Bull. Fac. Fish. Hokkaido Univ.
35(4), 201-224. 1984.

Review of the Genus *Chascanopsetta*, with the Description of a New Species

Kunio AMAOKA* and Eiichi YAMAMOTO**

Abstract

The genus *Chascanopsetta* of bothid flounders is reviewed. Five species and two subspecies, *C. prorigera* from the central and western Pacific, *C. micrognathus* n. sp. from the Kyushu-Palau Ridge, *C. lugubris lugubris* from the Indo-Pacific, *C. lugubris danae* from the Atlantic, *C. prognathus* from the Indian Ocean and western Pacific, and *C. crumenalis* from near the Hawaiian Islands are recognized. The new species is described and the others are redescribed here. The last species formerly belonged to the monotypic genus *Pelecanichthys* and is transferred to this genus for the first time. A key is given to these species and subspecies.

Introduction

Chascanopsetta is a genus of bothid flounders living in the deep waters of the Indian, Pacific, and even the Atlantic Oceans. The genus is characterized by the typical appearance of deep sea fishes, e.g. a strongly compressed, flexible, body and an extremely large mouth. This peculiar form has awakened the interest of many taxonomists in fishes of the genus, and many species have been described under new names. Since *Chascanopsetta lugubris* was first described by Alcock (1894) as the type of the genus, twelve nominal species in this genus are known from the Indian and Pacific Oceans. Though Norman (1934) and Kuronuma (1940) reviewed some species, the taxonomy of members of the genus has not become clarified since their works due to subsequent additions of some new species and extensions of range. The taxonomic confusion existing for the genus probably comes from a wide range of the meristic counts, and wide variation of morphometric characters due to the soft body and great transformation of body parts after and before metamorphosis (Amaoka, 1971).

In this paper, a lot of specimens of various sizes and localities were used, and directly compared with type specimens as far as possible. We recognized 5 species and 2 subspecies in this genus including a new species: *C. prorigera* Gilbert, 1905, from the central and western Pacific; *C. micrognathus* n. sp. from the Kyushu-Palau Ridge; *C. lugubris lugubris* Alcock, 1894, from the Indo-Pacific; *C. lugubris danae* Bruun, 1937, from the Atlantic; *C. prognathus* Norman, 1939, from the Indian and western Pacific; and *C. crumenalis* (Gilbert et Cramer, 1879) from near the Hawaiian Islands. Among them the last species is referred to this genus for the first time. It was previously regarded as a member of a monotypic genus, *Pelecanichthys*.

* Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University
(北海道大学水産学部水産動物学講座)
** Tottori Prefectural Laboratory of Aquaculture
(鳥取県栽培漁業試験場)

We give an analytical key for these species and subspecies, and describe them in details.

Materials and methods

Counts and proportional measurements were made according to Hubbs and Lagler (1974).

Depositories of specimens are abbreviated as follows: BMNH—British Museum (Natural History); BSKU—Department of Biology, Faculty of Science, Kochi University; FAKU—Department of Fisheries, Faculty of Agriculture, Kyoto University; HUMZ—Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University; NMS—Nagasaki University Nomo Marine Station; NSMT—Department of Zoology, National Science Museum (Nat. Hist.), Tokyo; SIO—Scripps Institution of Oceanography; SOSC—Smithsonian Oceanographic Sorting Center; SU-CAS—Division of Systematic Biology, Stanford University-California Academy of Sciences; UNC—Research Fish Collection, University of North Carolina; USNM—United States National Museum, Washington, D.C.; ZMC—Zoological Museum, Copenhagen.

Chascanopsetta Alcock, 1894

Chascanopsetta Alcock, 1894, 128 (type species by original designation: *Chascanopsetta lugubris* Alcock).

Pelecanichthys, Gilbert and Cramer, 1897, 432 (type species by original designation: *Pelecanichthys crumenalis* Gilbert et Cramer).

