventral view of: a, Spirinchus starki; b, Clinocottus globiceps; c, Anoplarchus purpureascens).
GUIDE TO THE COASTAL MARINE

PELVIC FIN

a) Topsmelt

PELVIC FIN is Abdominal when attached in this area

PELVIC FIN is Thoracic when attached in this area

A Thoracic Pelvic Fin is also termed Jugular when under the Gill Cavity

A Thoracic Pelvic Fin is also termed Mental when attached under the Chin or Eye

FIGURE 5. Abdominal and thoracic fin placement and construction.

FISHES OF CALIFORNIA

POSTERIOR RAKER

PELVIC FIN

b) Tuna

PELVIC FIN is Thoracic when attached in this area

A Thoracic Pelvic Fin is also termed Jugular when under the Gill Cavity

A Thoracic Pelvic Fin is also termed Mental when attached under the Chin or Eye

FIGURE 7. Gill rakers and gill arches of a bony fish.

PREMAXILLARY

MAXILLARY

UPPER JAW

MANDIBLE or LOWER JAW

TONGUE

VOMER

BASIDRANCHIAL or 'Hyoid' Teeth

PALATINE

FIGURE 8. Bones and teeth inside mouth or buccal cavity.

1st GILL ARCH

b) Floor of Mouth showing bones with Teeth and Tongue

c) Canine Teeth (caniniform)

d) Molarlike

FIGURE 6. Tail and dorsal fin shapes and construction.

i) Dorsal Fin Continuous

j) Dorsal Fin Continuous (slightly joined to or adjacent to, each other)

k) Tail of Tuna

l) Tail of a Salmon

FINLET

HYPOURAL BONES

K. Tail of Tuna

l) Tail of a Salmon

FIGURE 8. Bones and teeth inside mouth or buccal cavity.

PREMAXILLARY

MAXILLARY

UPPER JAW

MANDIBLE or LOWER JAW

TONGUE

VOMER

BASIDRANCHIAL or 'Hyoid' Teeth

PALATINE

1st GILL ARCH

a) Roof of Mouth showing bones with Teeth

b) Floor of Mouth showing bones with Teeth and Tongue

c) Canine Teeth (caniniform)

d) Molarlike

e) Incisor
FIGURE 9. Some body forms of fishes.

a) Hel-like, greatly elongated, attenuated

b) Elongate, fusiform, basslike

c) Ovate, truncated

d) Compressed, thin, narrow, deep, or perchlike

e) Body depressed, flattened

f) Body subcircular, hemispherical

FIGURE 10. Terminology of mouth and snout forms.

a) Lower Jaw Projecting beyond Upper Jaw

b) Snout Tubular with Jaws at tip

c) Snout Overhanging or Projecting beyond Mouth, the Mouth is thus Inferior

d) Upper Jaw is Prolonged into a swordlike beak

e) Jaws (and Lips) are Terminal, i.e., at end of body

f) The Upper Jaw is Extended and the Lower Lip is Inferior or Included

Pelvic axillary process

Adipose fin
KEY TO JAWLESS AND CARTILAGINOUS FISHES ENCOUNTERED IN THE NORTHEAST PACIFIC GROUNDFISHERY
(Agnatha and Chondrichthyes)

November 2013

1 Mouth without jaws; one median nostril; body more or less cylindrical; no paired fins or scales; 7-15 pore-like gill openings ..............................................................2

1 Jaws present; nostrils paired; paired pelvic and/or pectoral fins present; gill openings usually as slits, or covered by a flap-like operculum; body in a wide variety of shapes, with or without scales ..............................................................3

2(1) Gill openings 10-15; barbels around mouth and nostrils ..........Myxinidae – Hagfish

2 Gill openings 7; no barbels around mouth and nostrils...Petromyzontidae – Lampreys

3(1) Gill openings 5 to 7, on sides or underside of head; body without overlapping scales, frequently with rough denticles ..........Chondrichthyes (in part) ...............4

3 One gill opening on each side of head, covered by an operculum ...............8

4(3) Body very depressed (flattened vertically); Pectoral fins large, giving the body a horizontal disc shape ......................Rajiformes – Skates (see separate key)

4 Body round in cross section; pectoral fins do not define the shape of the body as a disc ..................................................Elasmobranchii – Sharks ...............5
5(4) Anal fin absent (no ventral fin posterior to anus)... **Squalidae – Dogfish sharks**... 6

5 Anal fin present....................................................................................................................... 7

6(5) Spine at origin of each dorsal fin; first dorsal fin larger than second; pectoral fins large and pointed; caudal fin with two distinct lobes..... No spine at origin of dorsal fins; first and second dorsal fin about same size; pectoral fins small and rounded; caudal fin flap-like, without two distinct lobes..... **Spiny Dogfish (Squalus acanthias)**

6 No spine at origin of dorsal fins; first and second dorsal fin about same size; pectoral fins small and rounded; caudal fin flap-like, without two distinct lobes..... **Pacific Sleeper Shark (Somniosus pacificus)**

7(5) Robust, heavy body; head somewhat cone-shaped; upper and lower caudal lobes nearly equal in size; pectoral fins short and broad.............. **Salmon Shark (Lamna ditropis)**

7 Slender, elongate body; head flattened; upper caudal lobe significantly larger than lower lobe; pectoral fins long and narrow................................. **Blue Shark (Prionace glauca)**

8(3) Operculum without bones; first dorsal fin with long, sharp spine; teeth fused to form a grinding plate; mouth inferior; caudal fin continuing to a point................................. **Spotted Ratfish (Hydrolagus coliei)**

8 Operculum a bony flap; fins erectile and flexible, supported by rays that are usually joined by membranes................................. **Osteichthyes – Bony fishes**

(next page)
KEY TO FAMILIES OF BONY FISHES
ENCOUNTERED IN THE NORTHEAST PACIFIC GROUND FISHERY
(Osteichthyes)

November 2013

1. Caudal fin with dorsal lobe supported by an upward extension of the vertebral column and distinctly larger than ventral lobe; five well-separated rows of bony plates arranged longitudinally along body; mouth inferior, protrusible, preceded by 4 prominent barbels in a transverse row. ..............................................................
   *Acipenseridae* – Sturgeons

1. Caudal fin not with an obviously enlarged dorsal lobe supported by vertebral column; without 5 rows of bony plates along body; mouth not preceded by 4 barbels. .................................................................................................................. 2

2(1). Body compressed asymmetrically with both eyes on same side of head and eyed side of body more strongly pigmented. ......................... *Flatfishes* (see separate key)

2. Body shape variable but symmetrical; one eye on each side of head; color similar on both sides. ........................................................................................................................................... 3

3(2). A movable, jointed, protrusible organ on anterior part of head modified as a fishing lure. ........................................................................................................................................... 4

3. No specialized fishing lure on anterior part of head. .................................................................................. 5
4(3) Size small (< 25 cm); skin smooth.........................
   **Oneirodidae** – Dreamers

4   Size large (> 30 cm); skin covered with conical
     spines........................................Ceratiidae – Seadevils

5(3) Body truncate (abruptly ending just behind the dorsal and anal fins),
     laterally compressed and deep; dorsal and anal fins thin, narrow and
     high; no rayed caudal fin....................... **Ocean Sunfish** (*Mola mola*)

5   Body and anal fins not as above; caudal fin (when present) with rays.................6

6(5) Pelvic fins absent or buried in flesh...........................................................7
6   Pelvic fins present (may be small or modified to form a ventral sucking disc).....18

7(6) Body extremely elongate, total
     length more than 40 times body
     depth; jaws long and strongly
     curved..............................................
     **Nemichthyidae** – Snipe eels

7   Body moderately elongate or not elongate, total length less than 20 times body
     depth....................................................................................................................................8
8\(\text{Lateral line high on body, near dorsal fin; elongate raised fleshy ridge on either side of ventral midline; scales minute; standard length } 8-12\text{ times body depth; caudal fin forked (maximum size } 26\text{ cm).} \text{Ammodytidae – Sand lances}\)

8 \(\text{Lateral line (if present) not near dorsal fin; no raised fleshy ridge on either side of ventral midline; body elongate or not; caudal fin forked or not } \)

9\(\text{Caudal fin slightly forked; body limp and laterally compressed; skin smooth, scaleless; eye small } \text{Icosteidae – Ragfish (adult)}\)

9 \(\text{Caudal fin not forked; body robust and moderately compressed or not compressed} \)

10\(\text{Large conspicuous pores with white borders on head, particularly near jaw and eye; mouth directed upward; fins smooth and rounded; dorsal fin long.} \text{Zaproridae – Prowfish}\)

10 \(\text{Pores on head not conspicuous, without white borders; fins not smoothly rounded} \)

11\(\text{Skin loose and delicate; gill openings small and pore-like, not extending below uppermost } 15-16\text{ rays of pectoral fin.} \text{Liparidae – Snailfishes (in part)}\)

11 \(\text{Skin not loose and delicate; gill openings slit-like and not restricted to level of origin of uppermost } 15-16\text{ rays of pectoral fin} \)
12(11) Body robust; preopercle with hooked spine; distinct caudal peduncle. **Cottidae** – Sculpins (in part; see separate key)

12 No distinct spine on preopercle; body elongate....................................................13

13(12) Caudal fin continuous with dorsal and anal fins; no distinct caudal peduncle; body more or less tapering to a point..........................................................................................14

13 Caudal fin distinct (may be partially attached to dorsal and anal fins); body not tapering to a point ..................................................................................................................15

14(13) Teeth large and conical, developed as crushing molars at back of mouth; dorsal fin composed entirely of spines; body covered with large black spots, on juveniles spots edged in white. **Wolf-eel** (*Anarrhichthys ocellatus*)

14 Teeth not as described above; dorsal fin composed entirely of soft rays; color uniform or speckled with tiny black spots. **Zoarcidae** – Eelpouts (in part)

15(13) Teeth developed as large canines in front of mouth, and as crushing molars in back.......................**Bering Wolffish** (*Anarhichas orientalis*)

15 Teeth small, not developed as described above..............................................................................16
16(15) Lateral line absent; dorsal fin spines soft and flexible; distance from anal fin origin to caudal fin base less than distance from snout to anal fin origin........Pholidae – Gunnels (in part)

16 Lateral line(s) 1 to 4, composed of faint pores; dorsal fin spines stiff; distance from anal fin origin to caudal fin base greater than distance from snout to anal fin origin.........................................................17

17(16) Mouth strongly upturned, with lower jaw projecting; eyes high on head; pits on side of head and along lower jaw; head depressed, broad, flat on top, without crest of cirri; lateral line 1..................Cryptacanthodidae – Wrymouths

17 Mouth horizontal or slightly upturned; eyes on side of head; no pits on head or lower jaw; head laterally compressed; lateral lines 1 or 4; species with 1 lateral line also with a crest of cirri on top of head.....Stichaeidae – Pricklebacks (in part)

18(6) Pelvic fins abdominal, with insertion well back on the body (at least 1/3 of distance from pectoral fin to anal fin)..................................................................19

18 Pelvic fins thoracic or jugular, with insertion closer to pectoral fin than anal fin..... .................................................................38

19(18) Photophores or luminescent organs present (may be round or elongate), usually arranged in rows along abdomen and/or along base of anal fin ..................20

19 Photophores and luminescent organs absent.........................................................25
20(19) Adipose fin absent........................................................................................................21
20  Adipose fin present ........................................................................................................23

21(20) Several large photophores forming elongate transverse bars across abdomen; tube-like projection directed posteriorly above pectoral fin..................Platytroctidae – Tubeshoulders

21  Photophores small and round or absent; no tubelike projection above pectoral fin .............................................................................................................22

22(21) Teeth in jaws prominent; dorsal fin placed very far back, leaving extremely short caudal peduncle..........Stomiidae – Dragonfishes

22  Teeth in jaws small; dorsal fin about mid-body..............................................Gonostomatidae – Lightfishes

23(20) Body strongly compressed; several series of enlarged, vertically elongate photophores on ventral side of body.................................Sternoptychedae – Hatchetfishes

23  Body moderately compressed; photophores on sides of body (if present) not enlarged........................................................................................................24
24(23) Teeth extremely large; dorsal fin placed far forward on body, its first ray greatly prolonged; dorsal and ventral adipose fin present; ventral adipose fin anterior to anal fin; small round photophores arranged in two rows along lower body....................Chauliodontidae – Viperfishes

24 Teeth small or moderate in size; dorsal fin about midbody, its first ray not greatly prolonged; ventral adipose fin absent; small round photophores arranged in rows or patches along lower body or on caudal peduncle.... Myctophidae – Lanternfishes

25(19) Adipose fin absent.........................................................................................................................26

25 Adipose fin present.........................................................................................................................29

26(25) Pelvic fin anterior to dorsal fin; mouth very large and inferior; upper jaw longer than lower jaw...

