

RAE BAXTER'S ANNOTATED KEY TO THE FISHES OF ALASKA

RAJIDAE

Caudal fin reduced; tail slender, long; dorsal fins usually 2, but may have single dorsal fin; generally mid-dorsal row of of spines on tail which may extend to scapular region.

Head length is the oblique, straight line distance from the tip of the snout to the posterior side of the 5th gill opening (rarely to 1st). Cephalic length is from the tip of snout to beginning of 1st vertebral centrum. Vertebra counts are precaudal + caudal to origin of dorsal fin + dorsal origin to end of caudal = total vertebra. If only 2 sets of figures are given then count is abdominal + caudal + total vertebra.

- 0 - Key to adult fish (mature males especially) (1)
- 0 - Key to the egg cases. (55)
- 1 - Snout relatively stiff; pectoral fin supporting cartilage not reaching tip of snout; both malar and alar hooks present on mature males. (Genus **Raja**) (2)
- 1 - Snout soft and flexible; pectoral fin supporting cartilage extending to tip of snout; alar hooks absent. (Genus **Bathyraja**) (8)
- 2 (1) - Anterolateral edge of pectoral fin concave. (3)
- 2 - Anterolateral of pectoral fin convex. (5)

RAJIDAE

3 (2) - Ventral side light; pelvic fin shallowly notched'

Raja (Dipturus) binoculata (Girard, 1854)

big skate

Range: Bering Sea – San Quintin Bay, Baja California

3-800m

Fig. : Baxter #885

Miller & Lee, 1972:44, 48

Notes: NODC #8713040103; NMFS #00420

Dorsal dark gray, brown or reddish brown, usually with large ocellus at base of pectoral, may have white rosette spots; white ventrally.

Tail with lateral fold.

Mid-dorsal spine row usually with single muchal spine, gap, then followed with spines on pelvic region and caudal spines; dorsal row of caudal spines on female may be staggered; orbital spines may be buried in skin in large adults.

Ventral pore rows approach edge of disk on rostrum; postero-lateral segment of ventral pore row with right angle laterally to 3rd - 4th gill slit, more than 15 pores posterior to the 5th gill opening; pores not extending onto pelvic arch.

| | | |
|--|-----------------------------------|-------------------|
| TL - 2440, Wt 91 kg | PreLip L | 46.1 - 54.6% HL |
| Body length: | Mouth W | 27.5 - 32.6% HL |
| Snout-pelvic 34.1 - 36.6% TL | PreNasal L | % HL |
| PreAnus 56.3 - 59.0% TL | InNasal W | 27.4% HL |
| Body W 73.8 - 79.2% TL | Intergill Widths, maximum: | |
| Head L, 1 st gill 27.4 - 28.1% TL | 1 st | 60.8 - 72.1% HL |
| Head L 5 th gill 28.1 - 33.3 % TL | 5 th | 37.2 - 51.9% HL |
| Snout L 52.8 - 62.6% HL | 1 st - 5 th | 22.7 - 27.0% HL |
| Orbit L 9.6 - 11.4% HL | Tail fold | 79.6% Tail Length |
| Eye L 5.5 - 6.6% HL | Dorsal fin base Length: | |
| InOrb W 19.7 - 9.3% HL | 1 st | % HL |
| Spiracle L 7.8 - 9.3% HL | 2 nd | % HL |
| InSpir W 27.6 - 32.8% HL | InterDorsal Fin L | 2.1 - 5.3% HL |
| Dorsal spines: | Clasper Length to pelvic junction | 44.5 - 46.9% HL |
| Orbital: 0-3, or many very fine | Ventral pores : | |
| Scapular: 0 | Teeth, upper 41 - 49 | |
| Mid-dorsal row: | lower 38 - 45 | |
| Nuchal 1 + 4-12 = 5-12 | Vert, PreDorsal 96 | |
| Caudal 12 - 55 | 29 + 83 = 112 | |
| InterDorsal 0 - 1 | Pelvic rays 21 | |
| InterMidDorsal: | Body L/W 76.4 | |
| Alar: rows 2-3; columns 2-10 | PreAnus L/Body W | |
| Malar: rows 4-7; columns 4-11 | | |

3 - Dark ventrally, especially anteriorly.

(4)

RAJIDAE

- 4 (3) - Mid-dorsal row of body spines discontinuous; pelvic fin deeply notched, when held at right angles to body they form 2 lobes.

Raja rhina (Jordan & Gilbert, 1880)

longnose skate

Range: Shumagin Islands, Alaska – Pt. Loma, California

55 – 680m

Refer : Baxter #904,1219A

Miller & Lee, 1972:44

Notes: NODC #8713040108; NMFS #00440

Dark to light brown with darker blotches dorsally; may have small ocellate markings at base of pectoral fins on dorsal side, spots with light center and dark rim; ventrally darker, may be more bluish, generally darker anteriorly; mouth white, lips dark.

Snout strongly projecting; antero-lateral margin of pectoral concave.

Posterior mid-dorsal row of spines on body starts with a double row; mid-dorsal spines on tail very uneven in spacing and size; in addition there are strong spines, generally paired on top of tail; may have fine spines ventrally on snout and front edge of pectoral in large adults; mature female with 3-6 spines dorsally on snout; dorsal fins with fine spines.

Ventral pores laterally of gill slits scattered, extending to more than 70% of distance from rear gill slit to edge of disk; pores on pelvic arch 6-15, extending laterally to beyond insertion of pelvic fin.

Males smaller than females.

| | |
|--|--|
| TL - 1400 | PreLip L 46.2 - 64.6% HL |
| Body Length: | Mouth W 25.6 - 30.2% HL |
| Snout-pelvic % TL | PreNasal % HL |
| PreAnus 56.0 - 56.6% TL | InNasal W 25.2 - 25.5% HL |
| Body W 72.1 - 77.2% TL | Intergill Widths, maximum: |
| Head L, 1 st gill 27.3 - 30.3% TL | 1 st 53.9 - 61.7% HL |
| Head L, 5 th gill 30.3 - 34.7% TL | 5 th 35.5 - 40.6% HL |
| Snout L 47.4 - 66.6% HL | 1 st -5 th 19.4 - 22.9% HL |
| Orbit L 10.3 - 11.8% HL | Tail fold 52.8% Tail Length |
| Eye L 8.0 - 9.1% HL | Dorsal fin base length: |
| InOrb W 16.2 - 18.3% HL | 1 st % HL |
| Spiracle L 7.6 - 9.9% HL | 2 nd % HL |
| InSpir W 20.3 - 23.5% HL | InterDorsal Fin L 5.5 - 7.1% HL |
| Dorsal spines: | Clasper Length to pelvic junction 51.1% HL |
| Orbital: 2-31, increasing with size | Ventral pores: |
| Scapular: 0 | Teeth, upper 39 - 46 |
| Mid-dorsal row: | lower 36 - 40 |
| Nuchal 0 - 2 + 4 - 9 = 6-13 | Vert |
| Caudal 11 - 60 | Body L/W |
| InterDorsal 0 - 6 | PreAnus L/Body W |
| InterMidDorsal: 0 | |
| Alar: rows 2; columns 8 - 17 | |
| Malar: 14 - 29 | |

RAJIDAE

4 - Mid-dorsal row of spines continuous.

Raja (Amblyraga) badia (Garman, 1899)

broad skate

Range: Vancouver Is., British Columbia – Panama

846-2311m

Refer: Zorzi & Anderson, 1988:89, fig.1

Notes: NODC #8713040xxx; NMFS #00445

Dorsally colored medium gray-brown to chocolate-brown with darker spots and blotches, light beneath eyes, brown bar across scapular region; ventrally dark with light blotches.

Snout pointed.

Interdorsal fin length 0-0% TL

Mid dorsal spine row continuous; coarse denticles on dorsally on disk and tail covering most of the body, enlarged spines on tip of snout; tail with enlarged row of spines along side larger mid dorsal row; ventrally smooth.

| | | |
|--|----------------------------------|-----------------|
| TL - 985 | PreLip L | 16.6 - 17.3% TL |
| Body Length: | Mouth W | 13.0 - 13.2% TL |
| Snout-pelvic 56.1 - 56.7% TL | PreNasal L | % HL |
| PreAnus 53.9 - 57.2% TL | InNasal W | % HL |
| Body W 73.7 - 75.9% TL | Intergill Widths, maximum: | |
| Head L, 1 st gill %TL | 1 st | 20.8 - 21.3% HL |
| Head L, 5 th gill 30.0 - 34.3% TL | 5 th | 13.7 - 14.8% HL |
| Snout L 14.6% HL | 1 st -5 th | % HL |
| Orbit L % HL | Tail fold | % Tail Length |
| Eye L less than 50% InOrb W | Dorsal fin base Length: | |
| InOrb W 6.0 - 6.5% HL | 1 st | % HL |
| Spiracle L % HL | 2 nd | % HL |
| InSpir W % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | Clasper Length to | |
| Orbital: 3 | pelvic junction | % HL |
| Scapular: 2-3 | Ventral pores: | |
| Mid-dorsal row: 22 - 29 | Teeth, upper 37 - 42 | |
| Nuchal ; mode | lower | |
| Caudal ; mode | Vert 33 + 19-24 = 52-57 | |
| InterDorsal ; mode | | |
| InterMidDorsal: | Body L/W | |
| Alar: rows ++ ; columns | PreAnus L/Body W | |
| Malar : rows + | | |

5 (2) - Scapular spines present. (6)

5 - Scapular spines absent (7)

RAJIDAE

6 (5) - Pelvic fin deeply notched.

Raja stellulata (Jordan & Gilbert, 1880)

starry skate

Range: Bering Sea – Baja California, Coronado Bank

18-732m

Refer: Ishihara & Ishiyama, 1986, fig.9B

Miller & Lee, 1972:46-47

Notes: NODC #8713040111; NMFS #00450

Brown or gray-brown, often spotted or with ocellus.

Snout short, soft, rounded or broadly angulated; disk much broader than long; antero-lateral edge of disk convex; lateral fold on tail, strongest posteriorly

Small spines dorsally and on most of ventral side; mid-dorsal row of spines may or may not be continuous; cluster of moderate spines along edge of pectoral fin from tip to snout; spines larger on males than on females; ventral pores extend onto pelvic arch with 3-6; pores laterally of gill openings scattered.

| | | | |
|-------------------------------|----------------------|----------------------------------|---------------|
| TL | - 770 | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L , 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | 58.8 - 83.3% Snout L | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | 2-16 | pelvic junction | % HL |
| Scapular: | 0-6, usually 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 40 |
| Nuchal | 3-26 | lower | 35 |
| Caudal | 18-27 | Vert | |
| InterDorsal | 1 | | |
| InterMidDorsal: | | Body L/W | |
| Alar: rows | 1-2 ; columns 4-11 | PreAnus L/Body W | |
| Malar: | 9-20 | | |

6 - Pelvic fin notch shallow.

Raja (Amblyraga) badia (Garman, 1899)

broad skate

SEE # 4

RAJIDAE

7 (5) - Dark spots dorsally: pelvic fin deeply notched.

Raja stellulata (Jordan & Gilbert, 1880) starry skate
SEE # 6 (5)

7 - Not spotted dorsally, but may have blackish ocellus; pelvic fin shallowly notched.

Raja inornata (Jordan & Gilbert, 1880) california skate

Range: Strait of San Juan de Fuca - Baja California 18-1600m
Refer: Ishihara & Ishiyama, 1986: fig.9A
Miller & Lee, 1972:44, 47
Notes: NODC #8713040104; NMFS #00425

Olive brown dorsally; ocellus become fainter on adults; tan ventrally: Moderately long, acutely pointed snout; Interorbital space narrow, concave; jaws somewhat curved; female with strong lateral row of spines on caudal; dorsal spines very small along mid back, changing opposite mid pelvics into a series of rather strong, hooked spines; ventral pores not extending onto pelvic arch; pores lateral of gill openings scattered, not forming longitudinal rows.

| | | | |
|------------------------------|------------------|----------------------------------|---------------|
| TL | - 760 | PreLip L | % HL |
| Body Length | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | & HL | Tail fold | % Tail Length |
| Eye L larger than spiracle | | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | 0-10 | pelvic junction | % HL |
| Scapular: | 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 40 |
| Nuchal | 0-11 | lower | 42 |
| Caudal | 10-66, scattered | Vert | |
| InterDorsal | ; mode | | |
| InterMidDorsal: | | Body L/W | |
| Alar: rows | 1; columns 9-15 | PreAnus L/Body W | |
| Malar: | 4-11 | | |

8 (1) - Ventral side dark or same color as dorsal side (9)

8 - Ventral side white, may have dark mottlings, especially on tail. (23)

RAJIDAE

9 - Mid dorsal spine row discontinuous or nuchal portion absent, spines markedly uneven in size (10)

10 (9) - Nuchal spines absent. (11)

10 - Nuchal spines present. (15)

11 (10)- Mid dorsal spines absent or very weak on tail

Bathyraja tobitukai (Hiyama, 1940)

Range: Western Bering – Japan

Refer : Masuda, et al, 1985:13, pl.15(B)

Notes:

Body grayish on both sides.

Mid dorsal spines absent on body, absent or very weak on caudal; dorsally evenly covered with coarse spines.

| | | | |
|------------------------------|-----------|----------------------------------|---------------|
| TL - | | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | | pelvic junction | % HL |
| Scapular: | | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | |
| Nuchal | ; mode | lower | |
| Caudal | ; mode | Vert 27-28 + 64-67 + ? = | 101-104 |
| InterDorsal | ; mode | | |
| InterMidDorsal: | | Body L/W | |
| Alar; rows | ; columns | PreAnus L/Body W | |

11 - Mid dorsal spines present on tail. (12)

RAJIDAE

12 (11) – Fine spines ventrally.

Bathyraja spinosissima (Beebe & Tee-Van, 1941)

white skate

Range: Oregon – Panama

800-2938m

Refer : Miller & Lee, 1972:46, 48

Notes: NMFS #00406

Pale gray dorsally and ventrally.

Wide gap between dorsal fins.

Very fine spines both ventrally and dorsally on body; mid=dorsal row of spines absent on body; without lateral row of spines on tail; ventral pores not more than 10 laterally of 5th gill opening.

| | | | |
|------------------------------|------------------|----------------------------------|---------------|
| TL - 1067 | | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | 76.9 - 111.1% HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: 0 | | pelvic junction | % HL |
| Scapular: 0 | | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | |
| Nuchal 4 | | lower | |
| Caudal 23-29 | | Vert 27-28 + 64-67 + ? = 101-104 | |
| InterDorsal | | | |
| InterMidDorsal: | | Body L/W | |
| Alar; rows ; columns | | PreAnus L/Body W | |

12 - Ventrally smooth (may have ventro-lateral spines on tail)

(13)

RAJIDAE

13 (12) – Interorbital width more than 19% HL

Bathyraja trachura (Gilbert, 1892)

rougtail skate
(black skate)
490-1993m

Range: Western Bering Sea – Northern Baja California

Refer : Baxter #855,1049

Miller & Lee, 1972:45, figs.45, 47

Ishihara & Ishiyama, 1985:169, fig.22

Notes: Holotype USNM 46930; NODC #8713040112; NMFS #00460

Resem: Related to B.isotrachys, but disk is broader, snout much blunter with angle much greater than a right angle; differs from all species of dark ventral sided skates by having a clasper without any components in ventral lobe and low predorsal vertebrae counts.