Trachypterophrys, Franz, 1910, 60 (type species by original designation: *Trachypterophrys raptator* Franz).

Body elongate, elliptical, strongly compressed and flexible. Caudal peduncle very narrow in depth. Tip of isthmus far behind posterior end of lower eye. Anterior dorsal profile similar in both sexes. Head rather small, less than 1/4 of standard length. Eyes separated by a narrow and flat or concave space and about same vertical; interorbital region similar in both sexes. No rostral, orbital and mandibular spines. Two nostrils on each side, anterior one on ocular side tubular with a flap posteriorly. Mouth extremely large and oblique, maxillary extending to below horizontal through posterior margin of lower eye or extremely behind it, more than half length of head; front tip of maxillary not extending beyond tip of snout. Tip of lower jaw projecting far or slightly beyond tip of the upper. Teeth on jaws uniserial or irregularly biserial in place, and slender; those on lower jaw well curved towards inner side and depressible; no distinct canine. Gill rakers absent, rudimentary or very short, not serrate; none on upper limb (Fig. 5). Scales extremely small, cycloid on both sides, more or less embeded. Lateral line equally developed on both sides, with a flat-topped curve anteriorly.

Dorsal fin originating on blind side; anterior rays slightly elongate, connected by membrane at their bases; all rays simple. Anal fin starting slightly in rear of base of pectoral fin. Pectoral fins unequal, that on ocular side longer than that on blind side, all rays simple. Left pelvic fin originating below and backward tip of

isthmus; third ray or space between second and third rays on ocular side opposite to first on blind side; last ray on ocular side connected to origin of anal fin by a low membrane; all rays simple. Caudal fin rounded posteriorly; uppermost and lowermost two rays simple, and other rays branched.

Vomer and palatine toothless.

Remarks: The genus *Pelecanichthys* established by *P. crumenalis* is synonymized with genus *Chascanopsetta*. *Pelecanichthys* was characterized by having both jaws far longer than head, and a distinct gular poach formed by the mandibular membrane (Gilbert and Cramer, 1897; Norman, 1934). These characters were probably very useful as generic characters before *C. prognathus* was described by Norman (1939). But on comparative examination between holotypes of both *crumenalis* and *prognathus*, and specimens of *lugubris*, it was found that *prognathus* is intermediate between *crumenalis* and *lugubris* in the lengths of both jaws, and also *prognathus* has a gular poach which is similar to that of *crumenalis* in structure (Fig. 8), though Norman (1939) pointed out that *C. prognathus* does not have a gular poach, while Kuronuma (1940) stated that *C. normani* (synonym of *C. prognathus*) has a gular poach. It is judged that these characters have no value as generic characters.

On the other hand, it was noted by Hubbs (1915) that the genus *Trachypterophrys* is surely included in *Chascanopsetta*. Norman (1931) also synonymized the former with the latter on the basis of examination of 3 cotypes from Japan. Following them we consider that *Trachypterophrys* is clearly a synonym of *Chascanopsetta*.

Key to the species and subspecies of the genus *Chascanopsetta*

1a Gill rakers on first gill arch 8-12. Mouth medium in size. Upper jaw reaching only about below the rear margin of orbit, its length 1.59-1.83 in head (Fig. 7). A dilated bony lamella on ventral margin of lower jaw (Fig. 8) .....(2)

1b Gill rakers on first gill arch 0-5. Mouth large. Upper jaw reaching far behind orbit, its length 0.9-1.48 (1.21-1.69 in smaller specimens just after metamorphosis, less than 140 mm SL) (Fig. 7). No bony lamella on ventral margin of lower jaw (Fig. 8) .....(3)

2a Anal fin rays 85-89. Pored scales in lateral line 136-144. Caudal vertebrae 40. ..... *C. prorigera*

2b Anal fin rays 93-98. Pored scales in lateral line 161-187. Caudal vertebrae 42-44. ..... *C. micrognathus* n. sp.