Northern Anchovy (Engraulis mordax)

26 Pelvic fin below dorsal fin; mouth moderate in size, terminal – (Herrings)............27

27(26) Body deep and compressed; ventral scutes with strong bony keel; a row of dark spots on body.....

American Shad (Alosa sapidissima)

27 Body elongate, nearly cylindrical; ventral scutes with weak keel or fine points...28
28(27) One or two rows of dark spots on body; ventral scutes with fine points; last anal ray elongate........

Pacific Sardine (*Sardinops sagax*)

28 No spots on body; ventral scutes without points; last anal ray not elongate.............................

Pacific Herring (*Clupea harengus*)

29(25) Dorsal fin absent; mouth very large, with strongly projecting lower jaw and prominent symphysial knob; 8-10 large dagger-like teeth in two rows on palatine, numerous smaller teeth on premaxillary and mandible .................................................................

.................................................................

Anotopteridae – Daggertooths

29 Dorsal fin present; mouth small or large, but without strongly projecting lower jaw; prominent symphysial knob absent; 2-4 large dagger-like teeth on palatine, or dagger-like teeth absent.................................................................................................30

30(29) Dorsal fin sail-like (with long base and very long rays), brittle and easily damaged; teeth prominent.................................................................

Alepisauridae – Lancetfishes

30 Dorsal fin not sail-like (with moderate base and rays) ..............................................................31

31(30) Eye relatively small, diameter less than 1/3 head length......................................................32

31 Eye large, diameter about 1/3 head length.....

Bathylagidae – Deepsea smelts
32(31) Anus well forward of anal fin, just behind pelvic fins; body slender; head narrow and pointed..........................................................................................................................33

32 Anus directly anterior to anal fin; body robust or slender; head blunt or moderately pointed..................................................................................................................................................34

33(32) Head laterally compressed; interorbital width much less than body depth; eye round; anal fin with 20-50 rays............... 
**Paralepididae** – Barracudinas

33 Head nearly round in cross-section; interorbital width nearly equal to body depth; eye oval; anal fin with fewer than 20 rays..............
**Notoptidae** – Paperbones and Waryfishes

34(32) Pelvic axillary process present....................... **Salmonidae** – Salmons and Trouts (see separate key)

34 Pelvic axillary process absent – (Smelts).................................35

35(34) Adipose fin rectangular, attached along its entire length; teeth small, of uniform size; scales very small, more than 170 along lateral line...............................**Capelin** (*Mallotus villosus*)
Strait of Juan de Fuca to Bering Sea

35 Adipose fin rounded, attached only in front; teeth small to large, canines may be present or absent; scales moderate, fewer than 80 along lateral line..................36
36(35) Opercle with distinct striations; pelvic fin origin anterior to dorsal fin origin; gill rakers less than 25....................
Eulachon (*Thaleichthys pacificus*)
Monterey Bay to Bering Sea

36 Opercle without striations; pelvic fin origin posterior to dorsal fin origin; gill rakers more than 25.................................................................37

37(36) Mouth large, maxilla extending to posterior margin of eye; 2 large canine teeth on roof of mouth, teeth on tongue......................
Rainbow Smelt (*Osmerus mordax*)
Vancouver to Bering Sea

37 Mouth small, maxilla not extending beyond mideye; canine teeth absent, teeth small and of uniform size...................................................
Surf Smelt (*Hypomesus pretiosus*)
Southern California to Gulf of Alaska

38(18) Pelvic fins fused, modified to form adhesive disc.......................39

38 Pelvic fins separate, not modified to form adhesive disc..........................40
39(38) Caudal fin continuous with dorsal and anal fins, may or may not taper to a point; no distinct caudal peduncle; body laterally compressed from anus to caudal fin; skin loose, with underlying flesh soft and gelatinous; pelvic disk may be small and/or obscured by lower pectoral fin rays... **Liparidae** – Snailfishes (in part)

39 Caudal fin not continuous with dorsal and anal fins; caudal peduncle distinct; body not laterally compressed but spherical; skin may be covered with large conical tubercles; pelvic disk large... **Cyclopteridae** – Lumpsuckers

40(38) Dorsal and anal fins continuous with caudal fin............................41

40 Dorsal and anal fins not continuous with caudal fin.............................43

41(40) Two dorsal fins; single barbel on lower jaw.................................42

41 One dorsal fin; barbel on lower jaw absent... **Zoarcidae** – Eelpouts (in part)

42(41) Pelvic fin short, not extending to anus; mouth large, with maxilla extending to or beyond posterior margin of eye........................................... **Giant Grenadier** (*Albatrossia pectoralis*)
Baja California to Bering Sea, Russia, Japan

42 Pelvic fin elongate, extending to or beyond anus; mouth small to medium, with maxilla not extending to posterior margin of eye.............................. **Macrouridae** – Rattails or Grenadiers
43(40) Body completely encased in bony plates. .................. Agonidae – Poachers

43 Body not completely encased in bony plates, although rows of bony or horny plates may be present. .................................................................44

44(43) Three separate dorsal fins; two separate anal fins .................. Gadidae – Cods (see separate key)

44 One or two dorsal fins; one anal fin.................................................................45

45(44) A single dorsal fin (or two connected dorsal fins).................................46

45 Two separate dorsal fins ..................................................................................59

46(45) Second and subsequent spines of dorsal fin greatly elongated, forming mane extending nearly to caudal fin (dorsal and anal fin may be recessed into a sheath along the sides of the fin); pelvic fin rays greatly elongate; snout blunt.......................... Caristiidae – Manefishes

46 Dorsal fin not modified as above; pelvic fins may be elongate or not; snout blunt or otherwise.................................................................47

47(46) Eye round and very large, its diameter more than 1/3 head length; body strongly compressed; juveniles with rows of horny protuberances on body............ Oreosomatidae – Oreos

47 Eye diameter less than 1/3 head length or oval; no horny protuberances on body..................................................................................................48
Dorsal fin with 12-17 (rarely 19) stiff spines; anal fin with 3 spines, the second usually more robust and longer than the others; body deep and robust; spines on preopercle, opercle, and usually elsewhere on head... **Scorpaenidae** – Rockfishes and Thornyheads (see separate key)

Fishes not as described above...........................................................................................................49

Caudal fin deeply forked..................................................................................................................50

Caudal fin rounded, truncate, or slightly forked.............................................................................52

Five lateral lines; body with green and yellow vertical bars............................................................

**Hexagrammidae (in part)** – Atka Mackerel

*(Pleurogrammus monopterygius)*

One lateral line; body without vertical bars....................................................................................51

Color uniform gray or brown (including fins); lateral line with a curve over the pectoral fin; size moderate (< 1 meter). ......................**Bramidae** – Pomfrets

Color gray with white spots, fins bright red; lateral line with a high arch almost reaching the dorsal fin; often very large (> 1 meter). .......**Lampridae** – Opahs
52(49) Body completely covered with scales; conspicuous small pores on top of head and/or preopercle; caudal fin completely separate from dorsal and anal fins; dorsal fin of soft flexible spines and rays; dorsal and anal fins long, smoothly rounded, and of consistent height..........................**Bathymasteridae** – Ronquils and Searchers

52 Body and fins not as described above.................................................................................53

53(52) Body elongate and laterally compressed, total length 7 or more times body depth; spines and rays of dorsal and anal fins nearly equal in length............................54

53 Body robust and round in cross-section or compressed and deep, total length 5 times body depth or less; spines and rays of the dorsal and/or anal fins of variable length......................................................................................................................55

54(53) Pelvic fins small, with 1 spine and 3-4 soft rays; dorsal fin with stout, sharp spines; distance from snout to anus usually less than distance from anus to caudal fin base.................................................................**Stichaeidae** – Pricklebacks (in part)

54 Pelvic fins minute, with 1 spine and 1 soft ray; dorsal fin with soft flexible spines; distance from snout to anus usually greater than distance from anus to caudal fin base .............................................................................................**Pholidae** – Gunnels (in part)

55(53) Lateral line absent; dorsal fin with short base, placed well back on body; head heavily sculptured with ridges, crests, and spines...**Melamphaidae** – Bigscales

55 At least one lateral line present; dorsal fin with long base; head not heavily sculptured, although spines and cirri may be present on head...............................................56
56(55) Dorsal and anal fins composed entirely of soft rays; caudal fin rounded; body deep and laterally compressed; single lateral line on each side...........  
**Icosteidae** – Ragfish (immature)

56 Dorsal fin composed of spines and soft rays; caudal fin truncate; body generally cylindrical, not compressed; one to five lateral lines on each side........................57

57(56) Four or five lateral lines on each side...........  
**Hexagrammidae** – Greenlings (in part)

57 One lateral line on each side ..................................................................................58

58(57) Body completely covered with scales; spines in fins soft and flexible; head without spines; mouth large, with large conical teeth..........  
**Hexagrammidae (in part)** – Lingcod  
(*Ophiodon elongatus*)

58 Scales reduced to tiny spines (spinules) or arranged in distinct rows; dorsal fin with 6-17 spines, often stout and sharp; gill cover and head usually with spines, frequently well developed; teeth never large and conical..........................................