Plum-brown to black to slate gray dorsally and ventrally; whitish tip of anterior lobes, margin of anus, gill openings, inside spiracles, mouth, lips, and ventral brachial area; may have large white blotch over dorsal branchial area.

Interorbital space concave to flattish-concave.

Dorsal fins small, equal, prickly, interdorsal space 1-18% of length of 1st dorsal fin base; distance from eye to nearest point of disk margin 8.3-9.2% TL.

Dorsally covered with moderate sized spines which tend to be long and hooked, especially posteriorly; body spines sparse over branchial area and on pectoral centers: spines crowded in interorbital space: ventrally without spines; nuchal area of mid dorsal spine row usually without spines, but may have 3 or less; lateral row of spines on tail slightly enlarged, smaller spines dorsally and between mid dorsal row.

Ventral pores hard to see on the dark background; pores not onto pelvic arch.

Pseudobranchial folds 14-16.

Clasper with global tip; large pseudosiphon #1 present proximally near outer lateral edge of lobe; inner surface of dorsal lobe with pseudosiphon and cleft; no component on inner surface of ventral lobe.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja trachura

TL - 886
 Body Length:
 Snout-pelvic 47.8 - 54.7 % TL
 PreAnus 46.8 - 52.4 % TL
 Body W 64.0 - 67.1 % TL
 Head L, 1st gill 21.4 - 22.5 % TL
 Head L, 5th gill 27.5 - 29.4 % TL
 Snout L 40.3 - 44.0 % HL
 Orbit L 14.8 - 15.6 % HL
 Eye L 10.6 - 14.2 % HL
 InOrb W 14.7 - 19.9 % HL
 Spiracle L 10.9 - 13.9 % HL
 InSpir W 21.6 - 26.3 % HL
 Dorsal spines:
 Orbital: 0
 Scapular: 0
 Mid-dorsal row:
 Nuchal 0 - 3
 Caudal 19 - 29
 InterDorsal 0
 InterMidDorsal: ++,
 Alar; rows 5-8 ; columns 21 - 23

PreLip L 31.4 - 40.5 % HL
 Mouth W 29.1 - 32.7 % HL
 PreNasal L % HL
 InNasal W 27.5 - 30.6 % HL
 Intergill Widths, maximum:
 1st 69.4 - 79.6 % HL
 5th 46.9 - 52.6 % HL
 1st-5th 29.5 - 34.2 % HL
 Tail fold 80.7 - 90.2 % Tail Length
 Dorsal fin base Length:
 1st % HL
 2nd % HL
 InterDorsal Fin L 1.5 % HL
 Clasper Length 51.6 - 58.8 % Tail L
 Ventral pores:
 Teeth, upper 26 - 35
 lower 30
 Vert, trunk 32 - 37
 PreDorsal 62 - 66
 Body L/W
 PreAnus L/Body W

RAJIDAE

14 (13) – Lateral keel extends less than half of distal portion of tail.

Bathyraja isotrachys (Gunther, 1877)

challenger skate

Range: Western Kamchatka – Pacific coast of Japan – Okinawa Trough 650-1100m

Refer : Baxter #851,853

Dolganov, 1984?:130, figs.8-9

Ishihara & Ishiyama, 1985, figs14B, 16A

Notes : Holotype BMNH 1887.12.7.3

Dorsally uniform brownish-gray to plum-brown: ventrally brownish-black to plum-brown; whitish around mouth, tip of anterior pelvic lobes, margin of anus, and gill openings.

Disk wider in males than in females; snout rather produced, anterior margins meeting at nearly a right angle; tail much longer than body in males and only slightly longer in females; interorbital space concave to flat.

Interdorsal distance 0 – 6.7% HL; pelvic fin notch shallow to moderate; dorsally body and tail thickly covered with minute spines; ventrally usually without prickles, but may have them ventro-laterally on tail; mid-dorsal spine row discontinuous, may have irregular row of 18 small spines posterior of nuchal spine row; scapular spine may have smaller, but enlarged spine postero-lateral to it; caudal row continuous; caudal spines tend to be longer than nuchal; no enlarged lateral spines on tail but smaller spines next to and between dorsal row; smaller spines on eyeballs; orbital and interorbital spines same size as rest of body spines.

Gill flaps evenly rounded, without any projection; pseudobranchial folds 11 – 16.

Claspers with pseudosiphon #1 near outer lateral edge of upper surface; inner surface of dorsal lobe with pseudosiphon and cleft, ventral lobe with projection, sentina, and knife-like sentinal.

Differs from other dark bellied skates, except for B. minispinosa by narrow interorbital width, less than 19% HL; clasper with pseudosiphon #1 only.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja isotrachys

| | | | |
|------------------------------------|------------------|----------------------------------|---------------------------|
| TL | - 862 | PreLip L | 46.5 – 57.9 % HL |
| Body Length: | | Mouth W | 24.6 – 33.4 % HL |
| Snout-pelvic | 47.4 – 50.5 % TL | PreNasal L | % HL |
| PreAnus | 50.1 % TL | InNasal W | 23.4 – 24.1 % HL |
| Body W | 59.5 – 65.1 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | 23.3 % TL | 1 st | 62.4 – 78.6 % HL |
| Head L, 5 th gill | 29.0 % TL | 5 th | 40.1 – 52.8 % HL |
| Snout L, Male | 49.0 – 60.2 % HL | 1 st -5 th | 24.4 – 30.6 % HL |
| Female | 50.1 – 62.3 % HL | Tail fold | 13.5 – 40.0 % Tail Length |
| Orbit L | 16.5 – 21.1 % HL | Dorsal fin base Length | |
| Eye L | 11.4 – 14.0 % HL | 1 st | % HL |
| InOrb W | 13.7 – 17.5 % HL | 2 nd | % HL |
| Spiracle L | 8.5 – 10.8 % HL | InterDorsal Fin L | 4.0 % HL |
| InSpir W | 23.2 – 29. % HL | Clasper Length to | |
| Dorsal spines: | | pelvic junction | % HL |
| Orbital: | 0 | Ventral pores: | |
| Scapular: | 0-1 – 1+1 | Pec rays | 74 - 81 |
| Mid-dorsal row: | | Teeth, upper | 23 - 37 |
| Nuchal | 0-5 + 18 | lower | |
| Caudal | 17 - 29 | Vert , trunk | 32 - 34 |
| InterDorsal | 0 -1 | PreDorsal | 70 - 75 |
| InterMidDorsal: | + | Body L/W | 0.75 – 0.78 |
| Alar; rows 3 - 7 ; columns 19 - 22 | | PreAnus L/Body W | |
| Clasper L | 23.3 – 23.9 % TL | | |

RAJIDAE

14 - Lateral keel on tail extends length of tail.

Bathyraja fedorovi (Dolganov, 1984 ?)

Range: Okhotsk - Pacific coast of Japan

1370 – 1550m

Refer : Dolganov, 1984?:fig.4

Body dark-cinnamon on both sides, dorsal surface monotone, ventral surface with numerous small white spots.

Snout pointed, snout angle less than 90 degrees; eyes moderately small; pectoral fin rays 71 - 72 ; pelvic fin rays 20 – 21; spiral valve turns 9.

Egg capsules 86x48mm

Differs from B.isotrachys by long lateral tail folds and presence of spines on central portion of pectoral fin in adults.

| | | | |
|------------------------------|--------------------------|----------------------------------|--------------------------|
| TL | - 733 | PreLip L | % HL |
| Body Length: | | Mouth W | 30.3 – 33.8 % Cephalic L |
| snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | 47.6 – 50.3 % TL | InNasal W | % HL |
| Body W | 57.3 – 59.7 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | 71.7 – 72.4 % TL | 1 st -5 th | % HL |
| Orbit L | 12.4 – 13.1 % Cephalic L | Tail fold | % Tail Length |
| Eye L | 69.2 - 76.0 % InOrb W | Dorsal fin base Length: | |
| InOrb W | 17.2 – 17.9% Cephalic L | 1 st | % HL |
| Spiracle L | 11.7 – 13.1% Cephalic L | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | 0 | pelvic junction | % HL |
| Scapular: | 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 22 - 23 |
| Nuchal | 0 | lower | 18 - 20 |
| Caudal | 22 – 26 | Vert, trunk | 28 - 29 |
| InterDorsal | ; mode | PreDorsa | 65 |
| InterMiddorsal: | | Body L/W | 0.85 – 0.87 |
| alar: rows | : columns | PreAnus L/Body W | |

15 (10) – Interorbital width less than 20 % HL (16)

15 - Interorbital width more than 20 % HL (18)

RAJIDAE

16 (15) – Inner margin of eye ball generally conspicuously whitish.

Bathyraja minispinosa (Ishiyama & Ishihara, 1977)

whitebrow skate

Range: Kamchatka – Bering sea

Refer : Amaoka, et al, 1983:312, fig.114

Baxter #557,558,706

Ishiyama & Ishihara, 1977:83, figs.15A-B

Notes : NMFS #00485

Body gray dorsally and ventrally, may be lighter ventrally, light colored line between ventral pore rows, ventral pores dark, lips white; Interorbital space generally white about the eyes.

Dorsal fins with very slight interspace; lateral tail fold extends almost length of tail, wide on posterior quarter of tail; interorbital space broadly concave with small spines; mid-dorsal spine row discontinuous; nuchal spines may be small; dorsal spines small, body covered except for brachial area and pelvic fin; slightly larger lateral spines on tail which continue forward as an irregular row to scapular region; spines on dorsal fins and a few on caudal fin; small spines between mid-dorsal spines; no spines ventrally; eye with small spines.

Gill flap with slight, rounded projection.

Clasper pointed distally with pseudosiphon #2; projection of clasper rudimentary; purse and knife of clasper absent.

| | | | |
|---------------------------------|-------------------|----------------------------------|------------------------|
| TL | - 825 | PreLip L | 41.3 – 42.8 % HL |
| Body Length: | | Mouth W | 22.6 – 26.6 % HL |
| Snout-pelvic | % TL | PreNasal L | 36.4 – 37.8 % HL |
| PreAnus | 45.2 – 47.3 % TL | InNasal W | 25.6% HL |
| Body W | 69.2 – 71.3 % TL | Intergill widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | 66.4 – 70.4 % HL |
| Head L, 5 th gill | 27.7 – 28.1 % TL | 5 th | 41.8 – 45.8 % HL |
| Snout L | 43.2 – 46.2 % HL | 1 st -5 th | 31.1 – 33.1 % HL |
| Orbit L | 13.9 – 14.7 % HL | Tail fold | % Tail Length |
| Eye L | 9.6 – 10.5 % HL | Dorsal fin base Length: | |
| InOrb W | 13.6 - 14.3 % HL | 1 st | % HL |
| Spiracle L | 10.1 – 10.0 % HL | 2 nd | % HL |
| InSpir W | 23.1 % HL | InterDorsal Fin L | 1.1 – 3.4 % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | 0 | pelvic junction | 47.9 – 48.1 % HL |
| Scapular: | 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 28 - 34 |
| Nuchal | 1 – 4, very small | lower | 31 - 36 |
| Caudal | 19 – 26 | Vert | 29-34 + 65-76 + 9-15 = |
| InterDorsal: | 0 | | = 108-119 |
| InterMidDorsal: | + | Body L | 64.2 % Body W |
| Alar: rows 2 – 7: columns 21-23 | | Pseudobr | 12 - 17 |

RAJIDAE

16 - Inner margin of eyeball same color as dorsal ground color. (17)

17 (16) – Nuchal spines very weak, not sharp, numbering 0-3; clasper tip roundish with tip of projection showing, without pseudosiphon #1, knife and purse present..

Bathyraja Isotrachys (Gunther, 1877)
SEE #14 (13)

challenger skate

RAJIDAE

17 - Nuchal spines strong, sharply pointed, numbering 3.

Bathyraja matsubarai (Ishiyama, 1952)

Range: North Pacific off Japan.

800-1205m

Refer : Amaoka, et al, 1983:169, fig.11

Baxter #848

Ishiyama & Ishihara, 1977:73, fig.6

Masuda, et al, 1985:14, pl.15(G)

Notes : TypeFAKU 49458

Resem: Distinguished from close allies by body coloration and size of eye.

Body dark purplish brown on both sides, area around mouth whitish.

Eye relatively large; dorsal fin interspace narrow, distance 7.4% HL; interorbital space concave; lateral tail fold narrow, extending 53.6 % of posterior portion of tail; pelvic fin notch dep; mid-dorsal spine row discontinuous; mid dorsal spines large, smooth, with even, oval bases; body covered with small spines, including spines between and around mid-dorsal row of spines on tail, lateral tail spines not larger than rest of tail spines; spines absent over brachial area and central portion of pectoral fin; dorsal and caudal fins with spines; pelvic fins without spines exceptfor small patch on central area of posterior lobe.

Clasper with pseudosiphon.

| | | | |
|------------------------------|------------------|----------------------------------|--------------------|
| TL | - 1037 | PreLip L | 35.4% HL |
| Body Length: | | Mouth W | 30.7 % HL |
| Snout-pelvic | 44.1 % TL | PreNasal L | % HL |
| Preanus | % TL | InNasal W | 35.1 % HL |
| Body W | 59.3 – 61.6 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | 20.0 % TL | 1 st | 82.7 % HL |
| Head L, 5 th gill | 25.3% TL | 5 th | 57.2 % HL |
| Snout L | 39.2 % HL | 1 st -5 th | 31.0 % HL |
| Orbit L | 15.8% HL | Tail fold | 53.6 % Tail Length |
| Eye L | 14.2 % HL | Dorsal fin base Length: | |
| InOrb W | 15.8 % HL | 1 st | % HL |
| Spiracle L | 12.0 % HL | 2 nd | % HL |
| InSpir W | 28.5 % HL | InterDorsal Fin L | 7.4 % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | many, very fine | pelvic junction | % HL |
| Scapular: | 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 25 |
| Nuchal | 3 – 4 | lower | |
| Caudal | 23 – 35 | Vert | 38 + 72 + 10 = 120 |
| InterDorsal | 0 -1 | Pseudobr | 16 - 18 |
| InterMidDorsal: | + | Body L/W | 0.72 |
| Alar: rows | ; columns | PreAnus L/Body W | |

RAJIDAE

18 (15) – Clasper ventral lobe without any components; vertebrate precaudal count 62 – 55.