3a Length of lower jaw shorter or more or less longer than head, 0.92-1.36 in head (Fig. 6), its tip slightly or more or less projecting beyond upper jaw. Upper jaw 1.12-1.69 in head (Fig. 7). Vertebrae 16-18+37-41=54-58. .....(4)

3b Length of lower jaw much longer than head, 0.65-0.81 in head (Fig. 6), its tip projecting well beyond upper jaw; upper jaw 0.92-1.02 in head (Fig. 7). Vertebrae 17-18+40-44=57-61. .....(5)

4a Length of lower jaw always shorter than head, 1.01-1.36 in head (Fig. 7); tip of lower jaw slightly projecting beyond tip of upper jaw; length of upper jaw 1.29-1.69 in head (Fig. 7) (Indo-Pacific subspecies) ..... *C. lugubris lugubris*

4b Length of lower jaw usually longer and rarely a little shorter than head, 0.92-

1.03 in head (Fig. 6); tip of lower jaw more or less well projected beyond tip of upper jaw; length of upper jaw 1.12-1.27 in head (Fig. 7) (Atlantic subspecies) ..... *C. lugubris danae*

5a Pored scales in lateral line 185-196. Length of upper jaw slightly shorter than or about as long as head, 1.00-1.02 in head (Fig. 7). Projecting length of lower jaw less than 18 per cent of its whole length. Length of lower jaw 0.78-0.81 in head (Fig. 6). Vertebrae 17-18+42-44=59-61. ..... *C. prognathus*

5b Pored scales in lateral line 209-241. Length of upper jaw longer than head, 0.92-0.95 in head (Fig. 7). Projecting length of lower jaw about 28 per cent of its whole length. Length of lower jaw 0.65-0.77 in head (Fig. 6). Vertebrae 17+40=57. ..... *C. crumenalis*

Chascanopsetta prorigera Gilbert, 1905
Fig. 2, A

Chascanopsetta prorigera Gilbert, 1905: 689, fig. 271 (original description, type locality: off the north coast of Maui, Hawaiian waters). Jordan and Seale, 1906: 413 (list). Norman, 1934: 251, fig. 192 (short description, distribution). Kuronuma, 1940: 39 (key). Gosline and Brock, 1960: 148, 149 (key, note). Nielsen, 1961: 222 (key). Tinker, 1978: 451, 2 figs. (note).
Chascamopsetta prorigera Fowler, 1928, 92 (note).

Material: USNM 51605 (holotype), 188.0 mm in SL, off north coast of Maui, Hawaiian waters, 326-376 m in depth. FAKU 3-7-493, 295.8 mm in SL, northern waters of Midway Island (30° 19.9′N, 178° 48.1′E), 267 m in depth, March 1-22, 1972. HUMZ 59423, 244.8 mm in SL, Emperor Seamount (32°N, 173°E), 350-400 m in depth, August 7, 1976.

Diagnosis: A species of *Chascanopsetta* with a vertically dilated bony lamella on ventral margin of lower jaw (Fig. 8, A); gill rakers well-developed, 8-11 on lower limb (Fig. 5); shorter mouth than head length; 3 dark blotches on straight part of lateral line; a small number of pored scales in lateral line.

Description: Dorsal fin rays 119-125 (125 in holotype); anal fin rays 85-89 (89); pectoral fin rays 14-15 (14) on ocular side. 13 (13) on blind side; scales in lateral line 136-144 (143); gill rakers on first arch 0+8-11 (0+8); vertebrae 16-17+40=56-57 (16+40=56).