..............................................................................................................**Cottidae** – Sculpins (in part)  
(see separate key)

59(45) Second dorsal fin and anal fin clearly indented ....................................................60

59 Second dorsal fin and anal fin not clearly indented (finlets or spines separated from soft rays may be present).................................................................61
60(59) First ray of dorsal and pelvic fins elongate, much longer than other rays; mouth strongly inferior; elongate rostrum projecting back below eye as a prominent ridge. Moridae – Pacific Flatnose (Antimora microlepis)

60 First ray of dorsal and pelvic fins not elongate; mouth not strongly inferior. Merlucciidae – Hake (see separate key)

61(59) Second dorsal and anal fin followed by 5 or more finlets; second dorsal fin shorter than first. Scombridae – Mackerels and Tunas

61 No finlets following second dorsal or anal fin................................62

62(61) Fleshy fringes on both lips; body compressed and deep; mouth directed upward. Trichodontidae – Sandfishes

62 No fringes on lips; body round in cross-section; mouth nearly horizontal.63

63(62) No spines or cirri on head; pectoral fin base approximately vertical, not extending anteriorly below opercle..................................64

63 Spines and/or cirri usually present on head; pectoral fin base extending anteriorly below opercle. Cottidae – Sculpins (in part) (see separate key)
64(63) Color uniformly gray to black, without blotches; dorsal fins separated by more than twice eye diameter; second dorsal-fin base approximately equal in length to anal-fin base..........................**Sablefish**

(*Anoplopoma fimbria*)

64  Color gray to black with conspicuous white blotches and spots; dorsal fins very close together, separated by less than eye diameter; second dorsal-fin base clearly longer than anal-fin base..........................**Skilfish**

(*Erilepis zonifer*)
# KEY TO SELECTED NORTH PACIFIC SCULPINS

Figures from *Pacific Fishes of Canada* (1973) and *Fishes of Alaska* (2002)
October 2013

1. Spinous and soft dorsal fins broadly connected .............................................. 2
2. Spinous and soft dorsal fins separate or adjacent ........................................... 6

2(1) Broad band of scales (3-8 rows) at base of dorsal fin and another band below lateral line .

*Hemilepidotus* ........................................................................................................... 3

2. Scales not arranged in two broad bands ............ *Cottidae sp.*

3(2) Third dorsal-fin spine longer than second; dorsal scale band consisting of 3-4 rows of scales; scales of ventral band much smaller than those of other bands; spinous dorsal fin not distinctly notched in females, with two deep notches in males

....................... *Butterfly Sculpin* (*Hemilepidotus papilio*)

North of Pribilofs only
(max length: 40 cm; max weight: <2 kg)

3. Third dorsal-fin spine equal to or shorter than second; dorsal scale band consisting of 4-8 rows of scales; scales of ventral band approximately the same size as other bands; spinous dorsal fin distinctly notched ................................................... 4

4(3) Anal scale row present as a single row of scales directly above anal fin; pelvic fins elongate in mature males ....................

....................... *Longfin Irish Lord* (*Hemilepidotus zapus*)

Aleutian Islands only
(max length: 29 cm; max weight: <2 kg)

4. Anal scale row absent; pelvic fins not elongate ................................................... 5
5(4) Color generally red to brown; branchiostegal membranes and lower body peppered with small brown spots..........................

......................Red Irish Lord (*Hemilepidotus hemilepidotus*)
Gulf of Alaska, eastern Aleutian Islands, southern Bering Sea
(max length: 51 cm; max weight: <2 kg)

5 Color generally yellow to brown, occasionally with red blotches; branchiostegal membranes and lower body uniform white to yellow.................................

......................Yellow Irish Lord (*Hemilepidotus jordani*)
Western Gulf of Alaska, Aleutian Islands, Bering Sea
(max length: 53 cm; max weight: 2.4 kg)

6(1) *Entire head and body covered with minute prickles*; head large, broad and depressed, with numerous cirri ......................

......................Bigmouth Sculpin (*Hemitripterus bolini*)
Gulf of Alaska, Aleutian Islands, Bering Sea
(max length: 82 cm; max weight: 13.2 kg)

6 Head and body not entirely covered with minute prickles, or, if covered with minute prickles then head small, narrow and compressed.........................................................7

7(6) Upper preopercular spine long, relatively straight, nail-like ........................................

......................8

7 Upper preopercular spine short, hooked, serrated, or branched ........................................10
8(7) Round, stellate scales with numerous minute spines present above lateral line ................. 9

8 Stellate scales absent above lateral line .............................................

...... Great Sculpin (*Myoxocephalus polyacanthocephalus*)
Western Gulf of Alaska, Aleutian Islands, Bering Sea
(max length: 82 cm; max weight: 9.9 kg)

9(8) Bands on caudal fin continuous; dorsal surface of body with irregular dark spots and blotches, not bands or saddles; ventral surface not brightly colored .............................................

......................... Plain Sculpin (*Myoxocephalus jaok*)
Western Gulf of Alaska, Bering Sea
(max length: 60 cm; max weight: 3.6 kg)

9 Bands on caudal fin interrupted; dorsal surface of body with prominent dark saddles; ventral surface often brightly colored (may be yellow, orange, or green) ..................................

......................... Warty Sculpin (*Myoxocephalus verrucosus*)
Bering Sea only
(max length: 58 cm; max weight: 2.9 kg)

10(7) Skin on body loose, without conspicuous scales, prickles, or cirri; upper preopercular spine short and straight ..................

......................... Darkfin Sculpin (*Malacocottus zonurus*)
Gulf of Alaska, Aleutian Islands, Bering Sea
(max length: 29 cm; max weight: 0.74 kg)

10 Skin on body not as described above; skin tight, with scales, prickles or cirri; upper preopercular spine elongate, hooked, or branched ............................................. Cottidae sp.
KEY TO THE FLATFISHES OF ALASKA

Original version by
J. W. Orr, D. C. Baker, and M. A. Brown
Figures from *A Systematic Monograph of the Flatfishes* (Norman, 1934)
October 2013
1. Eyes typically on right side of head; pelvic fins symmetrically placed along abdominal ridge.
   **Right-eyed Flounders**
   **Family Pleuronectidae**

2. (1) Eyes typically on left side of head; pelvic fins asymmetrically placed along abdominal ridge; large, maximum total length to 41 cm.
   **Left-eye Flounders**
   **Family Bothidae**
   **Pacific Sanddab**
   *Citharichthys sordidus*
   Bering Sea to Central California

3. (1) Large tuberculate scales appearing as star-shaped or round bony knobs on large areas of eyed side.

4. Large tuberculate scales typically absent but may be present on anterior portion of eyed side.

5. (2) Dorsal, anal, and caudal fins with bold black and white or yellow stripes; scattered, star-shaped tuberculate scales on both eyed and blind sides; often left-eyed.
   **Starry Flounder**
   *Platichthys stellatus*
   Arctic to Southern California

6. All fins uniformly brown; eyed side completely covered with rounded tuberculate scales, largest in 6 vague rows, blind side smooth; uncommon, deep-water.
   **Roughscale Sole**
   *Clidoderma asperrimum*
   Bering Sea to Oregon
4 (2) Eyed side with 4 to 7 large bony cones behind upper orbit; blind side bright yellow.
**Alaska Plaice**
*Pleuronectes quadrituberculatus*
Bering Sea to Southeast Alaska

4 Eyed side without large bony cones; blind side not bright yellow (except in Longhead Dab)

5 (4) Accessory dorsal branch (ADB) of the lateral line present

5 Accessory dorsal branch (ADB) absent

6 (5) Anal spine present, can be felt just anterior to anal fin base

6 Anal spine absent, cannot be felt just anterior to anal fin base
7(6) Mouth small, maxilla does not extend to mid-orbit; teeth small.................................10

7 Mouth large, maxilla extends to mid-orbit or beyond; teeth large.................................8

8 (7) Preopercle "L"-shaped; dorsal fin origin posterior to orbit; scales small and smooth; prominent, fang-like teeth on roof of mouth; blind side dark grey, with light speckling.

**Greenland Turbot**

*Reinhardtius hippoglossoides*

Arctic to Baja California

8 Preopercle rounded; dorsal fin origin anterior to orbit or at midorbit; scales large and rough; no prominent teeth on roof of mouth; blind side off-white.................................9

9 (8) Eye embedded on dorsal ridge, visible from blind side; gill rakers: total count on first arch more than 14, count on upper part of second arch = 2.

**Arrowtooth Flounder**

*Atheresthes stomias*

Bering Sea to Southern California

9 Eye on side of body, not visible from blind side; gill rakers: total count on first arch less than 14, count on upper part of second arch = 1.

**Kamchatka Flounder**

*Atheresthes evermanni*

Bering Sea to Northern Gulf of Alaska
10 (7) Caudal fin of moderate size, with posterior margin straight or slightly rounded; caudal peduncle length greater than orbit length; body color pattern brown with dark spots.

**Dover Sole**  
*Microstomus pacificus*  
Bering Sea to Baja California

10 Caudal fin small and circular; caudal peduncle length less than orbit length; body color pattern mottled.

**Deepsea Sole**  
*Embellischthys bathybius*  
Bering Sea to Southern California

11 (6) Mouth moderate to large, maxilla extends to mid-orbit or beyond.............................................. 16

11 Mouth small, maxilla does not extend to mid-orbit ........................................................................ 12
12(11) Lateral line with moderate to high arch over pectoral fin…………………14

12 Lateral line straight or with slight curve…..13

13(12) Pectoral fin black, longer than head length; scales small (< 3 mm), not deciduous, more than 20 scale rows between lateral line and dorsal fin at widest point of body; 5-12 gill rakers on first arch.
**Rex Sole** *Glyptocephalus zachirus*
Bering Sea to Baja California

13 Pectoral fin brownish, shorter than head length; scales unusually large (> 3 mm) and deciduous (fall off easily); fewer than 20 scale rows between lateral line and dorsal fin at widest point of the body; 11-14 gill rakers on first arch.
**Slender Sole**
*Lyopsetta exilis*
Northern Gulf of Alaska to Baja California

14(12) Dorsal margin of head strongly concave; blind side bright yellow; head elongate, at least 30% standard length; orbit length less than 20% head length; postocular ridge large and triangular with rough patches.
**Longhead Dab**
*Limanda proboscidea* Bering Sea

14 Dorsal margin of head convex or slightly concave; blind side white; head length less than 30% standard length; orbit length greater than 20% head length; postocular ridge smooth …………………………….15
15 (14) Dorsal and anal fins washed with yellow, black lines at base; blind side snowy white.

**Yellowfin Sole**
*Limanda aspera*
Bering Sea to British Columbia

15 Dorsal and anal fins brownish, without black lines at base; blind side off-white.

**Sakhalin Sole**
*Limanda sakhalinensis*
Bering Sea

16 (11) Lateral line with high arch over pectoral fin; caudal fin forked or doubly truncate; 16 or more pectoral rays; body shape elongate diamond; white or light brown spots on eyed side in juveniles.

**Pacific Halibut**
*Hippoglossus stenolepis*
Bering Sea to Baja California

16 Lateral line slightly curved or straight; caudal fin pointed or truncate; less than 16 pectoral rays; body shape elliptical

17 (16) Interorbital space wide and flat, with 4 to 5 scale rows; caudal membranes pigmented

**Petrale Sole**
*Eopsetta jordani*
Northern Gulf of Alaska to Baja California

17 Interorbital space narrow with ridge, with 0 to 3 scale rows; caudal membranes unpigmented
18 (17) Gill rakers: lower part of first arch, more than 14; total count on first arch, 17 or more, typically at least 20.

**Flathead Sole**
*Hippoglossoides elassodon*
Bering Sea to Central California

18 Gill rakers: lower part of first arch, less than 13; total count on first arch, 17 or less.

**Bering Flounder**
*Hippoglossoides robustus*
Bering Sea

19 (5) Accessory dorsal branch (ADB) of lateral line extends at least half the standard length; anterior 4-12 dorsal fin rays inserted on blind side...20

19 Accessory dorsal branch (ADB) of lateral line less than half the standard length; anterior portion of dorsal fin not extending onto blind side ...........................................................21

20 (19) Anterior 9-12 dorsal fin rays inserted on blind side; dorsal fin origin directly posterior to end of maxilla; eyed side and caudal fin uniformly brown.