Bathyraja trachura (Gilbert, 1892)
SEE # 13

(black skate) roughtail skate

18 (19) – Clasper ventral lobe with components; Vprd count more than 66

(19)

RAJIDAE

19 (18) – Body mottled with many, moderately sized, scattered white markings dorsally.

Bathyraja maculata (Gilbert, 1892)

white blotched skate

Range; Kamchatka – Bering Sea

190 – 570m

Refer : Baxter #949,1051

Ishiyama & Ishihara, 1977:80, figs.7D, 8D,13A-B

Notes : NMFS #00480

Resem: Differs from sp. #742 by having large yellow spots and smaller mid-dorsal and scapular spines.

Gray dorsally and ventrally; large scattered white to yellow blotches dorsally.

Interorbital space concave.

Pelvic fin notch moderate; broad lateral tail fold.

Body dorsally mostly covered with small spines, ventrally without spines; ventral pores 4 + 7 + 5

Clasper with large pseudosiphon.

| | |
|---|---|
| TL - 1102 | PreLip L 35.1 – 46.6 % HL |
| Body Length: | Mouth W 23.0 – 29.2 % HL |
| snout-pelvic 43.8 % TL | PreNasal L % HL |
| PreAnus 47.2 – 50.9 % TL | InNasal W 23.1 – 29.8 % HL |
| Body W 62.7 – 67.8 % TL | Intergill Widths, maximum: |
| Head L, 1 st gill 20.3 – 21.0 % TL | 1 st 58.8 – 79.9 % HL |
| Head L, 5 th gill 26.0 – 27.2 % TL | 5 th 37.9 - 58.9 % HL |
| Snout L 38.9 - 48.7 % HL | 1 st -5 th 26.1 – 29.8 % HL |
| Orbit L 14.9 – 16.8 % HL | Tail fold 35.6 – 61.0 % Tail Length |
| Eye L 9.5 – 11.9 % HL | Dorsal fin base Length: |
| InOrb W 14.2 – 15.3 % HL | 1 st 19.3 % HL |
| Spiracle L 11.9 – 12.1 % HL | 2 nd 19.4 % HL |
| InSpir W 21.5 – 28.3 % HL | InterDorsal Fin L 0 % HL |
| Dorsal spines: | Clasper Length to pelvic junction 65.6 % HL |
| Orbital: 0 | Ventral pores: |
| Scapular: 0 | Teeth, upper jaw 22 - 34 |
| Mid-dorsal row: | lower jaw 24 - 27 |
| Nuchal 2-5 - - | Pseudobr 15 - 19 |
| Lumbar 0-3 | Vert: 31-35 + 67-75 + 11-13 = |
| Caudal 17-28 | = 111-121 |
| InterDorsal 0 | Body L/W |
| InterMidDorsal: ++ | PreAnus L/Body W 0.81 |
| Alar: rows 20-24 ; columns 4-8 | |

19 - Body without numerous white markings.

(20)

RAJIDAE

20 (19) – Eye length less than dorsal spiracle length, clasper sentinal absent.

Bathyraja caeluronigricans (Ishiyama & Ishihara, 1977)

200-1000m

Range: Northwestern Pacific to Okhotsk Sea.

Refer : Amaoka, et al, 1983:169, fig.12; 311, fig.112

Ishiyama & Ishihara, 1977:74, figs.9A-B, 10A

Notes : Type MTUF 21803

Body black on both sides, area around mouth white.

Eye small, size about 75 % spiracle length, 22 % snout length, 54 % interorbital width.

Mid dorsal spine row discontinuous; margin of dorsal side with scattered, small spines, spines absent in central area of body; spines sparse on interorbital space and eye ball; ventrally smooth without spines.

Claspers with pseudosiphon.

| | | | |
|-------------------------------|------------------|----------------------------------|--------------------|
| TL | - 1231 | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | 57.8 – 64.2 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | 17.3 – 19.2 % TL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | 6.7 – 7.4 % TL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | 11.4 – 11.7 % TL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | | pelvic junction | % HL |
| Scapular: | 0 | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | 25 – 30 |
| Nuchal | 2-5 - - 0-2 | lower | |
| Caudal | 22-35 | Vert. | 36 + 73 + 11 = 122 |
| InterDorsal | 0 | Pseudobr | 17 - 20 |
| InterMidDorsal: | | Body L/W | |
| Alar: rows 2-8: columns 20-23 | | PreAnus L/Body W | |

20 - Eye length as long or longer than spiracle opening; clasper sentinel present.

(21)

RAJIDAE

21 (20) – Ventral side with fine spines.

Bathyraja abyssicola (Gilbert, 1896)

deepsea skate

Range: Bering Sea – Baja California; Japan

362-4000m

Refer : Amaoka, et al, 1983: 168, fig.9

Ishihara & Ishiyama, 1985 fig. 4A

Masuda, et al, 1983:13, pl.15(A)

Zorzi & Anderson, 1988:93, fig2:

Notes : Holotype USNM 48623; NODC #8713040101; NMFS #00410

Uniform whitish tan to dark brown both ventrally and dorsally; may have a few darker spots dorsally; ventral tail somewhat darker, whitish areas around mouth, anterior margins of gill openings, nostrils, and tip of clasper whitish.

Snout pointed, angle less than 90 degrees; interorbital space deeply concave, wider than orbit length; spiracles as large as orbits and separated from each by twice the distance of their length; tail a little more than half total length, lateral fold on tail from about mid tail, interdorsal space moderately narrow, 2.3 % HL; scapular spines reduced or absent in young and large adults; fine spines on dorsal and usually on ventral surfaces, bare areas on extreme anterior margin of disk, posterior margin, orbit region, outer portion of pelvic fins, and basal area of tail; ventral pores with inner row with more than 20 laterally of gill openings.

Claspers long, slender, flexible, oval tip; posterior third of upper surface with fine spines; pseudosiphon #1 present proximally near outer lateral edge of upper surface; inner surface of dorsal lobe with distinct pseudorhipidion and cleft, that of ventral lobe with projection, sentina with knife-like sentinel.

| | | |
|---|----------------------------------|-----------------|
| TL -1370 | PreLip | % HL |
| Body Length: | Mouth W | 7.2 – 12.4 % HL |
| Snout-pelvic 49.9 – 59.5 % TL | PreNasal L | % HL |
| PreAnus 49.1% TL | InNasal W | % HL |
| Body W 54.5 – 65.5 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill % TL | 1 st | 76.3 % HL |
| Head L, 5 th gill 26.2 – 30.9 % TL | 5 th | % HL |
| Snout L 67.7 % HL | 1 st -5 th | % HL |
| Orbit L 2.7 – 4.2 % HL | Tail fold | % Tail length |
| Eye L % HL | Dorsal fin base Length: | |
| InOrb W 3.7 % TL | 1 st | % HL |
| Spiracle L 2.7 – 2.9 % TL | 2 nd | % HL |
| InSpir W 5.8 % TL | InterDorsal Fin L | 2.4 % HL |
| Dorsal spines: | Clasper Length to | |
| Orbital: 0 | pelvic junction | % HL |
| Scapular: usually 0 | Ventral pores: | |
| Mid-dorsal row: | Teeth, upper | 31 - 36 |
| Nuchal 1 – 5 | lower | 31 |
| Caudal 21-34 | Vert 32-35 + 38-40 = | 70-77 |
| InterDorsal 0 – 1 | | |
| InterMidDorsal : | Body L/W | 0.94 |
| Alar: rows 3-7; columns 23-26 | PreAnus L/Body W | |

RAJIDAE

21 - Ventrally without spines (22)

22 (21) – Colored plum-brown; distance between posterior margin of pseudosiphon #1 and tip of clasper as long as length of pseudosiphon #1.

Bathyraja matsubarai (Ishiyama, 1952)

SEE # 16

RAJIDAE

- 22 - Colored grayish-brown; Distance between posterior margin of pseudosiphon #1 and clasper tip longer than length of pseudosiphon #1

Bathyraja notoroensis (Ishiyama & Ishihara, 1977)

Range: Northwestern Pacific – Japan: Okhotsk Sea 600m

Refer : Amaoka, et al, 1983:311, fig.113

Ishiyama & Ishihara, 1977:78, figs.7C, *c, 12A-B

Notes : TypeMYUF221817

Resem: Differs from B.matsubarai and B.caeluroigricans by body color and eye size.

Body dark grayish-brown on both sides; whitish around mouth.

Eye large, length about spiracle length, 65% interorbital width.

Mid-dorsal spine row discontinuous; dorsal spines absent or very weak; eye ball without spines.

Clasper rather short with shallow cleft.

| | | | |
|------------------------------|--------------------|----------------------------------|-----------------------------|
| TL | -1037 | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | 58.1 – 64.8 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | 18.1 % TL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Width |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | 7.7 % TL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | 11.8 % TL | InterDorsal Fin L | 0% HL |
| Dorsal spines: | | Casper Length to pelvic junction | % HL |
| Orbital: | | Ventral pores: | |
| Scapular: | 0 | Teeth, upper | |
| Mid-dorsal row: | | lower | |
| Nuchal | 1-5 - - 0-2 | Vert | 34-36 + 68-76 + ? = 116-122 |
| Caudal | 20-28 | Pseudobr | 14-16 |
| InterDorsal | 0 | Body L/W | |
| InterMidDorsal: | | PreAnus L/Body W | |
| Alar: rows | 4-7: columns 19-21 | | |

- 23 (8) – Mid dorsal spine row continuous. (24)
- 23 - Mid dorsal spine row discontinuous or absent (34)
- 24 (23) – Adults with fine spines other than on snout ventrally on body. (25)
- 24 - Ventrally smooth, without spines other than may be on snout. (27)

RAJIDAE

24 (23) – Ventral spines on branchial area.

Bathyraja aguja (Kendall & Radcliffe,)

Range:

Refer :

Notes :

Body with fine spines on both sides; interdorsal spines present; spines on posterior margin of gill openings; lateral caudal fold arising mid tail.

| | | | |
|------------------------------|------|----------------------------------|---------------|
| TL | - | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | | pelvic junction | % HL |
| Scapular: | | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | |
| Nuchal | | lower | |
| Caudal | | Vert | |
| InterDorsal | | Body L/W | |
| InterMidDorsal: + | | PreAnus L/Body W | |
| Alar: rows ; columns | | | |

RAJIDAE

26 (25) – Adult

Bathyraja aleutica (Gilbert, 1895)

Aleutian skate

Range: Bering Sea -Southeastern Alaska; Japan

49-950m

Refer : Amaoka, et al, 1983:170, fig.14; 313, 126

Baxter #394,403,404,413,415,422,463,551,552,938,1024,1174;

Notes : NODC #8713040102; 00472

Dorsally gray to dark gray; may have vague black ocellus on pectoral; may have faint black mottlings dorsally; pectoral and pelvic fins with dark margins; dark mottlings around anus and ventral mid-line of tail; juvenile from egg dorsally uniform dark gray; ventrally with dark margins, widest on lateral and posterior margins of pectoral fins, dark blotches around mouth, gill openings, around anus, and on tail.

Snout angle about 90 degrees; interorbital space slightly concave; distance from anus to tip of caudal longer than snout to anus; snout length more than 33% of body length; mid-dorsal spines usually continuous on body; main dorsal body spines relatively all of same size; no smooth areas free of scales dorsally, including area between and next to mid-dorsal row, but some areas with spines thinner, mid-pectoral and on base of pelvic fin; juveniles with spines lacking on pelvic fin; lateral scale row on tail enlarged and enlarged scale row continue onto body towards scapular area; fine spines on all fins including both dorsals and caudal; gill flap margin almost straight; dorsal pores stand out, are higher than spines; ventral pores numerous, 10-16 on oblique row.

| | | | | |
|------------------------------|---|------------------|----------------------------------|-----------------------------|
| TL | - | 1500 | PreLip L | 44.3 – 56.3 % HL |
| Body Length: | | | Mouth W | 20.4 – 25.2 % HL |
| Snout-pelvic | | 46.6 – 52.1% TL | PreNasal L | 37.6 – 49.6 % HL |
| PreAnus | | 45.7 – 56.4 % TL | InNasal W | 22.1 – 24.1 % HL |
| Body W | | 59.2 – 68.2 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 21.8 – 25.9 % TL | 1 st | 51.1 – 65.3 % HL |
| Head L, 5 th gill | | 25.4 – 32.3 % TL | 5 th | 30.0 – 47.1 % HL |
| Snout L | | 46.6 – 57.3 % HL | 1 st -5 th | 22.0 – 30.4 % HL |
| Orbit L | | 10.6 – 16.9 % HL | Tail fold | 40.2 % Tail Length |
| Eye L | | 6.8 – 14.7 % HL | Dorsal fin base Length: | |
| InOrb W | | 12.0 – 16.6 % HL | 1 st | % HL |
| Spiracle L | | 8.7 – 12.6 % HL | 2 nd | % HL |
| InSpir W | | 19.7 – 23.2 % HL | InterDorsal Fin L | 6.2 – 10.7 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | 76.5 % HL |
| Scapular: | | 1-2 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 28 -39 |
| Nuchal | | 4 - 12 | lower | 28 - 43 |
| Caudal | | 19-25 | Vert | 36 + 122 = 158 |
| InterDorsal | | 0-3 | | 35-38 + 69-77 + ? = 120-135 |
| InterMidDorsal: | | + | Body L/W | 0.728-0.877 |
| Alar: rows | | 1-5 ; columns 21 | PreAnus L/Body W | 0.825-0.909 |

RAJIDAE

26 - Juvenile, from egg, egg yoke sack mostly absorbed

Bathyraja aleutica (Gilbert, 1895)

Refer : Baxter #1024

| | | | | |
|------------------------------|---|-----------|----------------------------------|---------------|
| TL | - | 256.1 | PreLip L | 45.3 % HL |
| Body Length: | | | Mouth W | 25.3 % HL |
| Snout-pelvic | | 39.2 % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | 25.1 % HL |
| Body W | | 56.6 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | 66.1 % HL |
| Head L, 5 th gill | | 22.3 % TL | 5 th | 47.0 % HL |
| Snout L | | 46.8 % HL | 1 st -5 th | 26.3 % HL |
| Orbit L | | % HL | Tail fold | % Tail Length |
| Eye L | | 15.8 % HL | Dorsal fin base Length: | |
| InOrb W | | 17.0 % HL | 1 st | % HL |
| Spiracle L | | 11.2 % HL | 2 nd | % HL |
| InSpir W | | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 2 / 2 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | |
| Nuchal | | 13 | lower | |
| Caudal | | 22 | Vert | |
| InterDorsal | | 1 | | |
| InterMidDorsal: | | | Body L/W | 0.692 |
| Alar: rows | | 0 | PreAnus L/Body W | |

27 (24) – Enlarged, irregular spines on orbit. (28)

27 - Orbit spines smaller than body spines. (32)

RAJIDAE

28 (27) – Orbit with 3 spines.