Head 4.27-4.81 (4.27) in SL; depth 2.69-3.04 (2.98). Snout 4.23-4.68 (4.23) in head length; upper eye diameter 3.67-3.97 (3.67); lower eye diameter 3.7-4.02 (3.7); interorbital width 6.99-8.63 (8.63); upper jaw 1.64-1.79 (1.64) on ocular side, 1.69-1.88 (1.69) on blind side; lower jaw 1.25-1.28 (1.25) on ocular side, 1.24-1.27 (1.24) on blind side; depth of caudal peduncle 3.34-4.04 (4.04); curve width of lateral line 1.7-2.0 (2.0); longest dorsal ray 2.1-2.6 (2.1); longest anal ray 2.14-2.57 (2.33); pectoral fin 1.63-1.78 (1.63) on ocular side, 4.77-5.91 (−) on blind side; pelvic fin 2.73-3.64 (3.64) on ocular side, 2.77-3.29 (3.14) on blind side.

Body well elongated, moderately compressed and not so flexible, highest at posterior margin of abdominal cavity, upper and lower profiles behind this line gently curved and nearly straight; body depth about 1/3 of SL. Caudal peduncle

narrow, its depth a little less than 1/5 of body depth and about equal to eye diameter.

Head rather large, about 1.5 in body depth; upper profile with a faint concavity in front of middle of interorbital space, and gently rising before and above upper eye. Snout blunt and short, a little shorter than eye diameter. Eyes small, separated by a rather wide and deeply concave space, its width about half of eye diameter; upper eye a little behind the lower. Nostrils on ocular side located in front of middle line of interorbital space, anterior one tubular with a long flap posteriorly, posterior one more or less tubular without flap; those on blind side setting below origin of dorsal fin, anterior one tubular with a short flap, posterior one not tubular without flap.

Mouth oblique rather small, about equally developed on each side; maxillary slightly curved, extending to below posterior margin of lower eye; length of upper jaw much longer than half of head length. Lower jaw about equal to head length except for snout; its anterior tip a little projecting beyond that of the upper, its projecting length about half of eye pupil; each mandibular bone becomes vertically dilated to form a thin lamella on its middle portion (Fig. 8, A). Dentition about equally developed on both sides; teeth rather large, curved inward, depressible and uniserial; those on upper jaw decreasing in size backward; teeth on lower jaw stronger than those on the upper, about 18 on ocular side. Gill rakers on first arch short and pointed, none on upper limb (Fig. 5, A). Scales rather large, cycloid on both sides; fins except for caudal fin, jaws, snout and interorbital area naked. Lateral line equally developed on both sides of body, with a low, flat-topped curve above upper gill opening, its height about 1/4 of its width.

Dorsal fin starting slightly on blind side, before horizontal line through middle of interorbital region, some anterior rays free from fin membrane except for base, 1st ray a little longer than others succeeding it, its length about equal to eye diameter; all rays simple. Anal fin starting below base of pectoral fin, low membrane connecting between first anal ray and last pelvic ray. Pectoral fin very asymmetrical on each side, that on ocular side a little longer than 3 times of that on blind side; all rays simple. Pelvic fin on ocular side inserted below and slightly backward of tip of isthmus (lower arm of urohyal), 3rd ray opposite to 1st on blind side. Caudal fin rounded posteriorly, rather short, its length about 2.3–2.5 of depth of caudal peduncle; inner 13 rays branched.

Vent opens on a space on blind side between last pelvic fin ray and 1st anal fin ray; genital papilla on opposite of vent. Tip of interhaemal spine not projecting, but visible from outside.

In alcohol, general ground color on ocular side of body pale brownish, scattered with many small dark brown spots, especially the spots clear on head; a large dark blotch on origin, middle and near end of straight of lateral line; peritoneum dark blue; dorsal and anal fins with a series of inconspicuous brownish blotches and with many fine dark brown spots; caudal fin dark except for marginal portion; pectoral fin on ocular side dusky.

Distribution: Hawaiian waters, Emperor Seamount, at 267–400 m in depth.

Remarks: The present species is closely related to *C. micrognathus* in having small mouth and a bony lamella dilated from mandibule (Fig. 8, A). But is differs from the latter by a small numbers of the meristic counts.