**Curlfin Sole**
*Pleuronichthys decurrens*
Southeast Alaska to Baja California

20 Anterior 4-6 dorsal rays inserted on blind side; dorsal fin origin directly posterior to upper lip; distinct dark spot at center of body on eyed side; caudal fin with a dark reverse "C" at base and a large dark spot forming an "O."

**C-O Sole**
*Pleuronichthys coenosus*
Southeast Alaska to Baja California
21 (19) Lateral line with straight to low arch; ADB extends to or beyond opercular margin.... 23

21  Lateral line with high arch over pectoral fin; ADB not extending beyond opercular margin

Rock soles Genus Lepidopsetta ................................................................. 22

22(21) Gill rakers 7 or more on lower part of first arch, typically slender and pointed; blind side uniform creamy white, without glossy white highlights.
Northern Rock Sole
Lepidopsetta polyxystra
Bering Sea to Puget Sound

22  Gill rakers 6 or fewer on lower part of first arch, typically broad and blunt; blind side typically with glossy white highlights corresponding to muscle bands, especially on anterior portion of body.
Southern Rock Sole
Lepidopsetta bilineata
Southern Bering Sea to Baja California
*Retain any southern rock soles identified in the Bering Sea north of 56°N.

23 (21) Eye visible from blind side; mouth strongly asymmetrical; scales do not extend onto rays of dorsal and anal fins; scales cycloid, giving body a smooth, shiny appearance.

English Sole
Parophrys vetulus
Bering Sea to Baja California

23  Eye not visible from blind side; mouth slightly asymmetrical; scales do extend onto rays of dorsal and anal fins; scales ctenoid, giving body a rough appearance................. 24
24 (23) First 4-8 dorsal rays long and mostly free from membrane; maxilla typically extends to midorbit or beyond; lateral line with slight curve; body medium brown and speckled.  
**Sand Sole**  
*Psettichthys melanostictus*  
Southern Bering Sea to Southern California

24 First 4-8 dorsal rays not long or free from membrane; maxilla typically extends to anterior edge of orbit; lateral line with low arch; body uniform light brown, often with yellowish fins.  
**Butter Sole**  
*Isopsetta isolepis*  
Southern Bering Sea to Southern California
**ARROWTOOTH FLOUNDER**
- Lateral line with slight arch over pectoral fin
- Dorsal fin origin above mid-eye
- Dorsal eye visible from blind side
- Rounded preopercular margin
- Scales relatively large, ragged looking
  - Blind side off white
  - Gill rakers on first arch 14-17
  - Gill rakers on upper part of second arch 2

**KAMCHATKA FLOUNDER**
- Lateral line with slight arch over pectoral fin
- Dorsal fin origin at or anterior to mid-eye
- Dorsal eye not visible from blind side
- Rounded preopercular margin
- Scales relatively large, ragged looking
  - Blind side off white
  - Gill rakers on first arch 11-14
  - Gill rakers on upper part of second arch 1

**GREENLAND TURBOT**
- Lateral line with NO arch over pectoral fin
- Dorsal fin origin posterior to eye
- Dorsal eye visible from blind side
- Lower jaw massive, projecting beyond upper
- Preopercular margin forms right angle
- Scales relatively small, smooth looking
  - Blind side dark gray, but variable
  - Large sharp teeth on roof of mouth
FLATHEAD SOLE  BERING FLOUNDER  PETRALE SOLE

- Gill rakers on first arch
  - FLATHEAD SOLE: ≥ 17
  - BERING FLOUNDER: ≤ 17
  - PETRALE SOLE: > 17

- Gill rakers on lower part of first arch
  - FLATHEAD SOLE: ≥ 14
  - BERING FLOUNDER: ≤ 14
  - PETRALE SOLE: ≥ 14

- Geographic range
  - FLATHEAD SOLE: AI, BS, GOA
  - BERING FLOUNDER: BS
  - PETRALE SOLE: GOA

- Depth range
  - FLATHEAD SOLE: 0-1000 m
  - BERING FLOUNDER: Usually < 100 m
  - PETRALE SOLE: 0-500 m

- Rows of teeth in upper jaw
  - FLATHEAD SOLE: 1
  - BERING FLOUNDER: 1
  - PETRALE SOLE: 2 (small)

*Gill raker counts are the primary, and most reliable, characteristic for differentiating flathead sole from Bering flounder.
KEY TO THE CODS AND HAKES OF ALASKA

Figures from FAO Species Catalogue, Vol. 10 (1990)
October 2013

1 Dorsal fins 2; anal fins 1; chin barbel absent.
Pacific Hake
Merluccius productus
Gulf of California to Gulf of Alaska
Maximum size: 2.5 kg

1 Dorsal fins 3; anal fins 2; chin barbel present, although minute in some species .................... 2

2(1) Tip of snout posterior to tip of lower jaw; chin barbel minute, its length much less than pupil length ........................................................................................................................................ 3

2 Tip of snout anterior to tip of lower jaw; chin barbel medium to large, its length greater than or equal to pupil length ................................................................................................................................. 4

3(2) Caudal fin truncate or slightly forked; lateral line interrupted at origin of second dorsal and posterior; body mottled or blotched dorsally; fins grey to brown.
Walleye Pollock
Theragra chalcogramma (Gadus chalcogrammus)
Central California to Bering Sea
Maximum size: 5.2 kg

3 Caudal fin deeply forked, with rounded lobes; lateral line broken, forming wavy curves; body with small, dark spots dorsally.
Arctic Cod
Boreogadus saida
Bering Sea
Maximum size: <1 kg
4(2) Barbel thin and small, barbel length much less than diameter of orbit, about equal to diameter of pupil ........................................................................................................................................... 5

4 Barbel fleshy and long, barbel length greater than or equal to the diameter of orbit.
Pacific Cod
*Gadus macrocephalus*
Southern California to Bering Sea
Maximum size: 20 kg

5(4) Anus positioned under first dorsal fin; lateral line interrupted only on caudal peduncle; gill rakers 26-28; fins grey to brown; body tan to brown.
Pacific Tomcod
*Microgadus proximus*
Central California to South Bristol Bay
Maximum size: <1 kg

5 Anus positioned between first and second dorsal fins or under second dorsal fin; lateral line interrupted at about origin of second dorsal fin and posterior; gill rakers 14-25; fins and body washed with yellow.
Saffron Cod
*Eleginus gracilis*
Gulf of Alaska to Bering Sea
Maximum size: <1 kg
KEY TO THE SALMONIDS OF THE EASTERN
NORTH PACIFIC

Figures from *Pacific Fishes of Canada* (Hart, 1973) and
*Atlantic Fishes of Canada* (Scott and Scott, 1988)
October 2013

1 One or more large dark blotches on
operculum; several X-shaped spots on
body; mouth generally small, with jaw
extending to about middle of eye........
*Atlantic Salmon*
*Salmo salar*

1 Opercle without large dark blotches; spots on body, if present, round or irregular in shape, not
X-shaped; mouth generally large, extending beyond eye..........................................................

2(1) Numerous spots on body below the lateral
line; caudal fin slightly forked, emarginate,
or truncate, with dark spots along rays on
upper and lower lobe (10-13 per ray), and
often with silver streaks along middle rays;
anal fin rays 8-12.
*Steelhead (Rainbow Trout)*
*Oncorhynchus mykiss*

2 Very few spots on body below the lateral line; caudal fin distinctly forked, with or without spots
and silvering; anal fin rays 13-19...............................................................................................

3
3(2) Caudal fin with uniform silver wash extending nearly to tips of rays, usually with spots on both lobes (may be difficult to distinguish), 4-8 per ray; mouth black at base of teeth; dark spots on back.

**Chinook (King) Salmon**
*Oncorhynchus tshawytscha*

3 Caudal fin with or without silver wash, if present extending only 2/3 to 3/4 of fin length; caudal fin with or without spots, if present either 1-4 blotches per ray or spots limited to upper lobe; mouth not black at base of teeth (but may be mottled or gray); dark spots on back present or absent.....................................................................................................................................4

4(3) Caudal fin without silver wash; caudal fin with oval blotches on both lobes, 1-4 per ray; scales small, 170 or more along lateral line, more than 30 scale rows between lateral line and dorsal fin; dark spots on back.

**Pink (Humpback) Salmon**
*Oncorhynchus gorbuscha*

4 Caudal fin with or without silver wash; caudal fin without oval blotches, but may have small rounded spots on upper lobe; scales large, fewer than 155 along lateral line, 30 or fewer scale rows between lateral line and dorsal fin; dark spots on back present or absent .......................5
5(4) Caudal fin uniform dark without spots or silver; gill rakers long and thin, 28-40 rakers on first arch; body without spots, typically dark above and lighter below, head appears capped with dark.

**Sockeye (Red) Salmon**

*Sockeye (Red) Salmon*  
*Oncorhynchus nerka*

---

5 Caudal fin with spots and/or silver; gill rakers short and stout, 28 or fewer rakers on first arch; body with or without spots but without two-toned appearance ..................................................6

---

6(5) Caudal fin with discrete silver streaking on rays but not on membranes, streaks extending about 1/2 length of rays, caudal fin without spots; body without distinct spots on dorsal surface; caudal peduncle long and slender, its depth about 14 into standard length; teeth on lower edge of maxilla cannot be felt with mouth closed.

**Chum (Dog) Salmon**

*Chum (Dog) Salmon*  
*Oncorhynchus keta*

---

6 Caudal fin with silver wash on both rays and membranes, extending about 3/4 length of rays, caudal fin may have small rounded spots on upper lobe; body with dark spots on dorsal surface; caudal peduncle short and thick, its depth about 11 into standard length; teeth on lower edge of maxilla can be felt with mouth closed.

**Coho (Silver) Salmon**

*Coho (Silver) Salmon*  
*Oncorhynchus kisutch*
A FIELD GUIDE TO THE SKATES (RAJIDAE) OF ALASKA

Extracted from:

October 2013
VENTRAL

pectoral fin
pelvic fin
gill slits
alar hooks
malar hooks
cloaca
casper (male)
dorsal fins
orbital thorns (O)
nuchal thorns (N)
mid-dorsal thorns (D)
scapular thorns (S)
caudal fin

DORSAL

snout flexible
pectoral radials nearly reaching snout cartilage

Bathyraja

snout stiff
pectoral radials not reaching snout cartilage

Raja

prechondal length
tail length
snout length
disc width

MALE

indented pectoral fins
claspers
malar and alar hooks
pectoral fins not indented

FEMALE
KEY TO THE SKATES (RAJIDAE) OF ALASKA

1  Snout firm to tip (may be broken); pectoral fin rays not reaching close to tip of snout, creating squared off “windows” beside snout ................................................................. (genus *Raja*) ..........2
1  Snout flexible, especially near tip; pectoral fin rays nearly reach tip of snout, leaving narrow crescent-shaped “windows” beside snout .................................................. (genus *Bathyraja*) ...4

2(1)  Prominent thorns present near tip of snout; two or three pairs of scapular thorns .................. .......................................................... *Roughshoulder Skate* (*Raja badia* p. 4)
2  No prominent thorns near tip of snout; scapular thorns absent ................................................ 3

3(2)  Posterolateral margin of pelvic fin slightly concave; base of pectoral fin with large ocellus surrounded by ring of light spots; ventral surface nearly white; body diamond-shaped ................................................................. *Big Skate* (*Raja binoculata* p. 5)
3  Posterolateral margin of pelvic fin deeply notched; base of pectoral fin with ring of dark pigment; ventral surface dark; body elongate with very long snout ........................................ *Longnose Skate* (*Raja rhina* p. 6)