Bathyraja rosispinis (Gill & Townsend, 1897)

flathead skate

Range: Bering Sea – Oregon

-1554m

Refer :

Notes : NODC #8713040109: NMFS #00415

Snout bluntly rounded; body width 67% of it's length; caudal a little longer than body length.

| | | | |
|------------------------------|-----------|----------------------------------|---------------|
| TL | - | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | | pelvic junction | % HL |
| Scapular: | | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | |
| Nuchal | | lower | |
| Caudal | | Vert | |
| InterDorsal | | | |
| InterMidDorsal: | | Body W | 67 % HL |
| Alar: rows | ; columns | PreAnus L/Body W | |

28 - Orbit with more than 5 spines. (29)

29 (28) – With spines between mid-dorsal spines on tail.

29 - Without spines between mid-dorsal tail spines. (30)

RAJIDAE

30 (29) – Not heavily spotted, may have paired yellowish spots on body and tail.

Bathyraja parmifera (Bean, 1881)

Alaska skate

Range: Bering Sea – Southeastern Alaska

18-600m

Refer : Baxter 46 specimens

Notes : NODC #9713040107; NMFS #00471

Dark grayish dorsally with moderately large black spots and with variable, paired light spots; dorsal pale spots in a sample of 40; pectoral ocellus 20%; paired lateral spots on caudal 10%; antero-lateral spot at eye 5%; 2 sets of spots on pectoral fins antero- and postero-lateral margins 2.5%; generally with blackish mottlings ventrally on posterior half of tail and around anus; posterior margins of pectoral and pelvic fins dark.

Body width considerably broader than long; interorbital space slightly to moderately concave.

Pelvic fin moderately notched; length of interspace between dorsal fins 9.7% HL; generally with small caudal fin.

Dorsally body of adults with areas free of spines, spines primarily on snout, anterior and lateral edge of disk, scattered across head, and a mid-dorsal band; large adults may have spiny area ventrally side below snout; there is a moderate amount of change in the spine configuration between newly hatched young and adults, orbital spines are in a single uniform row in young, becoming a scattered band of uneven sized spines in adults; newly hatched young dorsally are more or less evenly covered with spines, shortly the spine-free areas develop so that young over 300 millimeters in length have spine-free areas on their backs; interorbital space thickly spined in young, spines becoming more scattered with growth and may be absent in large adults; mid-dorsal spines sharp; mid-dorsal spine row continuous 82.5% of the time; lateral spines slightly larger than dorso-lateral spines; lateral spines scattered; not in a uniform row of enlarged spines on tail of females, lateral row finer on males; on all sizes of fish, the area between and close along side mid-dorsal row of spines is free of spines; 3-9 spines on eye.

Ventral pore pattern as per figure, postero-lateral segment with 2-8 pores, average about 3; longitudinal section with 4-10 pores, average 7; 0-8 pores on inner section, average 2; no pores on pelvic arch.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja parmifera

| | | | | |
|------------------------------|---------------------|------|----------------------------------|-----------------------------|
| TL | - | 1125 | PreLip L | 39.5 – 53.3 % HL |
| Body Length: | | | Mouth W | 20.8 – 33.4 % HL |
| Snout-pelvic | 47.4 – 53.5 % TL | | PreNasal L | 39.3 – 56.9 % HL |
| PreAnus | 49.4 – 56.4 % TL | | InNasal W | 19.5 – 30.3 % HL |
| Body W | 65.5 – 77.3 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | 22.5 – 29.3 % TL | | 1 st | 63.5 – 77.2 % HL |
| Head L, 5 th gill | 28.7 – 31.8 % TL | | 5 th | 41.1 – 62.0 % HL |
| Snout L | 44.3 – 66.8 % HL | | 1 st -5 th | 23.4 – 30.0 % HL |
| Orbit L | 11.7 – 16.5 % HL | | Tail fold | 82.6 – 88.7 % Tail L |
| Eye L | 8.1 – 12.8 % HL | | Dorsal fin base Length: | |
| InOrb W | 13.0 – 21.1 % HL | | 1 st | 14.3 – 15.2 % HL |
| Spiracle L | 8.3 – 17.0 % HL | | 2 nd | 12.6 – 13.7 % HL |
| InSpir W | 20.6 – 25.3 % HL | | InterDorsal Fin L | 6.0 – 6.9 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 7-51 | | pelvic junction | 15.4 – 53.6 % TL |
| Scapular: | 1-4; mode 2 | | Ventral pores: | 2-8 + 3-10 + 0-7 |
| Mid-dorsal row: | | | Teeth, upper | 21-31 |
| Nuchal | 4-13; mode 10 | | lower | 21-31 |
| Caudal | 16-27; mode 21 | | Vert | 37-43 + 76-87 + ? = 134-144 |
| InterDorsal | 0-2; mode 1 | | Body L/W | 1.30 – 1.53 |
| InterMidDorsal: | 0-2 | | PreAnus L/Body W | 0.655 – 0.777 |
| Alar: rows | 2-6 ; columns 19-23 | | | |

RAJIDAE

31 (30) – Adult. (color form)

Bathyraja parmifera (Bean, 1881)

Alaska skate

Range: Northwestern Pacific and Southwestern Bering.

Refer : Baxter #906,939,940,995,997, egg & larva #1000

Body color dorsally brown with many roughly eye sized black spots; large yellow paired blotches on body and tail; clasper dark gray-brown dorsally without spots.

Interorbital space concave; lateral tail fold long, 82.6 – 87.3% tail length.

Dorsal spines small, absent between mid-dorsal row, absent on most of central portion of pectoral fin, very fine on pelvic, dorsal, and caudal fins, moderate in size on leading edge of pectoral fin, interorbital space without spines except for orbital spines which are very irregular, largest posteriorly, large anteriorly and most widely spaced on the central area; spines absent ventrally.

Clasper strong, very hard to open for observations, with enlarged tip; pseudosiphon #1 absent, pseudosiphon #2 relatively short.

| | | | | |
|------------------------------|------------------|------|-----------------------------------|----------------------|
| TL | - | 1051 | PreLip L | 39.5 – 46.5 % HL |
| Body Length: | | | Mouth W | 23.7 – 26.3 % HL |
| Snout-pelvic | 48.7 – 52.3 % TL | | PreNasal L | % HL |
| PreAnus | 52.3 – 56.4 % TL | | InNasal W | 21.0 – 22.9 % HL |
| Body W | 71.1 – 71.8 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | 24.2 – 24.6 % TL | | 1 st | 65.4 – 65.5 % HL |
| Head L, 5 th gill | 29.6 – 31.1 % TL | | 5 th | 49.2 – 49.7 % HL |
| Snout L | 44.9 – 48.9 % HL | | 1 st -5 th | 25.9 – 26.6 % HL |
| Orbit L | 13.7 – 14.0 % HL | | Tail fold | 82.6 – 87.3 % Tail L |
| Eye L | 9.3 – 9.7 % HL | | Dorsal fin base Length: | |
| InOrb W | 13.2 – 15.6 % HL | | 1 st | 11.8 – 13.7 % HL |
| Spiracle L | 11.0 – 11.7 % HL | | 2 nd | 9.5 – 13.1 % HL |
| InSpir W | 23.6 – 24.0 % HL | | InterDorsal Fin L | 3.8 – 5.3 % HL |
| Dorsal spines: | | | Clasper Length to pelvic junction | 55.9 % HL |
| Orbital: | 25-51 | | Ventral pores: | 5 + 5 + 4 |
| Scapular: | 2 | | Teeth, upper | 28 - 29 |
| Mid-dorsal row: | | | lower | 26 - 29 |
| Nuchal | 11-12 | | Vert | |
| Caudal | 18-24 | | Body L/W | 0.686 - 0.728 |
| InterDorsal | 1-2 | | PreAnus L/Body W | 0.737 – 0.785 |
| InterMidDorsal: | 0 | | | |
| Alar: rows | 5 ; columns | 19 | | |

RAJIDAE

31 - Juvenile from egg, yoke sac absorbed.

Bathyraja parmifera (Bean, 1881)
Same color form as #30 (29)

Alaska skate

Range; Western Aleutian Islands
Refer : Baxter #1000

Pair of light lateral tail spots.
Body covered with well hooked spines.

| | | | | |
|------------------------------|---|-----------|----------------------------------|---------------|
| TL | - | 132.7 | PreLip L | 38.3 % HL |
| Body Length: | | | Mouth W | 33.2 % HL |
| Snout-pelvic | | 33.2 % TL | PreNasal L | % HL |
| PreAnus | | 37.6 % TL | InNasal W | 21.2 % HL |
| Body W | | 48.5 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 14.9 % TL | 1 st | 75.2 % HL |
| Head L, 5 th gill | | 20.6 % TL | 5 th | 47.1 % HL |
| Snout L | | 36.5 % HL | 1 st -5 th | 34.7 % HL |
| Orbit L | | 25.5 % HL | Tail fold | % Tail Length |
| Eye L | | 20.1 % HL | Dorsal fin base Length: | |
| InOrb W | | 15.7 % HL | 1 st | 21.9 % HL |
| Spiracle L | | 14.2 % HL | 2 nd | 21.5 % HL |
| InSpir W | | 32.1 % HL | InterDorsal Fin L | 4.7 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 0 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 23 |
| Nuchal | | 0 | lower | 16 |
| Caudal | | 17 | Vert | |
| InterDorsal | | 0 | Body L/W | |
| InterMidDorsal: | | 0 | PreAnus L/Body W | |
| Alar: rows | | | | |
| | | ; columns | | |

RAJIDAE

32 (27) – Spines thickly and fairly evenly covering most of the dorsal side.

Rhinoraja kujiensis (Tanaka,)

Range: Northwestern Pacific off Japan

Refer : Baxter # 854

Masuda, et al, 1985:14, pl.336(G)

Notes :

Resem: Differs from B.longicauda by continuous mid-dorsal spine row: from B.odaj by nuchal spines.

Body ventrally uniform white.

Tail long, length about equal to body width; snout short, length less than 50% HL; interorbital space concave; pelvic fin with shallow notch; lateral fold on tail 45.1% of tail length; mid-dorsal series of spines continuous, strong; body and secondary spines with stellate bases of 4 – 6 non-uniform rays; lateral spines on tail small; with a few spines between mid-dorsal spines; spines absent on eye lids; spines absent on pelvic fins except for small patch in center; smaller spines on dorsal and caudal fins.

| | | | | |
|--------------------------------|-----------|-----|----------------------------------|---------------|
| TL | - | 869 | PreLip L | 49.6 % HL |
| Body Length: | | | Mouth W | 35.5 % HL |
| Snout-pelvic | 44.5 % TL | | PreNasal L | % HL |
| PreAnus | % TL | | InNasal W | % HL |
| Body W | 63.5 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | | 1 st | 89.7 % HL |
| Head L, 5 th gill | 19.6 % TL | | 5 th | 50.4 % HL |
| Snout L | 50.0 % HL | | 1 st -5 th | 40.4 % HL |
| Orbit L | 22.2 % HL | | Tail fold | % Tail Length |
| Eye L | 15.2 % HL | | Dorsal fin base Length: | |
| InOrb W | 17.8 % HL | | 1 st | % HL |
| Spiracle L | 13.4 % HL | | 2 nd | % HL |
| InSpir W | % HL | | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 0 | | pelvic junction | % HL |
| Scapular: | 2 / 2 | | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 26 |
| Nuchal | 11-12 | | lower | 20 |
| Caudal | 30 | | Vert | |
| InterDorsal | 0-1 | | Body L/W | 0.70 |
| InterMidDorsal: | + | | PreAnus L/Body W | |
| Alar: rows 5-8 ; columns 20-22 | | | | |

RAJIDAE

33 (32) – Clasper without pseudosiphon #1; mid-dorsal body spines generally weaker than nuchal or tail spines, except in the very young.

Bathyraja interrupta (Gill & Townsend, 1897)

Bering skate

Range: Bering Sea – Fort Bragg, California

50 – 1380m

Refer : Baxter #269,379,380,504

Ishihara & Ishiyama, 1985:152, figs.9A-C, 10A-c, table

Syn : May = B. kincaidi

Notes : Holotype USNM 48760; NODC #9713040105; NMFS #00435

Resem: Differs from B.trachouros by ventral surface of tail almost entirely dark, projection forming posterior outer angle of clasper, Vtr and Vprd; from B.violacea by disk with scapular and median nuchal spines, disk may be mottled with white markings, projection protruding from ventral lobe of clasper.

Grayish brown dorsally with black spots about eye size or larger; 14.4% of the time, has pale pectoral ocellus; generally with small white blotch anterior of eyes; rarely, no other pale spots ventrally black streak on caudal and dark blotch around anus.

Mouth small; mature males with snout shorter than immatures and females; interorbital space concave.

No spiny scales ventrally; dorsally, spines fairly evenly scattered; mid-dorsal row of spines consists of a row of slightly enlarged to enlarged spines; usually with 4 mid-dorsal spines on body; orbital spines absent on adults, although there may be some very small spines that are much smaller than other spines of the interorbital space on orbital region; scapular spines quite variable; from 1 very small, only slightly larger than regular body spines to 1 strong and 1 very small spine to 2 strong spines to only 4-7 small spines.

Ventral pores; postero-lateral segment 2-6; posterior segment 6-9; belly section 1-7; gill flaps with or without low point along free edge.

Clasper with pseudosiphon #1 absent; inner surface of dorsal lobe with pseudosiphon and cleft, ventral lobe with projection, sentina, and sentinel; projection protruding, forming outer angle of clasper tip.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja interrupta

| | | | | |
|------------------------------|------------------|-----------|----------------------------------|-----------------------------|
| TL | - | 777 | PreLip L | 49.8 – 52.3 % HL |
| Body Length: | | | Mouth W | 21.2 – 24.0 % HL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | 13.4 – 28.4 % HL |
| Body W | 63.3 – 67.5 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | 20.7 – 24.8 | % TL | 1 st | 51.8 – 63.4 % HL |
| Head L, 5 th gill | 28.4 | % TL | 5 th | 30.6 – 43.1 % HL |
| Snout L | 51.2 – 52.7 | % HL | 1 st -5 th | 25.9 – 28.2 % HL |
| Orbit L | 12.4 – 15.1 | % HL | Tail fold | 39.2 – 88.5 % Tail Length |
| Eye L | 9.9 – 11.0 | % HL | Dorsal fin base Length: | |
| InOrb W | 14.3 – 16.4 | % HL | 1 st | % HL |
| Spiracle L | 11.1 – 11.8 | % HL | 2 nd | % HL |
| InSpir W | 1.9 – 23.1 | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 0 | | pelvic junction | % HL |
| Scapular: | 1-7 | | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 20 - 33 |
| Nuchal | 0-7 + 1-4 = 7-11 | | lower | 25 - 31 |
| Caudal | 18-25 | | Vert | 29-35 + 60-73 + ? = 103-117 |
| InterDorsal | 1 | | Pec Rays | 74 - 80 |
| InterMidDorsal: | | | Pseudobr | 12 – 14 |
| Alar: rows | | ; columns | | |

RAJIDAE

33 - Clasper with pseudosiphon #1.