This species was only known from the Hawaiian waters. But our specimen was obtained from the Emperor Seamount located in waters far to the north-western of the original locality.

Chascanopsetta micrognathus n. sp.
New Japanese name "kuchiboso-zaragarei"
Figs. 1, 2, B

Chascanopsetta sp. Amaoka, 1982 : 299, 407, pl. 216 (description, distribution).

Holotype : HUMZ 74867, 194.2 mm in SL, Kyushu-Palau Ridge (26° 46.0′N, 135° 20.0′E to 26°44.0′N, 135° 24.3′E), 342 m in depth, February 13, 1978.

Paratypes : HUMZ 74858, 74859, 188.3 mm, 137.1 mm, Kyushu-Palau Ridge (26° 14.1′N, 135° 47.5′E to 26° 10.1′N, 135° 48.0′E), 360 m in depth, January 23, 1978. HUMZ 74860, 74861, 175.3 mm, 172.8 mm, Kyushu-Palau Ridge (26° 13.9′N, 135° 47.2′E to 26° 07.7′N, 135° 52.8′E), 360 m in depth, January 25, 1978. HUMZ 74862, 74863, 198.6 mm, 187.2 mm, Kyushu-Palau Ridge (26° 45.5′N, 135° 19.2′E to 26° 46.8′N, 135° 23.5′E), 332 m in depth, February 2, 1978. HUMZ 74865, 208.6 mm, Kyushu-Palau Ridge (26° 45.6′N, 135° 19.0′E to 26° 46.0′N, 135° 19.6′E), 334 m in depth, February 12, 1978. HUMZ 74866, 161.8 mm, Kyushu-Palau Ridge (26° 48.7′N, 135° 19.4′E to 26° 44.0′N, 135° 24.0′E), 345 m in depth, February 13, 1978. HUMZ 74868, 184.2 mm, Kyushu-Palau Ridge (26° 46.0′N, 135° 20.3′E to 26° 46.6′N, 135° 20.8′E), 640–320 m, November 18, 1978. BSKU 29471, 30711, 248.0 mm, 273.8 mm, Kyushu-Palau Ridge (26° 05.0′N, 135° 50.0′E), 360–370 m, December 16, 1979. BSKU 30885, 143 mm, Kyushu-Palau Ridge (26° 11.5′N, 135° 45.4′E), 355–375 m, December 16, 1979. BSKU 31444, 31445, 268 mm, 233.5 mm, Kyushu-Palau Ridge (26° 05.0′N, 135° 50.9′E), 358–375 m, December 16, 1979.

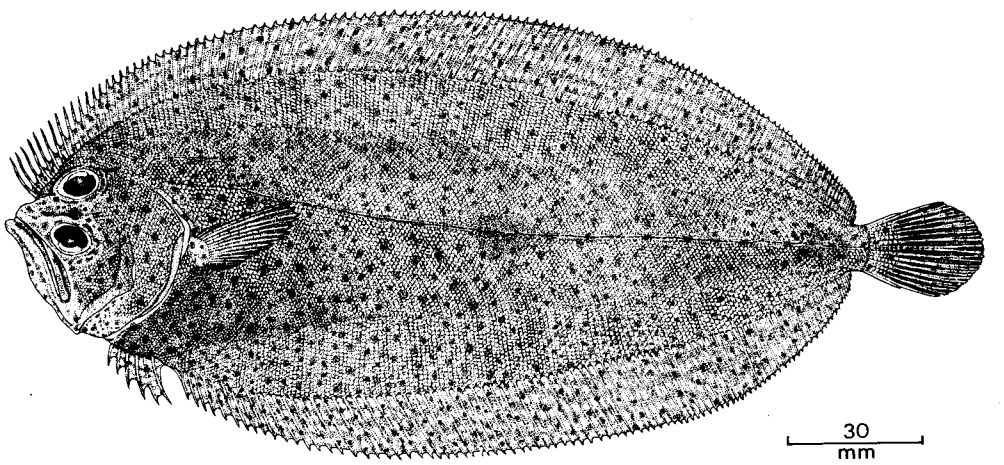

Fig. 1. *Chascanopsetta micrognathus* sp. nov., holotype, HUMZ 74867, 194.2 mm SL, collected from Kyushu-Palau Ridge.