4(1)  Scapular thorns present ....................................................................................................... 5
4  Scapular thorns absent ........................................................................................................... 7

5(4)  Denticles absent from area surrounding tail thorns; orbital thorns present (but often obscure) ........................................................................................................... *Alaska Skate* (*Bathyraja parmifera* p. 7)
5  Denticles surrounding tail thorns; orbital thorns absent ....................................................... 6

6(5)  Mid-dorsal row of thorns usually interrupted; thorns on disc significantly reduced in some specimens; tail thorns reduced along length of tail, 0-2 reduced thorns between dorsal fins; dorsal surface brown .................................. *Bering Skate* (*Bathyraja interrupta* p. 8)
6  Mid-dorsal row of thorns continuous (may be worn down in older specimens); tail thorns not reduced along length of tail, 1-2 strong thorns between dorsal fins; dorsal surface gray .................................................................. *Aleutian Skate* (*Bathyraja aleutica* p. 9)
7(4) Ventral surface typically white, or light with dusky blotches .............................................................8
7 Ventral surface predominantly dark ...........................................................................................................9

8(7) Disc thorns absent; dorsal surface in life brown, often with black and/or yellowish blotches; ventral surface of disc creamy white, without a distinct line separating dark tail..........................Mud Skate (Bathyraja taranetzii p. 10)
8 Nuchal thorns present; dorsal surface gray with white blotches; ventral surface of disk light and blotchy, with dark tail typically separated from lighter disk by a distinct line..........................Whiteblotched Skate (Bathyraja maculata p. 11)

9(7) Fine denticles on VENTRAL surface (underside) of disc and tail ...............................................................
9 Ventral surface of disc and tail smooth ......................................................................................................10

10(9) Mid-dorsal thorns present ............................................ Commander Skate (Bathyraja lindbergii p. 13)
10 Mid-dorsal thorns absent .............................................................................................................................11

11(10) Nuchal thorns absent; dorsal surface uniformly dark brown to black ..........................................Roughtail Skate (Bathyraja trachura p. 14)
11 Nuchal thorns present; dorsal surface dark, usually with white patches between eyes.....................Whitebrow Skate (Bathyraja minispinosa p. 15)

*Confirmation is required for Roughshoulder and Deepsea skates, as well as any skate not found in this key or any skate found out of range.
**Raja badia**
**Roughshoulder Skate**

**CONFIRMATION REQUIRED**

**Diagnosis:** The only Alaskan species of skate with rostral thornlets. Also the only Alaskan species of *Raja* with scapular thorns.

**Coloration:** Dorsal surface gray-brown, with darker spots and blotches; ventral surface gray-brown, with white blotches on snout, abdomen, and near mouth.

**Body Shape:** Disc somewhat diamond-shaped, with slightly concave anterior margin; precaudal length greater than tail length.

**Maximum Size:** 98 cm

**Range:** Bering Sea to California

**Depth:** 1280-2322 m
**Raja binoculata**
**Big Skate**

**Diagnosis:** The only Alaskan species of *Raja* with the following combination of characters: anterior margin of disk concave; posterolateral margin of pelvic fin slightly concave; and base of pectoral fin with large ocellus surrounded by light spots.

**Coloration:** Dorsal surface brown, gray-brown or reddish brown, often with large ocellus surrounded by smaller spots on pectoral fin; ventral surface white to light gray.

**Body Shape:** Disc wide, somewhat diamond-shaped, with concave anterior margin; posterolateral margin of pelvic fin slightly concave.

**Maximum Size:** 244 cm (>50 kg)

**Range:** SE Bering Sea to California

**Depth:** 16-800 m
Raja rhina
Longnose Skate

**Diagnosis:** The only Alaskan species of *Raja* with an elongate snout and deeply notched pelvic fins.

**Coloration:** Dorsal surface brown with dark blotches, may have ocelli on disk; ventral surface gray to black.

**Body Shape:** Disc elongate with pronounced snout; posterolateral margin of pelvic fin deeply notched.

**Maximum Size:** 180 cm (45 kg)

**Range:** Bering Sea to California

**Depth:** 24-675 m
*Bathyraja parmifera*

**Alaska Skate**

**Diagnosis:** The only Alaskan species of *Bathyraja* with orbital thorns present and scapular thorns present. Also the only species with naked area surrounding tail thorns. Row of mid-dorsal thorns may be complete or interrupted. (*B. roispinis* may be a synonym.)

**Coloration:** Dorsal surface dark brown or golden brown, often with lighter spots or blotches; ventral surface brown to white.

**Body Shape:** Tail length usually shorter than precaudal length.

**Maximum Size:** 179 cm (18 kg)

**Range:** Aleutian Islands, Gulf of Alaska, Bering Sea

**Depth:** 17-600 m
**Bathyraja interrupta**  
**Bering Skate**

**Diagnosis:** The only Alaskan species of *Bathyraja* with the following combination of characters: orbital thorns absent; scapular thorns present; row of mid-dorsal thorns usually interrupted; tail thorns reduced, with 0-2 reduced thorns between dorsal fins.

**Coloration:** Dorsal surface light to dark brown; ventral surface white.

**Body Shape:** Body roundish with short snout; tail length equal to or greater than precaudal length.

**Maximum Size:** 107 cm (4.2 kg)

**Range:** Bering Sea to California

**Depth:** 37-1372 m
**Bathyraja aleutica**
Aleutian Skate

**Diagnosis:** The only Alaskan species of *Bathyraja* with the following combination of characters: orbital thorns absent; scapular thorns present; row of mid-dorsal thorns usually continuous; tail thorns large, with 1-2 strong thorns between dorsal fins.

**Coloration:** Dorsal surface gray, with or without vague black ocellus on pectoral fin; ventral surface white with gray margin.

**Body Shape:** Body angled with elongate snout; tail length equal to or greater than precaudal length.

**Maximum Size:** 177 cm (27 kg)

**Range:** Aleutian Islands, Gulf of Alaska, Bering Sea

**Depth:** 29-950 m
**Bathyraja taranetzi**
Mud Skate

**Diagnosis:** The only Alaskan species of *Bathyraja* with the following combination of characters: disc free of thorns; body small and rounded, with tail length greater than precaudal length; ventral surface white or cream colored.

**Coloration:** Dorsal surface brown with small darker blotches, and usually a large lighter spot on posterior part of pectoral fin; ventral surface white or cream colored.

**Body Shape:** Body small and rounded; tail length greater than precaudal length

**Maximum Size:** 79 cm (2.7 kg)

**Range:** Aleutian Islands, Bering Sea

**Depth:** 58-1054 m
**Bathyraja maculata**  
Whiteblotched Skate

**Diagnosis:** The only Alaskan species of *Bathyraja* with a distinct line on the ventral surface separating the dark tail from the light body. Also distinguished by the following combination of characters: scapular, orbital, and mid-dorsal thorns absent; nuchal thorns present and strong; dorsal surface with strong denticles, ventral surface without denticles.

**Coloration:** Dorsal surface gray with white or yellow blotches; ventral surface blotchy gray, with dark border; underside of tail dark, separated from lighter ventral surface of body by distinct line.

**Body Shape:**

**Maximum Size:** 147 cm (14.5 kg)

**Range:** Aleutian Islands, Bering Sea, Russia

**Depth:** 84-1193 m
**Bathyraja abyssicola**
Deepsea Skate

**CONFIRMATION REQUIRED**

**Diagnosis:** The only Alaskan species of *Bathyraja* with fine denticles on the ventral surface.

**Denticles:** Fine, evenly distributed denticles on dorsal and ventral surface.

**Coloration:** Dorsal surface gray to brown; ventral surface gray to black, mouth and cloaca whitish, may have white blotches.

**Body Shape:** Tail length greater than or equal to precaudal length.

**Juveniles:** No denticles on ventral surface.

**Maximum Size:** 150 cm

**Range:** Japan to California, Bering Sea

**Depth:** 362-2904 m

---

**MALE**

**FEMALE**

ventral
**Bathyraja lindbergi**
Commander Skate

**Diagnosis:** The only Alaskan species of *Bathyraja* with the following combination of characters: scapular and orbital thorns absent; nuchal and mid-dorsal thorns present; ventral surface without denticles.

**Coloration:** Dorsal surface gray brown to black; ventral surface gray to black, darker around pectoral and pelvic fin margins, white around mouth and nostrils.

**Body Shape:** Tail length greater than precaudal length.

**Maximum Size:** 121 cm (9.5 kg)

**Range:** Bering Sea, Aleutian Islands, Japan

**Depth:** 160-1193 m
*Bathyraja trachura*
Roughtail Skate

**Diagnosis:** The only Alaskan species of *Bathyraja* with the disc free of thorns and a dark ventral surface.

**Coloration:** Dorsal and ventral surfaces dark brown to black, mouth and cloaca whitish.

**Body Shape:** Tail length less than precaudal length.

**Maximum Size:** 92 cm (4.5 kg)

**Range:** Japan to California, Bering Sea

**Depth:** 213-1504 m
Bathyraja minispinosa
Whitebrow Skate

Diagnosis: The only Alaskan species of Bathyraja with white patches around the eyes. Also distinguished by the following combination of characters: scapular, orbital, and mid-dorsal thorns absent; nuchal thorns present, but weak (occasionally absent); dorsal surface with fine denticles, ventral surface without denticles.

Coloration: Dorsal surface gray brown to dark brown, interorbital region and margins of orbits white; ventral surface light to medium brown, mouth white.

Body Shape:

Maximum Size: 98 cm (4.5 kg)

Range: Bering Sea, Aleutian Islands, Japan

Depth: 160-1420 m
KEY TO THE CRABS OF ALASKA FOUND IN COMMERCIAL FISHERIES

October 2013

**This key does not include all crab species found in Alaskan waters. Specimens not fitting this key should be identified as “crab unident” and retained."
1 Abdomen soft and curled; tail fan modified for use as anchor within hollow objects; third pair of walking legs reduced and usually hidden.................................................Family Paguridae (hermit crabs)

1 Abdomen with calcified plates, or if soft then not curled; tail fan not modified as above; third pair of walking legs not reduced or hidden......................................................................................................................2

2(1) Three pairs walking legs in addition to chelipeds (claws)..............Family Lithodidae .................3

2 Four pairs walking legs in addition to chelipeds (claws).................................................................12

3(2) Carapace, chelipeds, and walking legs covered with leathery scales; legs with burgundy or brick-red bands..........................................................Scaled Crab (Placetron wosnessenskii)
Bering Sea, Aleutians, GOA (0-250 m)

3 Chelipeds, walking legs, and usually carapace covered with spines, warty protuberances, or hairs ....................................................................................................................4

4(3) Body box-shaped, with short stubby legs that can be folded tightly against body to form a solid mass.........................................................Box crabs (Genus Lopholithodes)
Aleutians, GOA (50-700 m)

4 Body not box-shaped, legs long.................................................................................................................................................................5
5(4) Abdomen not clearly segmented, without calcified plates, forming a soft, membranous pouch..........................

**Fuzzy crabs (Acantholithodes and Hapalogaster)**
Bering Sea, Aleutians, GOA (10-240 m)

5 Abdomen clearly segmented, covered with calcified plates...................................................... 6

6(5) Carapace somewhat triangular, with a smooth round ball-like area surrounded by deep semicircular grooves........................................