Bathyraja simoterus (Ishiyama, 1967)

Range: Japan

Refer : Masuda, et al, 1985:14, pl. 336(F)

Body white ventrally.

Mid-dorsal spine row continuous; tail short, length shorter than body width; body spines mostly absent dorsally on adults.

| | | | |
|------------------------------|-----------|----------------------------------|---------------|
| TL | - | PreLip L | % HL |
| Body Length: | | Mouth W | % HL |
| Snout-pelvic | % TL | PreNasal L | % HL |
| PreAnus | % TL | InNasal W | % HL |
| Body W | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | % TL | 1 st | % HL |
| Head L, 5 th gill | % TL | 5 th | % HL |
| Snout L | % HL | 1 st -5 th | % HL |
| Orbit L | % HL | Tail fold | % Tail Length |
| Eye L | % HL | Dorsal fin base Length: | |
| InOrb W | % HL | 1 st | % HL |
| Spiracle L | % HL | 2 nd | % HL |
| InSpir W | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | Clasper Length to | |
| Orbital: | | pelvic junction | % HL |
| Scapular: | | Ventral pores: | |
| Mid-dorsal row: | | Teeth, upper | |
| Nuchal | | lower | |
| Caudal | | Vert | |
| InterDorsal | | Body L/W | |
| InterMidDorsal: | | PreAnus L/Body W | |
| Alar: rows | ; columns | | |

34 (23) - mid dorsal row of spines absent on body. (35)

34 - Mid dorsal spines present on nuchal area. (48)

35 (34) – Scapular spines present. (36)

35 - Scapular spines absent. (38)

RAJIDAE

36 (35) – Projection forming posterior margin of clasper.

Bathyjaja bergi (Dolganov, 1983)

bottom skate

Range: Sea of Japan, Okhotsk, S. Kuriles, Pacific coast of Japan south to 36 N. 78-510m

Refer : Dolganov, 1984?:124

Ishihara & Ishiyama, 1985, gig.19A

Syn : Bathyraja pseudoisotrachys Ishihara & Ishiyama, 1985

B. isotrachys, Raja interrupta of authors

Notes :

Resem: Differs from B.interrupta by more pectoral fin rays (91-92 versus 74-80), predorsal vertebra more (73-82 versus 61-70); from B.isotrachys by having scapular spines, lateral fold on tail full length instead of only posterior half, light colored pelvic surface, and by more pectoral fin rays (91-92 versus 74-81).

Dorsal side uniformly dark brown, distal portion of anterior pelvic lobes whitish; ventral side predominantly white with postero-lateral margin of pectoral, margins of pelvics, edges of clasper, and anus area may be dark brownish.

Interorbital space concave, space less than 20% HL, much wider than orbit length; pectoral rays 91-92; pelvic rays 24-26; tail longer than precaudal body length; dorsal fins close, interspace 3.2 – 4.5% HL; lateral fold on tail begins as low ridge along base of pelvic fin, becoming larger on posterior half of tail; dorsal spines almost entirely covering body and tail, sparse on central pectoral and absent on anterior pelvic lobes; ventral side smooth except for a few prickles on tip of snout; spiral valve turns 10.

Clasper with pseudosiphon #1 absent; inner surface of dorsal lobe with 2 clefts, ridge and pseudosiphon, anterior larger cleft divided into 2 subparts by terminal bridge; ventral lobe with reduced projection only.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja bergi

| | | | | |
|------------------------------|-------------|------|----------------------------------|------------------|
| TL | - | 1000 | PreLip L | % HL |
| Body Length: | | | Mouth W | 5.5 – 6.2 % HL |
| Snout-pelvic | 51.7 – 54.0 | % TL | PreNasal L | 10.4 – 11.7 % HL |
| PreAnus | | % TL | InNasal W | % HL |
| Body W | 63.9 – 68.9 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | 14.3 – 17.6 % HL |
| Head L, 5 th gill | 20.5 – 20.8 | % TL | 5 th | % HL |
| Snout L | 65.8 – 70.2 | % HL | 1 st -5 th | % HL |
| Orbit L | 15.3 – 15.6 | % HL | Tail fold | % Tail Length |
| Eye L | 25.0 – 31.0 | % HL | Dorsal fin base Length: | |
| InOrb W | 16.9 – 18.9 | % HL | 1 st | % HL |
| Spiracle L | 2.8 – 2.9 | % HL | 2 nd | % HL |
| InSpir W | 5.4 – 6.4 | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | | pelvic junction | 25.2 % HL |
| Scapular: | 1 | | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 26-28 |
| Nuchal | 0-4 | | lower | 25-29 |
| Caudal | 20-24 | | Vert, trunk: | 33-37 |
| InterDorsal | 0-1 | | PreDorsa | 73-82 |
| InterMidDorsal: | | | Body L/W | 0.78-0.85 |
| Alar: rows 6-7 ; columns 22 | | | PreAnus L/Body W | |
| Malar : | 0 | | | |

36 - Projection not extending to posterior margin of clasper.

(37)

RAJIDAE

37 (36) – Clasper with 2, long, free, slender “projection-like” structures other than regular projection.

Bathyraja sp. #1045

Range: Aleutian Islands

Refer: Baxter #1045,1046

Ventrally gray only on tail.

Interorbital space slightly concave to concave.

Body covered with moderately strong spines, except on anterior lobe of pelvic fin; orbital spines moderate, very slightly stronger posteriorly; mid dorsal spines moderately weak; tail evenly covered with spines, including between mid dorsal spines, lateral spines not stronger; ventrally without spines.

Ventral pores few on oblique row.

Pelvic fin notched deep.

Clasper leaf shape; pseudo siphon #1 absent.

| | | | | |
|------------------------------|-------------|------|----------------------------------|--------------------|
| TL | - | 582 | PreLip L | 47.5 % HL |
| Body Length: | | | Mouth W | 26.6 % HL |
| Snout-pelvic | | % TL | PreNasal L | 26.1 % HL |
| PreAnus | 47.9 – 48.1 | % TL | InNasal W | % HL |
| Body W | 63.4 – 65.4 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | 20.2 – 21.7 | % TL | 1 st | 63.5 – 65.4 % HL |
| Head L, 5 th gill | 27.7 | % TL | 5 th | 38.5 – 40.7 % HL |
| Snout L | 43.9 – 47.2 | % HL | 1 st -5 th | 28.7 % HL |
| Orbit L | 16.9 – 19.0 | % HL | Tail fold | 49.0 % Tail Length |
| Eye L | 12.2 | % HL | Dorsal fin base Length: | |
| InOrb W | 14.4 – 14.2 | % HL | 1 st | 14.7 – 16.4 % HL |
| Spiracle L | 11.5 – 12.0 | % HL | 2 nd | 13.5 – 14.8 % HL |
| InSpir W | 22.9 – 22.7 | % HL | InterDorsal Fin L | 2.4 – 3.2 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 12 | | pelvic junction | 53.3 – 58.1 % HL |
| Scapular: | 0-2 | | Ventral pores: | 2-3 + 7-9 + 4-5 |
| Mid-dorsal row: | | | Teeth, upper | 24-28 |
| Nuchal | 0 | | lower | 25-29 |
| Caudal | 20-21 | | Vert | 30 + 110 = 140 |
| InterDorsal | 0 | | Body L/W | |
| InterMidDorsal: | + | | PreAnus L/Body W | |
| Alar: rows 2; columns 15-18 | | | | |

RAJIDAE

37 - Clasper without extra projections.

Bathyraja trachouros (Ishiyama, 1958)

Range: W. Bering Sea – Japan

Refer : Baxter #852

Ishiyama & Ishihara, 1977:86, table 5

Masuda, et al, 1985:14, pl.15(D)

Black dorsally, white inside spiracles; ventrally black except white mouth, lips, and brachial region.

Interorbital space flat; no strong mid-dorsal spines on body, although small, slightly enlarged spines may be present; mid-dorsal series of spines on tail relatively small; body spines with stellate base of about 5 rays; body spines relatively abundant dorsally, uniformly covering body except for pelvic fins which are free of spines except for small central patch; tail with small spines around mid dorsal series, lateral spines same size and spacing as rest of tail spines; smaller spines on dorsal and caudal fins.

Posterior edge of lateral lip fringed; gill flaps with very slight projection of flap towards interior side.

| | | | | |
|------------------------------|---|-----------|----------------------------------|--------------------|
| TL | - | 757 | PreLip L | 50.3 % HL |
| Body Length: | | | Mouth W | 25.0 % HL |
| Snout-pelvic | | 46.2 % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | 23.8 % HL |
| Body W | | 62.2 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 21.5 % TL | 1 st | 59.9 % HL |
| Head L, 5 th gill | | 26.4 % TL | 5 th | 42.4 % HL |
| Snout L | | 50.9 % HL | 1 st -5 th | 24.0 % HL |
| Orbit L | | 15.3 % HL | Tail fold | 33.0 % Tail Length |
| Eye L | | 14.0 % HL | Dorsal fin base Length: | |
| InOrb W | | 12.7 % HL | 1 st | % HL |
| Spiracle L | | 8.1 % HL | 2 nd | % HL |
| InSpir W | | 23.4 % HL | InterDorsal Fin L | 4.1 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 1-2 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | |
| Nuchal | | 0 | lower | |
| Caudal | | 20-23 | Vert | 36 + 78 + 11 = 125 |
| InterDorsal | | 0-1 | Body L/W | 0.74 |
| InterMidDorsal: | | + | PreAnus L/Body W | |
| Alar: rows | | ; columns | | |

38 (35) – Mid dorsal row of spines on tail irregular or absent. (39)

38 - Mid dorsal row of spines on tail even (42)

RAJIDAE

39 (38) – Mid dorsal row of spines on tail.

Bathyraja violacea (Suvorov, 1935)

Okhotsk skate

Range: Aleutian Islands.

121m

Refer : Baxter #1025

Notes : NMFS #00495; also see #41 (40)

Dorsally brown with small dark blotches; double pair of ocelli with yellow-brown centers; light ocellus on pelvis fins that are eye sized; light lateral tail spots; ventrally pale with dark tail stripe.

Inter orbital space flattish-concave; pelvic fin notched deep; tail thickly covered with fine spines, lateral spines not larger.

| | | | | |
|------------------------------|---|-------------|----------------------------------|---------------|
| TL | - | 651 | PreLip L | 45.4 % HL |
| Body Length: | | | Mouth W | 28.4 % HL |
| Snout-pelvic | | 48.8 % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | 24.6 % HL |
| Body W | | 66.3 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | 66.8 % HL |
| Head L, 5 th gill | | 27.5 % TL | 5 th | 40.8 % HL |
| Snout L | | 46.5 % HL | 1 st -5 th | 28.1 % HL |
| Orbit L | | % HL | Tail fold | % Tail Length |
| Eye L | | 14.3 % HL | Dorsal fin base Length: | |
| InOrb W | | 14.0 % HL | 1 st | % HL |
| Spiracle L | | 10.6 % HL | 2 nd | % HL |
| InSpir W | | % HL | InterDorsal Fin L | 2.2 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | 17.3 % HL |
| Scapular: | | 0 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 26 |
| Nuchal | | 0 | lower | 27 |
| Caudal | | 0 | Vert | |
| InterDorsal | | 0 | | |
| InterMidDorsal: | | ++ | Body L/W | 0.737 |
| Alar: rows | | 3 ; columns | PreAnus L/Body W | |
| | | 19 | | |

39 - mid-dorsal row of spines on tail irregular.

(40)

RAJIDAE

40 (39) – Tail length always longer than body length; dorsal branchial region with spines; white markings dorsally; clasper with pseudosiphon #1.

“*Rhinoraja*” *taranetzi* (Dolganov, 1983)

Range: Western Bering Sea – Gulf of Alaska

190-590m

Refer : Dolganov 1984?:128-129, figs. 6-7

Ishihara & Ishiyama 1985, figs.6-7A

Syn : *Bathyraja hubbsi* Ishihara & Ishiyama, 1985

Notes : Holotype ZIN 46193; *b. hubbsi* MTUF 23936

Resem: Differs from *B. violacea* by tail length always longer than precaudal length, branchial area with some prickles, white markings dorsally, clasper with pseudosiphon #1; from other *Rhinoraja* by structure of claspers; from *R. longicauda* by lack of mid-dorsal spines on nuchal area and coarser body spines; from *B. odai* by fewer predorsal vertebrae (64 – 70 versus 85 – 91).

Dorsally cinnamon to dark brown with many whiter markings without ring; obvious white markings on each pectoral center, small oval spot aside each orbit; 2-3 transverse white bars on tail; ventrally white except for anus, corners of disk, posterior margins of pelvic pale brown, tip of anterior pelvic lobes and mouth area yellowish, tail partly to entirely dark brown.

Snout wide, blunt, angle more than 130 degrees; eyes large; tail longer than body length in adults; orbit length almost equal to interorbital width and spiracle length; interorbital width about half of interspiracle width; interdorsal distance narrow 0 – 1.0% TL; lateral tail folds extend most of length of tail; mid dorsal spines absent on body, indistinct and irregularly spaced on tail; dorsal spines moderate, densely arranged along vertebral area and along anterior edge of pectoral fins, sparse on orbits, branchial region, posterior pelvic lobes, absent on anterior pelvic lobes and ventral side: pseudobranchial folds 12-14.

Clasper slender, length 40.8– 47.6% tail length, 22.8– 25.0% TL; with pseudosiphon #1 present proximally near outer lateral edge of upper surface; inner surface of dorsal lobe with pseudorhipidion and cleft, ventral lobe with projection, sentina, and rudimentary needle-like sentinel.

MERISTICS ON NEXT PAGE

RAJIDAE
“Rhinoraja” taranetzi

| | | | | |
|------------------------------|-------------|-----------|----------------------------------|-------------------|
| TL | - | 700 | PreLip L | % HL |
| Body Length: | | | Mouth W | % HL |
| Snout-pelvic | 48.6 – 53.4 | % TL | PreNasal L | % HL |
| PreAnus | 43.5 – 47.4 | % TL | InNasal W | % HL |
| Body W | 50.9 – 64.0 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | 96.6 – 106.7 % HL |
| Head L, 5 th gill | 16.7 – 19.0 | % TL | 5 th | % HL |
| Snout L | 56.7 – 66.7 | % HL | 1 st -5 th | % HL |
| Orbit L | 3.2 – 4.0 | % HL | Tail fold | % Tail Length |
| Eye L | | % HL | Dorsal fin base Length: | |
| InOrb W | 3.1 – 3.6 | % HL | 1 st | % HL |
| Spiracle L | 3.0 – 3.5 | % HL | 2 nd | % HL |
| InSpir W | 5.7 – 6.6 | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 0 | | pelvic junction | % HL |
| Scapular: | 0 | | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | 28-34 |
| Nuchal | 0 | | lower | |
| Caudal | 14-21 | | Vert, trunk | 30-33 |
| InterDorsal | | | Predominantlydorsal | 69-74 |
| InterMidDorsal: | | | Pec rays | 75-77 |
| Alar: rows | | ; columns | pel rays | 23-24 |
| | | | Body L/W | |
| | | | PreAnus L/Body W | |

40 - Tail length usually less than body length; dorsal branchial region with or without spines; may have dusky vermiculations dorsally; clasper without pseudosiphon #1. (41)

RAJIDAE

41 (40) – Anterero-lateral edge of pectoral fin concave.