Diagnosis: A species of *Chascanopsetta* with shorter maxillary extending not beyond posterior margin of lower eye; a dilated bony lamella on ventral margin of lower jaw (Fig. 8, B); gill rakers well-developed, 9-12 on lower limb (Fig. 5); large numbers of anal fin rays and pored scales in lateral line.

Description: Dorsal fin rays 124-130 (128 in holotype); anal fin rays 93-98 (97); pectoral fin rays 13-16 (16) on ocular side, 12-15 (14) on blind side; scales in lateral line 161-187 (174); gill rakers 0+9-12 (0+12); vertebrae 15-17+42-44= 58-60 (16+43=59).

Head 4.68-5.05 (5.01) in SL; depth 2.39-3.06 (2.57). Snout 3.87-4.80 (4.36) in head; upper eye diameter 3.23-4.00 (3.73); lower eye diameter 3.13-3.98 (3.63); interorbital width 7.71-10.5 (9.24); upper jaw 1.59-1.83 (1.72) on ocular side, 1.63-1.84 (1.76) on blind side; lower jaw 1.22-1.39 (1.28) on ocular side, 1.19-1.35 (1.32) on blind side; depth of caudal peduncle 3.24-3.8 (3.43); curve width of lateral line 1.55-2.07 (1.96); longest dorsal ray 1.82-2.26 (2.16); longest anal ray 1.86-2.27 (2.09); pectoral fin 1.39-1.71 (1.55) on ocular side, 4.09-5.43 (4.91) on blind side; pelvic fin 2.57-3.29 (2.85) on ocular side, 2.54-3.40 (2.73) on blind side.

Body elliptical, moderately compressed and not flexible, highest a little before middle of body; upper and lower profiles evenly, gently curved. Caudal peduncle very narrow, a little more than eye diameter.

Head rather short, about equal to half of body depth; upper profile with a narrow concavity in front of lower margin of upper eye, and gently rising before eye. Snout blunt and short, a little shorter than eye diameter. Eyes small, separated by a rather wide and deeply concave space, its width about half of eye diameter; upper eye a little behind the lower. Nostrils on ocular side located in front of middle line of interorbital space, anterior tubular with a flap posteriorly, posterior one without flap; those on blind side small, anterior one below origin of dorsal fin, tubular with a short flap, posterior one not tubular without flap.

Mouth oblique, rather small, about equally developed on each side; maxillary faintly curved anteriorly, extending to below posterior margin of lower eye; the length of upper jaw much longer than half of head length. Lower jaw about equal to head length except for snout, its anterior tip slightly projecting beyond that of the upper when mouth closed, its projecting length shorter than half of pupil; each mandibular bone vertically dilated to form a thin lamella on middle portion (Fig. 8, B). Dentition about equally developed on each side; teeth rather small, depressible, uniserial and somewhat enlarged anteriorly; teeth on the upper decreasing in size backward; teeth on the lower stronger than those on the upper, and curved inward, about 27 on ocular side. Gill rakers on first arch slender and pointed at tip, none on upper limb (Fig. 5, B). Scales very small, cycloid on both sides; fins except for caudal fin, jaws, snout and interorbital area entirely naked. Lateral line equally developed on both sides of body, with a low flat-topped curve above upper gill opening, its height about 1/4 of its width.