**Rhinoceros Crab (Rhinolithodes wosnessenskii)**
Aleutians, western GOA (20-200 m)

6 Carapace outline generally oval, without deep semicircular grooves........................................... 7

7(6) Carapace densely covered with short, blunt spines or tubercles; one prominent spine on dorsal surface of carapace posterior to rostrum; second abdominal segment covered by one plate .................................................................**Genus Paralomis**.............................. 8

7 Carapace covered with widely spaced sharp spines; no single prominent spine posterior to rostrum; second abdominal segment covered by 3-5 plates........**King crabs**................................. 9
8(7) Carapace covered with small spines; walking legs angular in cross-section. *Paralomis multispina* Bering Sea, Aleutians (250-1400 m)

4

8 Carapace covered with rounded tubercles, spines mainly confined to margins of carapace; walking legs flattened............. *Paralomis verrilli* Bering Sea, GOA (1200-1500 m)

9(7) Rostrum ending in a single thorn-like spine; ventral rostrum spine absent; second abdominal segment covered by 5 plates .............................................................. 10

9 Rostrum forked; strong ventral rostrum spine present; second abdominal segment covered by 3 plates ........................................................................................................................................ 11
10(9) Rostrum long, usually with terminal median dorsal spine followed by pair of spines; 3 paired prominent spines on mid-dorsal plate; color red to purple. ...........................................................

**Red King Crab** (*Paralithodes camtschaticus*)
Bering Sea, Aleutians, GOA (0-300 m)

10 Rostrum short, commonly with terminal pair of dorsal spines; 2 pairs of prominent spines on mid dorsal plate; color blue or purple. .............................. **Blue King Crab** (*Paralithodes platypus*)
Bering Sea, Aleutians, western GOA (20-400 m)
11(9) Spines on lateral margins of carapace and spines on dorsal surface of carapace approximately equal in size; rostrum with 9-10 spines, a median spine anterior to each pair of dorsal rostrum spines; color brown to golden brown. .... **Golden or Brown King Crab** (*Lithodes aequispina*)  
Bering Sea, Aleutians, GOA (50-700 m)

11 Spines on lateral margins of carapace notably longer than those on dorsal surface of carapace; rostrum with 7 spines, no median spine anterior to each pair of dorsal rostrum spines; color pink to scarlet red. ......................................................... **Couesi King Crab** (*Lithodes couesi*)  
Bering Sea, Aleutians, GOA (200-1500 m)
12(2) Carapace round to oval, with spines or low tubercles arranged in triangular shape on carapace
.................................................................................................................. Tanner crabs........ 13

12 Carapace guitar-shaped, triangular, hexagonal, or oval without spines or low tubercles arranged in triangular shape on carapace.................................................................................................................................16

13(12) Lower lateral margin of carapace not protruding beyond margin of branchial region; dorsal triangle prominent, composed of spines; dorsal surface of carapace with shallow or deep notch in center.................................14

13 Lower lateral margin of carapace protruding beyond margin of branchial region; dorsal triangle not prominent, composed of low tubercles; dorsal surface of carapace without notch in center.........................................................15

14(13) Branchial regions of carapace separated by deep, narrow groove; lateral apex of dorsal triangle U-shaped, with two spines at margin of carapace...................................................
Tanneri Tanner Crab (*Chionoecetes tanneri*)
Bering Sea, Aleutians, GOA (20-1500 m)

14 Branchial regions of carapace separated by shallow groove and central ridge; lateral apex of dorsal triangle V-shaped, with one spine at margin of carapace...........................................
Angulatus Tanner Crab (*Chionoecetes angulatus*)
Bering Sea, Aleutians, GOA (75-1500 m)
15(13) Epistome M-shaped; rostral spines sharply pointed and tilted upward; lateral spines in row above carapace margin unequal in size and spacing; eyes usually red.................................

**Bairdi Tanner Crab (Chionoecetes bairdi)**
Bering Sea, Aleutians, GOA (5-800 m)

15 Epistome nearly horizontal; rostral spines rounded and nearly horizontal; lateral spines in row above carapace margin uniform in size and spacing; eyes usually greenish.................................

**Opilio Tanner Crab (Chionoecetes opilio)**
Bering Sea, Aleutians, western GOA (5-800 m)
16(12) Carapace oval, with smooth dorsal surface; claw tips white....
*Dungeness Crab (Cancer magister)*
SE Bering Sea, GOA (5-500 m)

16 Carapace hexagonal, triangular, or lyre-shaped

17(16) Carapace generally hexagonal, covered with bristle-like hairs

17 Carapace acutely triangular or lyre-shaped; carapace and legs may be decorated, but not covered with bristle-like hairs

18(17) Tips of claws light in color; carapace weakly hexagonal, with seven lateral spines posterior to eye; spines generally point forward

*Korean Horsehair Crab (Erimacrus isenbeckii)*
Bering Sea, Aleutians, GOA from Kodiak west (20-400 m)

18 Tips of claws black; carapace strongly hexagonal, with six lateral spines posterior to eye; spines generally point outward

*Telmessus Crab (Telmessus cheiragonus)*
Bering Sea, Aleutians west to Atka, GOA from Kodiak west (0-300 m)
19(17) Carapace acutely triangular, teardrop-shaped; rostral spines long, slender, parallel; body and legs usually profusely decorated with kelp, hydroids, sponges, etc....

**Decorator Crab** (*Oregonia gracilis*)
Bering Sea, Aleutians, GOA (10-1000 m)

---

19  Carapace guitar-shaped; rostral spines short, triangular; body and legs not profusely decorated (carapace may have some decoration).......  

**lyre crabs (Genus Hyas)**
Bering Sea, Aleutians, GOA (10-900 m)
CORALS

**Hydrocorals** (Anthoathecatae) – code 815
Colonial corals with a hard inflexible calcareous skeleton. Colonies may be up to one meter tall but are often highly fragmented on deck as they are extremely fragile.

**Stony corals** (Scleractinia) – code 816
Small solitary ‘cup’ corals with a hard calcareous skeleton.

**Gorgonians** (Gorgonacea) – code 817
Colonial corals that may be bushy or uniplanar and quite large (more than 1 m tall or wide), resembling small trees, fans, or bushes. Internal skeleton is firm but flexible and may be ‘woody’ (dark protein material) or calcified (white bone-like) to some degree.
**Black corals** (Antipatharia) – **code 818**

Axial skeleton **black or dark brown**, highly flexible and covered with small thorn-like projections. Live specimens covered with a **mucus-rich** soft tissue with small non-retractable polyps.

**Soft corals** (Alcyonacea) – **code 819**

Colonies have fleshy bodies without an axial skeleton, usually resembling mushrooms, berries, or cauliflower.

**Sea pens and sea whips** (Pennatulacea) – **code 58**

Colonies consist of an elongated fleshy stalk supported by an internal stiff calcium carbonate rod.
OTHER INVERTEBRATES

This section is a basic orientation to the major groups of invertebrates that observers are likely to encounter in their samples. The illustrations of typical species provided here are intended to aid observers in general invertebrate identification. However, observers should keep in mind that the identification of fish species is a top priority, and therefore they are generally not expected to put substantial effort into invertebrate identification. Line drawings courtesy of the Florida Center for Instructional Technology (http://etc.usf.edu/clipart/).

Phylum Porifera: sponges (code 26)
- sessile, highly variable in size, color, and shape
- includes encrusting, ball-shaped, tree-like, and various other morphologies
- exterior pores for water transfer usually visible
- texture may be soft, rubbery, hard, or crystalline

Phylum Cnidaria: jellyfish, anemones

Class Scyphozoa: jellyfish (code 35)
- consist of a bell and tentacles
- may be up to 50 cm wide
- clear, yellow, pink, or purple

Class Anthozoa: Order Actiniaria: sea anemones (code 55)
- body is a thick column with crown of tentacles
- tentacles often retract out of water
- may be brightly colored, very slimy
- typically attached to rocks or shells
Phylum Annelida: worms and leeches

Class Polychaeta: bristleworms (code 54)
- body generally cylindrical and segmented
- multiple appendages with hairlike setae

Class Hirudinea: leeches (code 52)
- flattened body with tapered anterior end
- suckers at both ends
- usually distinctly banded

Phylum Mollusca: snails, clams, squids, octopus

Class Polyplacophora: chitons (code 44)
- dorsoventrally flattened, ovoid
- 8 articulating shell plates on dorsal surface
- edges may have bristles

Class Gastropoda: snails (code 30) and nudibranchs (code 25)
- marine snails highly variable in size, color, shape
- nudibranchs lack shells, often very colorful

Class Bivalvia: clams, mussels, oysters, scallops (code 29)
- shell consists of two hinged halves, or valves
- size, shape, sculpturing, and colors highly variable
Class Cephalopoda: squids (code 50) and octopus (code 60)
squids are generally elongate, with fins on the mantle and 10 appendages (8 arms and 2 tentacles)
octopuses have a robust, rounded mantle, and 8 arms

Phylum Arthropoda

Class Pycnogonida: sea spiders (code 56)
very elongate, narrow body and 4-6 pairs of legs
often bright red or green

Class Cirripedia: barnacles (code 48)
sessile filter-feeders usually attached to rocks
smaller species may also attach to crabs and snails

Class Malacostraca: shrimps (code 70)
various sizes and color patterns
females carry eggs under tail segments
Class Isopoda: isopods (code 33)
- dorsoventrally flattened, segmented
- usually small (less than 5 cm long)
- often pink or red, may be parasitic

Phylum Echinodermata: crinoids, sea stars, urchins, cucumbers, etc.

Class Crinoidea: crinoids (code 53)
- commonly known as sea lilies or feather stars
- crown has pentameral symmetry, with 5 forked arms
- stalk jointed

Class Asteroidea: sea stars (code 20)
- may have 5 to over 20 arms
- size, shape, texture, and color highly variable

Class Echinoidea: sea urchins, sand dollars (code 40)
- usually less than 15 cm in diameter
- spherical shell covered with long spines
- shell (test) divided into 10 radial sections
- may be white, green, or purple

Class Holothuroidea: sea cucumbers (code 41)
- elongate tube-shaped body
- leathery or slimy texture
- may be bright yellow, orange, or purple
- appendages (tube feet) arranged in five rows on body
- when irritated, organs forcibly expelled from anus
Class Ophiuroidea: basket stars (code 21) and brittle stars (code 22)

- Basket stars have 5 highly branched arms, each of which ends in a coiled mass
- Basket stars are generally yellow to orange, and may be relatively large (20-30 cm wide)

- Brittle stars have a very small rounded disc and 5 long slender arms
- Brittle stars are generally red to brown, but the color is variable

Phylum Chordata

Class Ascidiacea: tunicates and sea squirts (code 43)
- Tunicates may be solitary or colonial
- Solitary tunicates include sea squirts, and may be attached directly to the substrate or stalked
- Solitary tunicates have one incurrent and one excurrent siphon
- Colonial tunicates form large ball-shaped or club-shaped colonies
- Colonial tunicates vary in color including gray, brown, yellow, or orange
**ATLANTIC SALMON**  
(*Salmo salar*)  
(1) large dark spots on operculum  
(2) black x-shaped spots on back  
(3) narrow caudal peduncle  
(4) large scales  
(5) truncate caudal fin  

**NOTE:** If found, bring back the entire fish.

**STEELHEAD TROUT**  
(*Oncorhynchus mykiss*)  
(1) many small black spots on body and fins  
(2) thick caudal peduncle  
(3) caudal fin truncate to weakly forked  
(4) dark spots along all caudal rays