Bathyraja violacea Suvorov, 1935

Okhotsk skate

Range: Bering Sea – Japan

47-520m

Refer : Amaoka, et al, 1983:310, fig.111

Baxter #960,999,1002,1448,1450

Masuda, et al, 1985:14, pl.15(E)

Notes : NMFS # 00495

Resem: Differs from B. diplotaenia by short pelvic anterior lobe.

Dorsally body brown with or without many black spots; may have single lighter spot on postero-central portion of pectoral fin; may have pair of lateral white spots on tail at tip of pelvic fin; white ventrally with up to 4 large, gray blotches, tail mostly gray.

Interorbital space flat to concave.

Disk width 110-160% tail length; pelvic fin with deep notch.

Dorsally covered thickly with small spines, including dorsal and caudal fins, except for pelvic fin which has only a small central patch; interorbital space with spines; no mid-dorsal row of spines on body; mid-dorsal spines on tail may be absent in largew adult males, when present are hardly larger than lateral tail spines; lateral spines on tail are not enlarged, numerous; eye lid spines small; lateral tail fold mostly very slight, but extending 79.5% of tail length.

Clasper without pseudosiphon.

| | | | | |
|--------------------------------|---|------------------|----------------------------------|---------------------------|
| TL | - | 1450 | PreLip L | 39.0 – 48.9 % HL |
| Body Length: | | | Mouth W | 22.2 – 28.4 % HL |
| Snout-pelvic | | 38.6 – 55.4 % TL | PreNasal L | % HL |
| PreAnus | | 41.0 – 49.5 % TL | InNasal W | 22.0 – 26.4 % HL |
| Body W | | 57.2 – 66.8 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 19.1 – 23.5 % TL | 1 st | 60.6 – 72.7 % HL |
| Head L, 5 th gill | | 23.7 – 29.6 % TL | 5 th | 35.2 – 43.9 % HL |
| Snout L | | 41.3 – 50.1 % HL | 1 st -5 th | 26.1 – 33.3 % HL |
| Orbit L | | 14.1 – 18.2 % HL | Tail fold | 45.9 – 79.5 % Tail Length |
| Eye L | | 11.1 – 14.3 % HL | Dorsal fin base Length: | |
| InOrb W | | 12.3 – 14.2 % HL | 1 st | 12.3 – 18.6 % HL |
| Spiracle L | | 8.6 – 13.9 % HL | 2 nd | 25.1 – 27.0 % HL |
| InSpir W | | 20.9 – 24.6 % HL | InterDorsal Fin L | 1.2 – 4.1 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | ++ | pelvic junction | 33.7 – 66..6 % HL |
| Scapular: | | 0 | Ventral pores: | 4-9 + 5-10 + 4-5 |
| Mid-dorsal row: | | | Teeth, upper | 18-31 |
| Nuchal | | 0 | lower | 17-37 |
| Caudal | | 0-19 | Vert | 27-37 + 109 = 110-136 |
| InterDorsal | | 0 | | |
| InterMidDorsal: | | 0 | Body L/W | |
| Alar: rows 3-4 ; columns 18-29 | | | PreAnus L | 71.7 – 75.3% Body W |

RAJIDAE

41 - Anterio-lateral edge of pectoral fin convex.

Rhinoraja odai (Ishiyama, 19xx)

Range: Northern Japan

330-335m

Refer : Baxter #846

Masuda, et al, 1985:15, pl.336(H)

Notes :

Resem: Differs from B.longicauda by lack of nuchal spines and whitish dorsal blotches; from B. kujiensis by lack of nuchal spines.

Body brown dorsally, with darker brown and whitish , pupil sized, roundish spots.

Interorbital space concave with a few very small spines; mid-dorsal spine row only on tail, spines irregular in size and spacing; dorsal and caudal fins with spines; pelvic fins without spines; ocular spines irregular, largest posterior; tail with small, thickly scattered lateral spines, spines dorsally larger, sparser; smaller spines between mid dorsal spine row; Alar spines with long, slender point; tail long, length about equal to disk width; 2 dorsal fins without interspace between them; pelvic fin with deep notch.

| | | | | |
|------------------------------|---|----------------|-----------------------------------|--------------------|
| TL | - | 518 | PreLip L | 37.5 % HL |
| Body Length: | | | Mouth W | 30.5 % HL |
| Snout-pelvic | | 44.6 % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | 21.7 % HL |
| Body W | | 59.5 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 18.9 % TL | 1 st | 62.8 % HL |
| Head L, 5 th gill | | 25.4 % TL | 5 th | 36.9 % HL |
| Snout L | | 41.1 % HL | 1 st -5 th | 29.2 % HL |
| Orbit L | | 18.7 % HL | Tail fold | 43.9 % Tail Length |
| Eye L | | 16.2 % HL | Dorsal fin base Length: | |
| InOrb W | | 13.9 % HL | 1 st | % HL |
| Spiracle L | | 13.1 % HL | 2 nd | % HL |
| InSpir W | | 26.9 % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to pelvic junction | 67.1 % HL |
| Orbital: | | 14-15 | Ventral pores: | |
| Scapular: | | 0 | Teeth, upper | 32 |
| Mid-dorsal row: | | | lower | |
| Nuchal | | 0 | Vert, PreDorsal | 85-91 |
| Caudal | | 19 | | |
| InterDorsal | | 0 | Body L/W | 0.69 |
| InterMidDorsal: | | 0 | PreAnus L/Body W | 0.75 |
| Alar: rows | | 4 ; columns 18 | | |

RAJIDAE

42 (38) - Mid-dorsal series of spines on tail not extending to dorsal fin.

Rhinoraja taranetzi (Dolganov, 1984?)
SEE #37 (36)

42 - Mid-dorsal series of spines extending to dorsal fin. (43)

43 (42) – Basically colored the same, pale gray, dorsally and ventrally

Bathyraja spinosissima (Beebe & Tee-Van, 1941) white skate
SEE #12 (11)

43 - Ventrally white, dorsally darker; dorsal body spines very small to minute. (44)

44 (43) – Body uniformly covered with spines dorsally. (45)

44 - Body spines not universal on dorsal side. (46)

45 (44) – Orbit spines slightly enlarged posteriorly.

Bathyraja sp. #1045
SEE #35 (34)

RAJIDAE

45 - Orbital spines uniform.

Bathyraja sp. #1047

Range: Central Aleutians

Refer : Baxter # 1047,1048

Male dark brown with darker brown, eye sized spots; female without darker brown spots, with pair of small yellow spots slightly posterior on pectoral fin; dark margin to pectoral and pelvic fins; black rim to anus.

Interorbital space concave.

Body thickly covered with small spines except lacking on anterior portion of pelvic, edges of pelvic and on claspers; spines absent ventrally.

Ventral pores 4-5 + 7-8 + 3

Claspers slender.

| | | | | |
|------------------------------|------------------|------|----------------------------------|--------------------|
| TL | - | 564 | PreLip L | 39.9 % HL |
| Body Length: | | | Mouth W | 26.2 % HL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | 44.4 – 44.9 % TL | | InNasal W | 22.4 % HL |
| Body W | 59.2 – 59.5 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | 19.8 – 19.9 % TL | | 1 st | 69.5 – 71.0 % HL |
| Head L, 5 th gill | 24.9 – 25.7 % TL | | 5 th | 39.8 – 43.1 % HL |
| Snout L | 43.5 – 44.1 % HL | | 1 st -5 th | 29.4 – 32.2 % HL |
| Orbit L | 17.1 – 17.4 % HL | | Tail fold | 59.4 % Tail Length |
| Eye L | 12.4 – 13.4 % HL | | Dorsal fin base Length: | |
| InOrb W | 12.4 – 13.4 % HL | | 1 st | 17.7 – 18.6 % HL |
| Spiracle L | 12.3 – 13.2 % HL | | 2 nd | 16.8 – 18.6 % HL |
| InSpir W | 23.5 % HL | | InterDorsal Fin L | 1.7 – 3.5 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | 0 | | pelvic junction | 50.8 – 58.1 % HL |
| Scapular: | 0 | | Ventral pores: | 4-5 + 6-8 + 3-6 |
| Mid-dorsal row: | | | Teeth, upper | 30-35 |
| Nuchal | 0 | | lower | 31 |
| Caudal | 18-20 | | Vert | |
| InterDorsal | 0 | | Body L/W | |
| InterMidDorsal: | evenly covered | | PreAnus L/Body W | |
| Alar: rows | 2 ; columns | 16 | | |

RAJIDAE

46 (44) – Colored light brown dorsally; pelvic fin deeply notched; clasper pointed.

Bathyraja diplotaenia (Ishiyama, 1952)

Range: Northern Japan

800-1000m

Refer : Amaoka, et al, 1983:168, fig.10

Baxter #849

Dorsally pale greyish brown, darker on tail; ventrally white, anus margin black; tail pale greyish brown.

Caudal length shorter than disk width.

Interorbital space concave with a few, scattered spines.

Pelvic fins deeply notched; dorsal fin interspace very narrow, distance 2.2% HL

Mid-dorsal spines usually absent or very weak on body, regular on caudal; secondary spines on tail denser laterally with few between mid-dorsal series of spines; spines very small on dorsal fins, absent on caudal fin; spines densest on lateral portion of pectoral fins; body bare of spines laterally of eye, branchial region, and central portion of pectoral fins; body spines sparse or absent on central part of pectoral fin base; spines absent on pelvic fins.

Tip of clasper pointed, pseudosiphon present.

| | | | | |
|------------------------------|---|------------------|----------------------------------|--------------------|
| TL | - | 839 | PreLip L | 47.9 % HL |
| Body Length: | | | Mouth W | 28.1 % HL |
| Snout-pelvic | | 54.3 % TL | PreNasal L | % HL |
| PreAnus | | 45.7 % TL | InNasal W | 27.7 % HL |
| Body W | | 66.7 – 69.4 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | 22.2 % TL | 1 st | 66.8 % HL |
| Head L, 5 th gill | | 26.8 % TL | 5 th | 42.9 % HL |
| Snout L | | 50.2 % HL | 1 st -5 th | 27.2 % HL |
| Orbit L | | 16.4 % HL | Tail fold | 43.4 % Tail Length |
| Eye L | | 13.4 % HL | Dorsal fin base Length: | |
| InOrb W | | 13.5 % HL | 1 st | % HL |
| Spiracle L | | 9.5 % HL | 2 nd | % HL |
| InSpir W | | 23.9 % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 0 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | |
| Nuchal | | 0-4 weak | lower | |
| Caudal | | 22-24 | Vert | 33 + 71 + 13 = 117 |
| InterDorsal | | 0-1 | Body L/W | 0.73 – 0.79 |
| InterMidDorsal: | | + | PreAnus L/Body W | |
| Alar: rows | | 4-5 ; columns 21 | | |

46 - Dorsally light cream, light lilac colored, or grayish with small white spots.

(47)

RAJIDAE

47 (46) – Dorsal light lilac-colored or grayish with small white spots.

Bathyraja andriashevi (Dolganov, 1984?)

Range: Pacific Coast of Japan off Honshu, 36 24'W, 141 29'N 1390-1480m

Refer : Dolganov, 1984?:122 figs. 1-2

Notes :

Resem: Differs from other skates by structure of claspers and small eyes.

Snout wide, blunt; eyes very small; central portion of pectoral fin without spines; Lateral tail folds long, beginning along internal aspect of the pelvic fins; turns to spiral valve 11.

Clasper with large pseudosiphon dorsally; on ventral portion of inner surface a pronounced , elongate projection is present, located under it is a rounded cartilage with a spinous edge – spike (knife).

| | | | | |
|------------------------------|---------------|--------------|----------------------------------|--------------------------|
| TL | - | 1200 | PreOral L | 67.2 – 77.0 % Cephalic L |
| Body Length: | | | Mouth W | 26.1 – 32.8 % Cephalic L |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | 46.8 – 48.0 | % TL | InNasal W | % HL |
| Body W | 63.0 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | % HL |
| Head L, 5 th gill | | % TL | 5 th | % HL |
| Cephalic length | 31.5 – 32.6 | % BW | 1 st -5 th | % HL |
| Snout L | 70.2 – 75.7 | % Cephalic L | Tail fold | % Tail Length |
| Orbit L | 9.9 – 10.1 | % Cephalic L | Dorsal fin base Length: | |
| Eye L | 58.5 – 71.0 | % InOrb W | 1 st | % HL |
| Eye L | 13.1 – 14.4 | % Snout L | 2 nd | % HL |
| InOrb W | 14.0 – 17.2 | % Cephalic L | InterDorsal Fin L | % HL |
| Spiracle L | 127.3 – 158.3 | % EyeL | Clasper Length to | |
| Spiracle L | 12.6 – 16.0 | % Cephalic L | pelvic junction | % HL |
| InSpir W | | | Ventral pores: | |
| Dorsal spines: | | | Pec rays | 97 |
| Orbital: | 0 | | Pel rays | 27 |
| Scapular: | 0 | | Teeth, upper | 29-30 |
| Mid-dorsal row: | | | lower | 25-28 |
| Nuchal | 0 | | Vert trunk | 43 |
| Caudal | 25-31 | | PreDorsal | 79 |
| InterDorsal | | | Body L/W | 0.79 |
| InterMidDorsal: | 0-1 | | PreAnus L/Body W | |
| Alar: rows | 5 ; columns | 20 | | |

RAJIDAE

47 - Cream colored dorsally.

Bathyraja tzinovskii (Dolganov, 1984?)

Range: Pacific Coast of Japan, 40 12'N, 143 35'E 2500m

Refer : Dolganov, 1984?:127, fig.5

Notes :

Resem: Differs from B.isotrachys by long tail lateral folds and complete covering of body dorsally with spines; from B. fedorovi by more rounded shape of disk and larger eyes.