**PINK SALMON**  
(*Oncorhynchus gorbuscha*)  
(1) scales small, 170 or more along lateral line, >30 rows between lateral line and dorsal fin  
(2) large oval blotches on both lobes of caudal fin  
(3) some spotting on back

mouth not a distinctive characteristic  
blotches on both lobes and a dull gray background  

scale size comparison between pink and Chinook salmon

---

NOAA Fisheries  
North Pacific Groundfish Observer Program Cr. 2011  
Pictures and layout: A-SHOP staff and observers
CHINOOK SALMON  (*Oncorhynchus tshawytscha*)

(1) mouth black at base of teeth  
(2) caudal fin with spots on both lobes and silver wash  
(3) irregular shaped but distinct black spots on back  
(4) dorsal area greenish-blue and black, silvery on sides

mouth black at base of teeth

faint spotting on both lobes

distinct spots on dorsum

prominent spots on both lobes
SOCKEYE SALMON (Oncorhynchus nerka)
(1) no spots or silver on caudal fin
(2) dorsum blue-black, without spots
(3) gill rakers long, thin, >28 on first arch

CHUM SALMON (Oncorhynchus keta)
(1) no spots on caudal fin
(2) discrete silver streaks on caudal rays for half the length, not on membranes
(3) no distinct spots on dorsal surface or caudal fin

North Pacific Groundfish Observer Program Cr. 2011
Pictures and layout: A-SHOP staff and observers
COHO SALMON  *(Oncorhynchus kisutch)*
(1) caudal fin typically with spots on upper lobe (2) silver wash on caudal rays AND membranes, extending about 3/4 length (3) dark spots on dorsal surface (4) gums white at base of teeth

- silver on rays and membranes, spots on upper lobe (faint)
- distinct black rim and whitish color at base of teeth
- spots on dorsal surface
- white at base of teeth
- black at base of teeth
- faint spots on upper lobe and silver wash on rays and membranes

North Pacific Groundfish Observer Program Cr. 2011
Pictures and layout: A-SHOP staff and observers
SEX DETERMINATION

ROUNDFISH

Roundfish gonads are in the visceral cavity, ahead of the vent. Insert your knife or scalpel blade in or near the anus and cut forward toward the head. There will be only two organs attached directly to the anus - the intestine and the gonads. If you carefully move the other organs aside until you get a clear view of the tubes attached to the anus, you can then pull on the tubes and discern intestine (which is coiled and attached to the stomach) from gonads (which end as paired structures near the backbone).

Cod, Pollock, and Giant Grenadier

The gonads are directly above the vent and are attached to the vent. Slit the skin of the belly near the vent and look behind the stomach area for the paired organs.

Ovaries are paired sacs which are typically pink or orange (or clear when immature). When ovaries are mature, you should be able to see the eggs inside. The sacs should look granular. Pacific cod ovaries often have a black covering on each sac.

Testes look very different from ovaries. When mature, the testes are convoluted, opaque and smooth in texture. In a mature male, the testes are best described as “greasy-looking, white, twisted Ramen noodles.” Immature testes will be pink or cream colored, located near the backbone and have a ruffled look to the edges of the tubes.
Rockfish

Rockfish gonads are found near the backbone in the visceral cavity. Trace the gonad strings from the vent upwards until you see the paired organs. There will always be two strings near the anus that have to be traced some ways before you can find the sacs. Sometimes there is another structure directly at the vent that appears to be a single gonad sac, but this is not the sex organ! You must follow the string-like tubes up to the paired gonads. Though you may notice external structures at the vent that seem sexually dimorphic, *never sex rockfish using external characteristics*. It is too easy to judge an immature male as a female or a huge female as a male when using external characteristics.

There can be a significant amount of fatty tissue in the visceral cavity of both male and female rockfish. Those observers accustomed to sexing pollock, Pacific cod and grenadier have mistaken this tissue for testes, because it is whitish and ribbon like. Rockfish gonads are smooth and discernible as paired structures: you must move any fatty tissue aside and look dorsally in the visceral cavity to see the gonads!

**Ovaries** are elongate ovals with granular insides. They will be pink, orange, yellow, or white. The two sacs will have smoothly rounded sides, as opposed to the male testes which have a three-sided, triangular shape in cross-section. If immature, look closely or cut the gonad open to see the granular insides which identify it as female. Rockfishes are live spawners, so a spawning female will have larvae in the cavity.

**Testes** are cream colored or pink, elongate (5 times as long as they are wide) and smooth in texture. They have three “edges” to the tubes. Instead of a rounded oval tube, testes look triangular in cross section due to the distinct edges. Testes will look like flat tubes when immature, but when examined closely you will see the defined edges and the triangular shape.

Don’t mistake the fatty tissue found in the visceral cavity of some rockfish as testes! The testes of rockfish look nothing like those of pollock, Pacific cod and grenadier!
**Atka Mackerel**

Like rockfish, Atka mackerel gonads are at the top of the visceral cavity, close to the backbone. Externally, mature males have a yellow tinge to the white stripes but external color differences cannot be used to sex these fish. The cut and gonad location is the same as with rockfish.

**Ovaries** are two clear sacs filled with small round eggs that are olive green, tan or brown. Atka mackerel spawn in spurts, so eggs in the ovaries will be a mix of different sizes and stages of development.

**Testes** are similar to those in rockfish. The two tubes will be smooth in texture, cream colored and longer than wide. Be aware that males eat the eggs from other Atka mackerel nests. Don't confuse a stomach full of eggs, or eggs loose in the cavity as a female mackerel.

---

**Skates**

Skates can easily be sexed externally by noting the presence or absence of claspers. The claspers are paired reproductive structures located between the pelvic fin and the base of the tail. In mature males the claspers are large (possibly half the length of the tail), rigid and are easily identified. In immature males the claspers are much smaller and flexible, and may be more difficult to distinguish from the pelvic fin.
Sablefish

The gonads of sablefish are very different from all other roundfish; they lie directly on the backbone. Remove all the other organs from the visceral cavity and peer at the backbone area near the posterior of the visceral cavity for the gonad tubes. Immature fish will have nearly see-through ribbons, so you will need to probe them apart to count the correct number of lobes.

*It is important to count the lobes at the posterior portion of the gonad, since the lobes will be fused anteriorly and will always look like just two lobes.*

Both females and males have fleshy smooth tubes of a cream or pink color. Mature fish have liver colored gonad tubes. There are no reliable differences in color or texture between non-ripe males and females. You can reliably tell the difference between males and females based on whether the gonads have two (females) or four (males) lobes. When mature, the ovaries may have a partial fold through each of the two lobes, giving a false impression of four lobes. Cut across the gonad strands and distinguish the true number of lobes.

**Male sablefish gonad lobes are fused at the anterior point, making it easy to mistake a male as female. When checking the gonad lobes, look at the posterior portion!**
Sculpins

The gonads are directly above the vent and are attached to the vent. Slit the skin lengthwise from the vent forward (anterior/towards the head) and look behind the stomach area for the paired organs. To avoid cutting the stomach first make a gentle cut just below the skin, allowing you to move the stomach to the either side, then make a larger cut to allow for identification. Cutting the stomach may make sexing more difficult because the stomach contents may fill the visceral cavity. For Yellow Irish Lord, this step is very important, as the stomach often protrudes outward right next to the cavity wall near the gonads and the skin can be very thin in this area.

Ovaries are paired sacs which will be typically pink or orange (or clear when immature). When the ovaries are mature, you should be able to see the eggs inside. The sacs should look granular. Sculpin ovaries often have a translucent covering on each sac, but sometimes may be dark. For immature specimens, look for small paired sacs.

Ripe mature female great and plain sculpins are typically caught during the late fall and winter; their ovaries will be large (up to 20% of body weight) and eggs will be visible. Ripe mature yellow Irish Lord females are typically caught in summer and early fall. During the spawning season, some ovaries may be spent, and they are much smaller after having released the eggs.

Testes look very different from ovaries. Male gonads in all species will be flat, often with discernible edges. When mature, the testes will be opaque and smooth in texture. Immature testes will be pink or cream colored, long and thin, and located near the backbone.
FLATFISH

Flatfish gonads are also paired, but are located behind the visceral cavity. If the flatfish has an anal spine, the gonads will begin just behind it. Cut from the anal spine location back toward the tail of the fish. When you gain experience determining sexes using a larger cut, your cut can be made smaller, faster, and in the correct spot for seeing the sex difference.

Flatfish gonads are posterior to the visceral cavity (and the anal spine if present) and extend just under the flesh on both sides of the fish, although it is easier to cut on the blind side. Cut back toward the tail from the anus as if skinning the fish. Lift the skin flap and check for a triangular shaped gonad.

**Ovaries:** Female flatfishes have elongate triangle ovaries that extend from behind the anal spine area almost to the tail when mature. When immature, the ovaries will be almost equilateral triangles with one angle shaped like a smoothly rounded tube extending only slightly back toward the tail (the triangle looks like a funnel in shape). The color will be pink (spent, immature) or orange (ready to spawn). Ovaries always have rounded edges.

**Testes:** Male flatfishes have a white, equilateral triangle shaped gonad on each side. The triangle will not have a tail extending back toward the caudal fin. Immature males have a small crescent moon shaped, tan colored gonad laying right at or behind the anal spine location. All male flatfishes have “edges” to the triangle. If you lift the gonad with the knife or scalpel and examine the sides of the triangle, you can distinguish the sharp edges (male) or rounded sides (female), even on an immature flatfish.

**Turbot male**

Note: Mature Greenland turbot males may have elongate testes that extend beyond the visceral cavity. However, they still have the typical edges and the same consistency as other testes.
Skate Maturity Stages

**MALES**

1. **Immature (Maturity Stage 1)**
   - Testis
   - vas Deferens
   - (Stomach, liver, and left testis removed)

2. **Developing (Maturity Stage 2)**
   - Testis
   - vas Deferens
   - (Stomach, liver, and left testis removed)

3. **Pre-Spawn (Maturity Stage 3)**
   - Testis
   - vas Deferens
   - (Stomach, liver, and left testis removed)

**FEMALES**

1. **Immature (Maturity Stage 1)**
   - Ovary
   - Shell Gland
   - (Stomach, liver, and left ovary removed)

2. **Developing (Maturity Stage 2)**
   - Ovary
   - Shell Gland
   - (Stomach, liver, and left ovary removed)

3. **Pre-Spawn (Maturity Stage 3)**
   - Ovary
   - Left Shell Gland
   - Right Shell Gland
   - Eggs
   - (Stomach, liver, and left ovary removed)
STOMACH SAMPLING

Removing a Gadid Stomach

Cut here to excise stomach
Removing a Flatfish Stomach
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Immature</td>
<td>Ovaries small, transparent to translucent, grayish-red. Eggs not visible to the eye.</td>
</tr>
<tr>
<td>2. Developing</td>
<td>Ovaries occupy about half the length of the ventral cavity. Color ranges from opaque grayish-red to reddish-yellow and orange. Eggs usually are present but may not be visible to eye.</td>
</tr>
<tr>
<td>3. Pre-spawning</td>
<td>Ovaries occupy about 2/3 or more of the ventral cavity. Color becomes more opaque. As eggs begin to hydrate, some become translucent.</td>
</tr>
<tr>
<td>4. Spawning</td>
<td>Roe runs with slight pressure. Most eggs hydrated (translucent) with few opaque eggs left in ovary.</td>
</tr>
<tr>
<td>5. Spent</td>
<td>Ovaries almost, to completely empty. May contain a few opaque eggs or eggs in a state of reabsorption. Ovaries are flaccid, watery and bloodshot.</td>
</tr>
</tbody>
</table>
Visual Maturity Scan Reminders and Suggestions: (see observer manual and visual maturity PowerPoint for complete instructions)

- Visual maturity is assessed on female otolith specimen fish only
- Be careful not to damage the internal structures (especially the stomach) while cutting the abdomen
- Consider all three characteristics listed below before assigning a visual maturity stage
- Remove only the ovaries before reweighing the fish
- The weight obtained after removing the ovaries is entered where weight data is required for the visual maturity specimen
- Use the otolith vial number for the visual maturity specimen number on the data sheets and in Atlas

Additional photographs:

A

B

C

Photograph A: developing; yellow-orange in color, well developed blood vessels, visible eggs

Photograph B: Prespawning; occupies 2/3 or more of abdominal cavity, color becoming more opaque, and eggs begin to hydrate

Photograph C: potential spawning (if eggs emitted with slight pressure to the abdominal cavity.)