Snout angle of nearly 100 degrees; eyes comparatively small; spiracles small; lateral folds on tail originate at base of pelvic fins, widens posteriorly; mid-dorsal spines on tail small; dorsally body completely covered with small spines, ventrally spines absent on body and tail; spiral valve turns 8; egg capsules 85 x 49mm.

| | | | | |
|------------------------------|---|-------------------|----------------------------------|------------------|
| TL | - | 714 | PreOral L | 76.5 % CephalicL |
| Body Length: | | | Mouth W | 33.1 % CephalicL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | % HL |
| Body W | | 58.1 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | % HL |
| Head L, 5 th gill | | % TL | 5 th | % HL |
| Snout L | | 69.9 % Cephalic L | 1 st -5 th | % HL |
| Orbit L | | 14.7 % Cephalic L | Tail fold | % Tail Length |
| Eye L | | 58.8 % InOrb W | Dorsal fin base Length: | |
| InOrb W | | 25.0 % CephalicL | 1 st | % HL |
| Spiracle L | | 85 % Eye L | 2 nd | % HL |
| InSpir W | | % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 0 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper jaw | 28 |
| Nuchal | | 0 | lower jaw | 32 |
| Caudal | | 22 | Vert trunk | 30 |
| InterDorsal | | 0 | PreDorsal | 69 |
| InterMidDorsal: | | | Body L/W | |
| Alar: rows | | ; columns | PreAnus L/Body W | |

RAJIDAE

- 48 (34) – Scapular spines present. (49)
- 48 - Scapular spines absent. (54)
- 49 (48) – Orbit with irregular, enlarged spines. (50)
- 49 - Orbital spines small or absent. (51)
- 50 (49) – Orbit with more than 5 spines. (go back to #28)
- 50 - Orbit with 3 spines.

Bathyraja rosispinis (Gill & Townsend, 1897)
SEE #27 (26)

flathead skate

RAJIDAE

51 (49) – Pseudosiphon #1 present.

Bathyraja smirnovi (Soldatov & Pavlenko, 1915)

golden skate

Range: Bering Sea – Japan

100-950m

Refer : Amaoka, et al, 1983:313, fig.117

Masuda, et al, 1985:14, pl.16(E)

Notes : NODC #8713040110; NMFS #00490

Resem: Looks like B.parmifera with discontinous mid-dorsal spine row.

Body grayish brown to brown dorsally; white ventrally; light ocellus on base of pectoral and lateral edge of caudal.

Interorbital space flat; mid-dorsal spine row on caudal with clear area around them; mid-dorsal spine row discontinous; caudal short, disk width 1.4 times or more time caudal length.

Clasper with pseudosiphon.

| | | | | |
|------------------------------|-------------|-----------|-----------------------------------|---------------|
| TL | - | 1014 | PreLip L | % HL |
| Body Length: | | | Mouth W | % HL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | | % TL | InNasal W | % HL |
| Body W | 62.5 – 76.1 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | % HL |
| Head L, 5 th gill | | % TL | 5 th | % HL |
| Snout L | 20.6 – 23.3 | % TL | 1 st -5 th | % HL |
| Orbit L | | % HL | Tail fold | % Tail Length |
| Eye L | | % HL | Dorsal fin base Length: | |
| InOrb W | 6.5 – 6.9 | % TL | 1 st | % HL |
| Spiracle L | | % HL | 2 nd | % HL |
| InSpir W | 9.4 – 10.3 | % TL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to pelvic junction | % HL |
| Orbital: | | | Ventral pores: | |
| Scapular: | 1 / 1 | | Teeth, upper | |
| Mid-dorsal row: | | | lower | |
| Nuchal | 2-4 | | Vert | |
| Caudal | 21-26 | | | |
| InterDorsal | 0 | | Body L/W | |
| InterMidDorsal: | 0 | | PreAnus L/Body W | |
| Alar: rows | | ; columns | | |

RAJIDAE

52 (51) – Clasper sentinel large, projecting, with rounded, slightly compressed knob at tip.

Bathyraja violacea (Suvarov, 1935)

Okhotsk skate

Range: Southcentral Bering Sea

503m

Refer : Baxter, figs. #742,886,887,899,1113,1114,1117,1208

Notes : See #39 (38) and 41 (40). Problem with spines on scapular, supraorbital, nuchal and body may = B. kincaidi of Authors or really is a valid B. kincaidi

Resem: differs from B.interrupta by the body color, clasper configuration; from B. trachouros by ventral tail color, 3-12 nuchal mid-dorsal spines, scapular spine absent to having 2 pairs; keys out to this species in Ishihara & Ishiyama 1985.

Dorsally brownish-yellow with eye sized brown spots; ventrally white with with gray stripe on tail, dark around anus; claspers dark; anterior lobe of pelvic fin dark dorsally, white ventrally.

Interorbital space slightly concave.

Dorsal fins interspace narrow or lacking; moderate notch to pelvic fin, with tips of 6 rays showing in outer lobe; tail with lateral keel that starts at mid tail and is widest under dorsal fins.

Interorbital spines numerous, same size and spacing as on rest of body; a few, scattered, very small spines on eye lid; spines cover body dorsally, none ventrally; pelvic fin free of spines except for a posterior central patch on larger lobe; lateral spines on tail not enlarged; no clear spiny area around mid dorsal spine row; spines on and between dorsal fins, on caudal fin.

Ventral pores 4-5 + 5 + 4-8; gill flap with lateral point.

Claspers with double, rounded tip; projection with rounded tip; knife with rounded, compressed, enlarged tip; no pseudosiphon #1 slit or opening.

MERISTICS ON NEXT PAGE

RAJIDAE
Bathyraja violacea

| | | | | |
|------------------------------|---------------|-------|----------------------------------|---------------------------|
| TL | - | 879 | PreLip L | 43.3 – 54.6 % HL |
| Body Length: | | | Mouth W | 21.5 – 26.5 % HL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | 44.8 – 50.8 | % TL | InNasal W | 20.4 – 24.3 % HL |
| Body W | 61.4 – 66.7 | % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | 21.2 – 25.6 | % TL | 1 st | 58.4 – 64.7 % HL |
| Head L, 5 th gill | 26.7 – 30.7 | % TL | 5 th | 35.5 – 45.6 % HL |
| Snout L | 42.8 – 57.2 | % HL | 1 st -5 th | 23.8 – 28.7 % HL |
| Orbit L | 12.9 – 16.8 | % HL | Tail fold | 29.9 – 99.9 % Tail Length |
| Eye L | 8.0 – 12.6 | % HL | Dorsal fin base Length: | |
| InOrb W | 11.9 – 14.9 | % HL | 1 st | 15.0 % HL |
| Spiracle L | 9.8 – 12.9 | % HL | 2 nd | 13.7 % HL |
| InSpir W | 19.0 – 22.7 | % HL | InterDorsal Fin L | 0 – 7.5 % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | ++ | | pelvic junction | 19.7 – 65.4 % HL |
| Scapular: | 0-2 | | Ventral pores: | 5 + 4 + 5 |
| Mid-dorsal row: | | | Teeth, upper | 25-32 |
| Nuchal | 3-12 variable | | lower | 25-32 |
| Caudal | 17-23 | | Vert | 22-30 + 115-119 = 143-149 |
| InterDorsal | 0-1 | | PreDorsal | 89 |
| InterMidDorsal: | ++ | | Body L/W | |
| Alar: rows | 3-7 ; columns | 21-23 | PreAnus L/Body W | 0.686 |

RAJIDAE

52 - Clasper sentinel absent or small and pointed. (53)

53 (52) – Clasper projection extending past posterior margin of clasper.

Bathyraja interrupta (Gill & Townsend, 1897)
SEE #31 (30)

Bering skate

53 - Clasper projection not exposed, short.

Bathyraja bergi (Dolganov, 1984?)
SEE #34

54 (48) – Pelvic fin deeply notched; clasper tip pointed; body spines sparse or absent.

Bathyraja diplotaenia (Ishiyama, 1952)
SEE #40 (39)

54 - Pelvic fin moderately deeply notched; body spines moderate to strong, clasper tip rounded (55)

55 (54) -Orbit with irregular, large spines.

Bathyraja parmifera (Bean, 1881)
SEE #29

Alaska skate

RAJIDAE

55 - Orbit with spines small, irregularly spaced, largest posteriorly.

Rhinoraja longicauda (Ishiyama,)

Range: Northwestern Pacific off Japan

540-980m

Refer : Amaoka, et al, 1983:15, fig.15

Baxter #847,850

Masuda, et al. 1985:15, pl.16(F)

Notes :

Resem: Differs from R. odai by having nuchal spines and lack of dorsal white blotches; from R. kujiensis by discontinuous mid-dorsal spine row.

Body dark grayish to chocolate brown dorsally, with lots of small dark spots; young dark ventrally, becoming light as adults, with margins of pectoral and pelvic fins, tail, and anus remaining dark.

Interorbital space concave; tail long, length equal to body width, lateral fold 34.6 - 98.1% of tail length.

Mid dorsal spine row discontinuous, few spines between mid dorsal spines; lateral spines on tail slightly smaller than dorso-lateral spines; dorsal body spines thick, long, noticeable stellate with 5 to 6 lateral basal rays; spines thin posteriorly on pectoral fin, dense anteriorly, branchial area not less dense than rest of pectoral; spines on eye lid small, dense; pelvic fin without spines except for patch in center of anterior lobe; small spines on dorsal and caudal fins.

Dorsal fins separated by short interspace, interspace distance 3.6 - 6.2% HL; posterior edge of pectoral and pelvic fins crenulate; pelvic fin notch moderately deep.

MERISTICS ON NEXT PAGE

RAJIDAE
Rhinoraja longicauda

| | | | | |
|------------------------------|---------------------|-----|-----------------------------------|---------------------------|
| TL | - | 565 | PreLip L | 41.2 – 44.4 % HL |
| Body Length: | | | Mouth W | 22.2 – 27.8 % HL |
| Snout-pelvic | 43.7 – 53.4 % TL | | PreNasal L | 9.8 – 11.5 % HL |
| PreAnus | 40.3 – 45.3 % TL | | InNasal W | 22.0 – 27.5 % HL |
| Body W | 47.6 – 63.1 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | 19.0 – 19.4 % TL | | 1 st | 73.1 – 81.6 % HL |
| Head L, 5 th gill | 23.0 – 24.4 % TL | | 5 th | 46.7 – 54.2 % HL |
| Snout L | 41.5 – 43.8 % HL | | 1 st -5 th | 29.7 – 33.5 % HL |
| Snout L | 14.9 – 17.5 % BW | | Tail Length | 87.2 – 102.1 % BW |
| Orbit L | 18.1 – 20.8 % HL | | Tail fold | 37.4 – 98.1 % Tail Length |
| Orbit L | 6.1 – 8.2 % BW | | Dorsal fin base Length: | |
| Eye L | 11.3 – 17.7 % HL | | 1 st | % HL |
| InOrb W | 13.2 – 14.9 % HL | | 2 nd | % HL |
| InOrb W | 5.9 – 63 % BW | | InterDorsal Fin L | 3.6 – 6.2 % HL |
| Spiracle L | 10.2 – 14.7 % HL | | Clasper Length to pelvic junction | % HL |
| InSpir W | 4.2 – 5.7 % HL | | Ventral pores: | |
| Dorsal spines: | | | Teeth, upper | 25-32 |
| Orbital: | many, very fine | | lower | 26-35 |
| Scapular: | 0 | | Vert, trunk | 28-31 |
| Mid-dorsal row: | | | PreDorsal | 74-81 |
| Nuchal | 0-4 | | Body L/W | 0.71 – 0.77 |
| Caudal | 19-26 | | PreAnus L/Body W | |
| InterDorsal | 0 | | | |
| InterMidDorsal: | | | | |
| Alar: rows | 5-6 ; columns 17-18 | | | |

RAJIDAE

55 - - - **Rhinoraja cf. longicauda**

Refer : Baxter #707 (OSU #8851)

Dark spots dorsally; light colored ventrally.

Interorbital space slightly concave, very spiny with normal sized spines; scales are sharp pointed spines, dorsally cover body except for pelvic fins; spines absent on ventral side; lateral spines on tail smaller than rest of tail spines; spines between mid dorsal row of enlarged spines; spines on dorsal fins and caudal fin; lateral tail fold 37.4% of tail length; eyes in preserved specimen high; pelvic fin moderately notched with 5 fin ray tips showing on outer lobe; gill flap with very slight projection towards outer side.

| | | | | |
|------------------------------|---|-----------|----------------------------------|---------------|
| TL | - | 526 | PreLip L | % HL |
| Body Length: | | | Mouth W | 22.7 % HL |
| Snout-pelvic | | % TL | PreNasal L | % HL |
| PreAnus | | 40.3 % TL | InNasal W | 25.0 % HL |
| Body W | | 53.6 % TL | Intergill Widths, maximum: | |
| Head L, 1 st gill | | % TL | 1 st | 74.2 % HL |
| Head L, 5 th gill | | % TL | 5 th | 45.1 % HL |
| Snout L | | 38.3 % HL | 1 st -5 th | 30.5 % HL |
| Orbit L | | 17.2 % HL | Tail fold | % Tail Length |
| Eye L | | 10.2 % HL | Dorsal fin base Length: | |
| InOrb W | | 13.7 % HL | 1 st | % HL |
| Spiracle L | | 13.4 % HL | 2 nd | % HL |
| InSpir W | | 23.3 % HL | InterDorsal Fin L | % HL |
| Dorsal spines: | | | Clasper Length to | |
| Orbital: | | 0 | pelvic junction | % HL |
| Scapular: | | 0 | Ventral pores: | |
| Mid-dorsal row: | | | Teeth, upper | |
| Nuchal | | 0 | lower | |
| Caudal | | 19 | Vert | |
| InterDorsal | | 0 | | |
| InterMidDorsal: | | + | Body L/W | 0.752 |
| Alar: rows | | ; columns | PreAnus L/Body W | |

RAJIDAE

SPECIES WITHOUT DATA FOR PLACEMENT

- - - - **Bathyraja sp. cf. interrupta**

Range; Aleutian Islands: 408m
 Refer : Baxter #969,970

Color dark gray dorsally.

Body covered with fine spines dorsally, ventrally without spines; ventral pores 7 + 6 + 4; gill cover flap small, rounded to lacking; interorbital space shape slight concave.

| | | | | |
|------------------------------|------------------|------|-----------------------------------|---------------------------|
| TL | - | 1102 | PreLip L | 33.1 – 40.9 % HL |
| Body Length: | | | Mouth W | 27.4 – 27.8 % HL |
| Snout-pelvic | 43.1 – 44.9 % TL | | PreNasal L | % HL |
| Snout-Anus | 47.1 – 48.3 % TL | | InNasal W | 33.9 – 32.0 % HL |
| Body W | 64.7 % TL | | Intergill Widths, maximum: | |
| Head L, 1 st gill | 20.6 % TL | | 1 st | 70.9 – 76.4 % HL |
| Head L, 5 th gill | 26.5 % TL | | 5 th | 51.7 – 54.1 % HL |
| Snout L | 37.2 – 43.2 % HL | | 1 st -5 th | 29.4 – 31.5 % HL |
| Orbit L | 15.4 – 15.6 % HL | | Tail fold | 42.1 – 45.7 % Tail Length |
| Eye L | 8.9 – 10.4 % HL | | | |
| InOrb W | 18.0 – 19.1 % HL | | | |
| Spiracle L | 11.7 – 12.1 % HL | | | |
| InSpir W | 25.1 – 26.9 % HL | | | |
| Dorsal spines: | | | Clasper Length to pelvic junction | % HL |
| Orbital: | 0 | | | |
| Scapular: | 0 | | | |
| Mid-dorsal row: | | | Teeth, upper | 31-32 |
| Nuchal | 3-4 | | lower | 22-31 |
| Caudal | 23-26 | | Vert | |
| InterDorsal | 0 | | | |
| InterMidDorsal: | | | Body L/W | 1.55 – 1.60 |
| Alar: rows | 5 ; columns | 21 | | |

56 (0) - Egg cases more or less rectangular, flattened, with prominent “horns” at the corners. (57)

56 - Egg cases not rectangular. (73)

57 (56)- Egg cases with strong, recurved “horns” at corners, anterior horn tips overlap. (Bathyraja) (58)

57 - Egg cases without strong “horns” at corners, will have moderate to slight corner projections (72)

RAJIDAE

58 (57) – Egg cases without data for placement.

– - **Bathyraja bergi**

*Surface rough with minute coarse prickles in numerous longitudinal rows; lateral keel narrow, width 6.3% of least capsule width; color of both sides plum-brown, lateral keel somewhat lighter; byssus attachment at base of anterior horns”.

| | | | |
|----------------------|-------|------------------------|-------|
| Total Length: | | Case Length: | 114.5 |
| Anterior Width: | 71.5 | | |
| Maximum or Mid Width | 81.0 | | |
| Posterior Width: | | | |
| Inside Horn Widths: | | Apron Length, Anterior | 10.5 |
| Anterior | 75.0 | Keel Width | 4.5 |
| Posterior | 115.0 | | |

Position of byssus attachment: near base of anterior horns

58 - Egg cases without data for placement. (59)

59 (58) – Sculpture of individual spines in rows. (60)

59 - Sculpture of longitudinal ribs without individual spines (62)

60 (59) – Spines moderately long; posteriorly directed, generally flattened at tip; tip rounded, pointed, or with multiple cusps.

Bathyraja aleutica (Gilbert & Thoburn, 1896)

Refer : Baxter #938

Spines vary from being slender, sharply pointed to club-shaped with a rounded tip to having a flattened tip with multiple cusps, see figure; spine rows 2.1 – 2.2 per millimeter; spine length 2.1 .

| | | | |
|-----------------------|-------------|---------------|-----------|
| Total Length : | 211 - 242 | Case Length : | 121-147 |
| Anterior Width : | 63.9 – 82.9 | Height : | 35 – 36 |
| Maximum or Mid Width: | 77.4 – 95.7 | | |
| Posterior Width : | 65.5 – 85.3 | Keel Width : | 2.0 – 4.2 |

Position of byssus attachment : on anterior horn near base.
 Longitudinal ribs : 1.51 – 2.07/mm; spines 2.14 – 2.21/mm.
 Spine length 1.3 – 2.1mm

60 - Spines short, less than 1mm. (61)

RAJIDAE

61 (60) – Spines very uneven.

Bathyraja minispinosa

Surface sculpturing of minute prickles in longitudinal rows.

| | | | |
|---------------------------------|----|-----------------------|------|
| Total Length : | | Case Length : | 76mm |
| Anterior Width : | 46 | Height : | |
| Maximum or Mid Width | 56 | | |
| Posterior Width : | | Keel Width : | 4mm |
| Position of byssus attachment : | | Anterior apron Width | 3 |
| Longitudinal ribs : | ++ | Posterior apron Width | 14 |
| Spine Length | | | |

61 - Spines vertical, single, slender conic in shape.

Bathyraja sp.

Range : Aleutians, Cruise 866, Haul 103

Refer : Baxter #1017

In addition to spines surface covered with many long threads; spines about 0.70mm in height.

| | | | |
|---------------------------------|-------------------------|--------------------|------|
| Total Length : | 161 | Case Length | 86.4 |
| Anterior Width | 50.8 | Lateral keel Width | 1.8 |
| Maximum or Mid Width | 61.7 | Height : - | |
| Posterior Width : | 48.2 | | |
| Position of byssus attachment : | base of posterior horn. | | |
| Longitudinal rows : | 2.98/mm | | |

62 (59) – Surface sculpturing of relatively high raised, longitudinal ribs with short, generally flat tipped projections or spines. (63)

62 - Surface sculpturing of low, rounded, longitudinal ribs (65)

RAJIDAE

63 (62) – Case length more than 100mm

Bathyraja caeluronigricans

Bands of long, silky fibers overlay base sculpturing.

| | | | |
|---------------------------------|----|-----------------------|-------|
| Total Length: | | Case Length : | 104mm |
| Anterior Width : | 52 | Height : | |
| Maximum or Mid Width | 65 | | |
| Posterior Width : | | Keel Width | 2mm |
| Position of byssus attachment : | | Anterior apron width | 8 |
| Longitudinal ribs : | ++ | Posterior apron width | 15 |
| Spine length | | | |

63 - Case length less than 100mm.

(64)

64 (63) – Case length 85 – 99mm; covered with long hairs in addition to base sculpturing.

Bathyraja maculata

Refer :

Bands of long, silky fibers overlay base sculpturing.

| | | | |
|---------------------------------|----|-----------------------|------|
| Total Length: | | Case Length : | 97mm |
| Anterior Width : | 51 | Height : | |
| Maximum or Mid Width | 63 | | |
| Posterior Width : | | Keel Width | 4mm |
| Position of byssus attachment : | | Anterior apron width | 11 |
| Longitudinal ribs : | ++ | Posterior apron width | 17 |
| Spine length | | | |

64 - Case length less than 85mm.

Bathyraja sp.

Range : Dead case from 600 meters in Pribilof Canyon, Southcentral Bering Sea.

Notes : Same general type of sculpturing as Bathyraja maculata and Bathyraja caeluronigricans have.

| | | | |
|---------------------------------|-----------------------------|---------------------|--------|
| Total Length : | 147.7 | Case Length : | 79.2 |
| Anterior Width : | 43.6 | Height : | |
| Maximum or Mid Width : | 52.0 | Keel Width : | |
| Position of byssus attachment : | posterior of center of case | | |
| Posterior Width: | | Longitudinal ribs : | 1.10mm |

RAJIDAE

65 (62) - longitudinal ribs unevenly jointed: ribs relatively even in width; interspace slightly narrower than rib width.

Bathyraja interrupta (Gill & Townsend, 1897)

Range : Bering Sea

| | | | |
|---|---------------|--------------|-------------|
| Total Length : | 151.2 – 171.4 | Case Length | 75.3 – 93.4 |
| Anterior Width : | 55.0 – 59.4 | Height : | |
| Maximum or Mid Width: | 63.5 – 73.4 | | |
| Posterior Width : | | Keel Width : | |
| Position of byssus attachment: central to slightly posterior. | | | |
| Longitudinal ribs : | /mm | | |

65 - Longitudinal ribs not jointed, ribs uneven in width, low. (66)

66 (65) – Ribs more than 10 per millimeter ; ribs forming mat-like surface; anterior horns not elongate nor do tips overlap. (67)

66 - Ribs less than 9 per millimeter. (68)

67 (66) – Posterior web or apron deep.

Raja rhina (Jordan & Gilbert, 1880)

Range : North Gulf, South of Kodiak Island

Egg case less than 180mm in total length, more than 60mm in least length; surface of case relatively smooth with very fine, low longitudinal striations that are not pronounced; Horns slender, short, anterior horns are somewhat longer. Posterior edge of case almost straight or evenly convex; anterior edge moderately concave; egg case more like Bathyraja type than Raja binoculata.

| | | | |
|--|---------------|----------------|------------|
| Total Length: | 175 - 180 | Case Length: | 131-137 |
| Anterior Width: | 72 – 55 | Height: | |
| Maximum or Mid Width: | 72 – 101 | | |
| Posterior Width: | 56 – 76 | Lateral keel W | 5.5 – 13.4 |
| Longitudinal ribs | 30.4 – 32.8mm | | |
| Position of byssus attachment: along lateral edges, major is slightly posterior of center. | | | |

RAJIDAE

67 - posterior web not deep.

Bathyraja unknown genera and species

Range: Port Dick, North Gulf of Alaska

| | | | |
|--------------------------------|-----------|--------------|---------|
| Total Length: | 178 – 199 | Case Length: | 70 – 73 |
| Anterior Width: | 89 | Height: | |
| Maximum or Mid Width: | 98 – 101 | | |
| Posterior Width: | 70 – 73 | Keel width: | |
| Position of byssus attachment: | central | | |

68 (66) – Ribs 3.7 – 5.1 per millimeter. (69)

68 - Ribs 6 – 9 per millimeter. (70)

69 (68) – Longitudinal ribs moderately uneven in width; ribs crossed with very fine notches or slightly raised ribs that may or may not be uniform from rib to rib, 8.31/mm; byssus central.

Bathyraja sp.

Refer : Baxter #939,997,998,1012,1013,1016,1020

Range: Bering Sea, 54 38.88'N, 165 46.41'W: 351m – South of Kodiak

| | | | |
|-----------------------|---------------------------------|-----------------|-----------|
| Total Length: | 130.7 – 158 | Case Length: | 74 – 90 |
| Anterior Width: | 42.0 – 60.4 | Height: | 14 – 28 |
| Maximum or Mid Width: | 52.5 – 71.5 | | |
| Posterior Width: | 43.0 – 61.7 | Lateral Keel W: | 5.3 – 8.8 |
| Byssus position: | central to slightly posteriorly | | |
| Longitudinal ribs: | 3.44 – 5.13/mm | | |
| Color: | black, tan when fresh | | |

69 - Longitudinal ribs smoothish; byssus slightly posterior.

Bathyraja sp.

Refer : Baxter #995

Range: Aleutians, 51 46.47'N, 177 22.69'E ; 137m

| | | | |
|-----------------------|-------------------------------|--------------------|------------|
| Total Length: | 127 | Case Length: | 68.5 |
| Anterior Width: | 38.7 | Height : | 16 |
| Maximum or Mid Width: | 46.4 | Posterior Width: | 38.2 |
| Lateral Keel W: | 2.4 | Longitudinal ribs: | 3.91/mm |
| Byssus position: | slightly posterior of center. | Color: | dark brown |

RAJIDAE

70 (68) – Ribs smooth.

Bathyraja parmifera (Bean,1881)

Range: Bering Sea.

| | | | |
|--------------------------------|-------------------------------------|---------------------|-------------|
| Total Length: | 219 – 260 | Case Length: | 129 – 132.3 |
| Anterior Width: | 68.7 – 85.0 | Height: | |
| Maximum or Mid Width: | 81.8 – 100.2 | | |
| Posterior Width: | 69 | Lateral Keel Width: | |
| Inside anterior horns Width: | 40.7 | | |
| Position of byssus attachment: | Central portion of posterior horns. | | |
| Longitudinal ribs: | 6.71/mm | | |

70 - Ribs not smooth. (71)

71 (70) – Ribs rough with cross nodes; case length 140.

Bathyraja sp.

Range: Bering Sea, 54 44.51'N, 166 17.63'W

238m

Note : Recovered empty

| | | | |
|-----------------------|---------|---------------------|-----|
| Total Length: | 275 | Case Length: | 142 |
| Anterior Width: | 75.8 | Height: | |
| Maximum or Mid Width: | 75.8 | | |
| Posterior Width: | 71.7 | Lateral Keel Width: | |
| Byssus attachment: | unknown | | |
| Longitudinal ribs: | 4.87/mm | | |

71 - Ribs fairly smooth; case length 70.

Bathyraja sp.

Range: Aleutian Islands

Refer : Baxter #1000 w/young, 1003

Ribs low, nonuniform in width.

| | | | |
|-----------------------|------------------------------|---------------------|-------------|
| Total Length: | 122.5 - 129 | Case Length: | 66.3 – 69.7 |
| Anterior Width: | 35.1 – 38.2 | Height: | 12.6 – 18.1 |
| Maximum or Mid Width: | 42.5 – 44.4 | | |
| Posterior Width: | 37.9 – 38.0 | Lateral Keel Width: | 2.4 – 4.2 |
| Byssus attachment: | Slightly posterior of center | | |
| Longitudinal ribs: | 8.26 – 8.75mm | | |

RAJIDAE

72 (57) – Egg case more than 190mm in least length. All horns are short, blunt, and flattened; dorsal rectangular outline moderately pinched about mid-length; posterior edge of case between horns nearly straight, anterior edge slightly concave; dorsal surface highly arched; prominent ridges originating near middle of dorsal arch extend forward roughly parallel for about half length and the separate to edges of egg case and on anterior horns; anterior horns obscured by a flat connection between them; surface smooth.

Raja binocularata (Girard, 1854)

Range: Southeastern Bering Sea off North side of Alaskan Peninsula.

| | | |
|--------------------------------|-----|----------------------------------|
| Total Length: | 303 | Case Length: more than 190 (243) |
| Anterior Width: | 131 | Height: 58 |
| Maximum or Mid Width: | 158 | |
| Posterior Width: | 146 | Lateral Keel Width: |
| Position of byssus attachment: | | |

72 - Egg case less than 180mm in total length, more than 60mm in least length; surface of case relatively smooth with longitudinal striations not pronounced. All horns slender and short, anterior horns are somewhat longer. Posterior edge of case almost straight or even convex; anterior edge moderately concave.

Raja rhina (Jordan & Gilbert, 1880) SEE #59 (58)

73 (56) – Egg case slightly constricted about one-third of distance from truncated anterior end; posterior end rounded; a flange around margin is drawn out into long coiled tendrils at each corner, which may be used as holdfasts or may be lost at one end.

Apristurus brunneus (Gilbert, 1912)

Brown cat shark

Range:

| | | |
|-----------------------|----|--------------|
| Total Length: | 55 | Case Length: |
| Anterior Width: | | Height: 13 |
| Maximum or Mid Width: | 23 | |
| Posterior Width: | | |

73 - Egg case spindle shaped or nearly cylindrical.

(74)

RAJIDAE

74 (73) – Egg case spindle-shaped with one end reduced and drawn out into a filament; case with longitudinal radially asymmetrical ridges, some carrying elaborate frills.

Hydrolagus colliei (Kay & Benney, 1839)

spotted ratfish

Range: Southeastern Alaska.

Total Length: to 200

Case Length:

Anterior Width:

Height:

Maximum or Mid Width:

Posterior Width:

Position of byssus attachment:

74 - Egg cases transparent, cylindrical with rounded ends, often found in long strings.

Eptatretus (stouti?)

hagfish

Range:

Refer : Eschmeyer, et al, 1983, pl.1, fig.20

Total Length: about 25

Case Length:

Maximum Diameter: 10

Position of byssus attachment: hooked tufts of adhering fibres at each end.