Note: development is more advances in the center of the ovary. Hydrated and free flowing eggs are surrounding less hydrated, pre-spawning stage eggs. This example confirms the need to cut open a pollock ovary to verify maturity stage evaluation. Assign most advanced stage observed to the whole ovary cavity)

For questions regarding Pacific cod key contact Sandi.Neidetcher@noaa.gov with the Fisheries Interaction Team, Alaska Fisheries Science Center
### PACIFIC COD MATURITY CODES (FEMALE)

1. **Immature**
   - Ovaries appear as pink or transparent paired sacs, no oocytes (eggs at earlier stage of development) are visible to the eye.
   - Very small ovaries are close to vertebral column and may be difficult to sex.

2. **Developing**
   - Ovaries are smallish to about ½ the length of body cavity.
   - Ovaries form 2 tapered, distinct lobes with well-developed blood vessels.
   - Oocytes are distinct and visible through the ovary wall and typically appear orange to yellowish in color.
   - Oocytes stick together forming a solid mass.

3. **Pre-Spawn**
   - Ovaries form 2 large distinct lobes ½ or greater the length of the abdominal cavity.
   - Most oocytes have matured to opaque or almost clear ova (mature eggs)
   - Ova are less adhesive resembling the color and consistency of Cream of Wheat- the breakfast cereal.

4. **Spawning**
   - Ova are loose in the ovary and run under slight pressure to the body. (The ovary shown was cut upon sexing; the ova fill the abdominal cavity and flow into the bin.)

   * To differentiate ovary stages 2 through 4 look at the adhesive quality of the eggs. Stage 2 eggs form a solid mass while stage 3 eggs are looser and stage 4 eggs flow freely.

5. **Spent**
   - Ovaries appearing flaccid, dark, and watery or bloody.
   - Ovaries may contain remnants of disintegrating ova and associated structures.

6. **Resting**
   - Ovaries are small and firm, may have some black or silver color.
   - No oocytes are visible to the eye.

* Look for transparent pinkish coloration. There may be slight silver or dark blotching on the surface, but the ovary should be small and new looking as shown.

* To differentiate ovary stages 2 through 4 look at the adhesive quality of the eggs. Stage 2 eggs form a solid mass while stage 3 eggs are looser and stage 4 eggs flow freely.

* Spawning females who have released their eggs may have some loose eggs in the ovary, but the ovary will look flaccid where the ovary starts to shrink, looking wrinkled or bumpy. Disintegrating ova and structures look bloody.

* Look for small ovaries (as shown or slightly larger) in larger fish. The surface may be dark or silver and fibrous. The shape is more triangular and thicker than an immature ovary.
Visual Maturity Scan Reminders and Suggestions: (see observer manual and visual maturity PowerPoint for complete instructions)

- Visual maturity is assessed on female otolith specimen fish only
- Be careful not to damage the internal structures (especially the stomach) while cutting the abdomen
- Consider all three characteristics listed below before assigning a visual maturity stage
- Remove only the ovaries before reweighing the fish
- The weight obtained after removing the ovaries is entered where weight data is required for the visual maturity specimen
- Use the otolith vial number for the visual maturity specimen number on the data sheets and in Atlas

Three main characteristics of visual maturity:

1) The size of the ovary in comparison to the size of the abdominal cavity.

2) The color of the ovary and the individual oocytes (ova)

3) The adhesiveness of the oocytes – do they stick tightly together or can they be separated easily; do they run freely.

For questions regarding Pacific cod key contact Sandi.Neidetcher@noaa.gov with the Fisheries Interaction Team, Alaska Fisheries Science Center
North Pacific Right Whales

MARINER ADVISORY

The right whale population in the eastern North Pacific is the most endangered stock of whales in the world, with fewer than 100 individuals remaining. Right whales are slow swimmers that sometimes feed at or near the surface. They show little or no instinct to avoid vessels and are vulnerable to ship strikes. They also tend to roll when they meet an obstacle, which may result in gear entanglement. North Pacific right whales have been observed over the central Bering Sea shelf and off Kodiak Island in recent years.

DO
1. Look out for whales.
2. Log the time and location of right whale sightings.
3. Immediately notify federal fisheries observer of right whale sightings.
4. If no federal fisheries observer, photograph whale for sighting confirmation and send sighting report to address on reverse side.
5. Notify nearby vessels and ask them to stay away.
6. Remain at least 100 yards from whales.
7. If a whale approaches your vessel, take the vessel out of gear (neutral) and allow the whale to pass.
8. Leave the area at a slow, safe speed, ASAP.

DON’T
1. Set or haul gear of any type close to whales.
2. Approach within 100 yards of any whale.
3. Place your vessel in the path of oncoming whales, forcing them to surface.
4. Remain near a right whale.
5. Operate your vessel at anything greater than a slow, safe speed near whales.
Right whales may be confused with humpback and gray whales. Look for these important differences. Right whales are baleen (filter-feeding) whales. They have bowed lower lips that enfold a narrow arching rostrum, the narrow upper jaw. North Pacific right whales grow to about 60 feet (18.3 meters) in length, and adults average 50 tons. They have robust bodies with large heads that are one fourth of the body length. There are a series of callosities – areas of raised, roughened, white-colored skin – on the chin, above the eyes, on the lower lip, behind the blowholes and on the rostrum. The skin is usually black, with white patches on the belly. Right whales have no dorsal (back) fin, and no throat grooves. They have large paddle-like flippers and very broad triangular tails with straight edges. Their blow is V-shaped and up to 16 feet (5 meters) high. Note: never use blow shape alone to identify whales because this characteristic will change depending on weather conditions and whale behavior.

Take photos if possible! Right whales can be individually identified by the pattern of callosities on their head and by other features, so photographs - especially of the head and any scars - are of great value to researchers. At a minimum: report date, number of animals, location (lat/long).

REPORT SIGHTINGS AND SEND PHOTOGRAPHS TO:

Director
National Marine Mammal Lab
Alaska Fisheries Science Center
NMFS, NOAA
7600 Sand Point Way N.E.
Seattle, WA 98115-6349
(206) 526-4045 voice
(206) 526-6615 fax
http://nmml.afsc.noaa.gov/
North Pacific Albatrosses

SHORT-TAILED ALBATROSS

BLACK-FOOTED ALBATROSS

LAYSAN ALBATROSS

Match numbered photos with text on reverse.
Identification of Live Birds:
Please match numbers with photos on front. Bill outlines are life-size for positive identification.

**SHORT-TAILED ALBATROSS**

1. **SHORT-TAILED, Juvenile**
   - First two months at sea
   - **Similarities**
     - Large, light gray bill with traces of pink
   - **Differences**
     - Smaller dark gray bill
     - White on face at base of bill
   - Note: Bill of young short-tailed albatross changes to pink probably within its first two months at sea. It departs from nest mid-May to early June.

2. **SHORT-TAILED, Juvenile/Immature**
   - Confusion with other species unlikely at this stage
   - Completely brown body and wings
   - Large pink bill
   - Pale legs (sometimes dark)

3. **SHORT-TAIRED, Immature**
   - **Similarities**
     - Brown body, some white on chest and face
   - **Differences**
     - Smaller dark bill
     - Dark legs
     - White rump and undertail
     - Wings all brown

4. **SHORT-TAILED, Sub-adult**
   - **Similarities**
     - Pink bill (Laysan bill varies yellowish to pinkish-beige)
     - White body with brown back
     - Pale legs
   - **Differences**
     - White head/neck
     - Brown back and upperwings
     - Dark gray eye patch
   - Note: Can breed at this stage.

5. **SHORT-TAILED, Adult—full grown**
   - **Similarities**
     - White head/neck with yellow tinge
     - White back
     - Brown and white upperwings
     - Lacks eye patch
   - **Differences**
     - White head/neck without yellow tinge
     - Brown back and upperwings
     - Dark gray eye patch

**BLACK-FOOTED AND LAYSAN ALBATROSS**

6. **BLACK-FOOTED, Juvenile**
   - **Similarities**
     - Difficult to distinguish; completely brown body and wings, dark bill and legs
   - **Differences**
     - Smaller dark gray bill
     - White on face at base of bill

7. **BLACK-FOOTED, Old adult**
   - **Similarities**
     - Brown body, some white on chest and face
   - **Differences**
     - Smaller dark bill
     - Dark legs
     - White rump and undertail
     - Wings all brown

8. **LAYSAN ALBATROSS, All ages**
   - **Similarities**
     - Pink bill (Laysan bill varies yellowish to pinkish-beige)
     - White body with brown back
     - Pale legs
   - **Differences**
     - White head/neck
     - Brown back and upperwings
     - Dark gray eye patch

**GENERAL DESCRIPTIONS**

**Short-tailed Albatross**
*Phoebastria albatrus*
- Can occur anywhere in the North Pacific Ocean during all months. Currently less than 200 breeding pairs. Multiple threats throughout its range require international cooperation to prevent extinction. Distinctive pink color.
- Adult at nesting only.
- Breeds: Japan
- Estimated breeding pairs: 180

**Black-footed Albatross**
*Phoebastria nigripes*
- Mostly brown throughout its life and always has white at base of dark bill (6 and 7). Dark legs. Develops a white rump and more white on the face as it matures (7).
- Breeds: Hawaiian Islands, Japan
- Estimated breeding pairs: 71,000

**Laysan Albatross**
*Phoebastria immutabilis*
- A white-bodied albatross, like the adult short-tailed albatross, but solid dark brown from wing tip to wing tip on upper side; dark back (8). Pink bill but can vary. Legs pale. Plumage colors do not change.
- Breeds: Hawaiian Islands, Japan, Mexico
- Estimated breeding pairs: 650,000

**OTHER FACTS**

Albatrosses are adult-size when they leave the nest and spend their first several years at sea. They mate for life. Both sexes of these three species raise a single chick annually, which takes 5 to 6 months. If one parent is killed, the chick also dies and the mate is not replaced for up to three years. These three species have an approximate 7-foot wingspan and range across the entire North Pacific Ocean. They can live 40 years or more.

Please report sightings of short-tailed albatrosses to the U.S. Fish & Wildlife Service: 1-800-272-1174. The only way of knowing the short-tailed albatross' age is from leg bands placed on them as chicks. By reporting the following information, you are contributing to the knowledge of this endangered seabird's pelagic range: 1) Date and time 2) Vessel's position 3) Plumage characteristics 4) Leg band combinations (both right and left leg)

**Photographers:**
Hiroshi Hasegawa, Elizabeth Mitchell, VIREO

**Text/Design/Art/Graphs:**
Elizabeth Mitchell, Greta Tristram