Dorsal fin starting on blind side, before lower margin of upper eye, some anterior rays free from fin membrane except for base, first and second rays more or less stronger than neighbouring ones slightly longer than eye diameter; all fin rays simple. Anal fin starting below base of pectoral fin, origin of the fin connected to last ray of pelvic fin by a low membrane; all rays simple. Pectoral fin short, very asymmetrical, that on ocular side a little longer than 3 times of that on blind side,

all rays simple. Pelvic fin on ocular side inserted slightly below and backward of tip of isthmus, third ray opposite to first on blind side. Caudal fin rounded posteriorly, its length about 2.6 of depth of caudal peduncle ; inner 13 rays branched, upper and lower two rays simple.

Vent opens on a space on blind side between last ray of pelvic fin and first ray of anal fin ; genital papilla on opposite of vent. Tip of interhaemal spine projecting behind last pelvic rays and before vent.

In alcohol, general ground color on ocular side of body pale brownish, a indistinct large blotch on origin, middle, and near end of straight part of lateral line, and scattered with many dark spots, especially becoming clear on head and abdominal cavity ; peritoneum dark blue. Dorsal, anal and caudal fins with many dark spots ; pectoral fin on ocular side dusky. Body on blind side milky white except for dark blue on peritoneum.

Distribution : Kyushu-Palau Ridge, 320–375 m in depth.

Remarks : The present new species is closely related to *C. prorigera* known from waters of Hawaii and the Emperor Seamount in having both jaws small (Figs.

Fig. 2. *Chascanopsetta prorigera*, HUMZ 59423, 244.8 mm SL (A). *C. micrognathus*, HUMZ 74863, 187.2 mm SL (B).

Table 1. Comparison between *C. micrognathus* and its related two species, *C. prorigera* and *C. microstoma*.

Species	*C. micrognathus*	*C. prorigera*	*C. microstoma*
Number of specimens	16	3	1*
Standard length	137.1-273.8	188.0-295.8	129.5
Body depth in SL	2.39-3.06	2.69-3.04	3.14
Head length in SL	4.68-5.05	4.27-4.81	5.41
Upper jaw in head	1.59-1.83	1.64-1.79	1.68
Lower jaw in head	1.22-1.39	1.25-1.28	1.39
Dorsal fin rays	124-130	119-125	120
Anal fin rays	93-98	85-89	83
Scales in lateral line	161-187	136-144	187
Gill rakers	0+9-12	0+8-11	—
Vertebrae	15-17+42-44 =58-60	16-17+40 =56-57	—

Asterisk marking specimen cited from data in the original description

6, 7) and a bony lamella vertically dilated from mandible (Fig. 8, A,B), but differs from the latter by large numbers of the dorsal and anal fin rays, pored scales in the lateral line and vertebrae (Table 1). It is apparently separated from other species of this genus in having the small jaws much shorter than head length, rather well-developed and a large number of gill rakers, a large number of anal fin rays, and rather thick body. This species resembles *C. microstoma* Kuronuma, 1940 based on a single specimen collected from off Heta, Sagami Bay having a small mouth (upper jaw on ocular side 1.68 in head length, on blind side 1.65; lower jaw on ocular side 1.39), but it is easily distinguished from the latter by a large number of anal fin rays and a bony lamella on mandible (Table 1). It is thought that *C. microstoma* (129.5 mm in SL) is a young specimen of *C. lugubris* just after metamorphosis. Our examination of a lot of specimens of *C. lugubris* shows that smaller specimens than about 140 mm in SL have small mouths (upper jaw on ocular side 1.36–1.69 in head, that on blind side 1.31–1.69; lower jaw on ocular side 1.09–1.36). It, therefore, is judged from these evidences that *C. microstoma* is not identical with the present new species, and is a synonym of *C. lugubris*.

Chascanopsetta lugubris lugubris Alcock, 1894
"zaragarei"
Fig. 3, A-C

Chascanopsetta lugubris Alcock, 1894: 129, pl. 6, fig. 4 (original description, type locality: Bay of Bengal). Alcock, 1899: 125 (description). Brauer, 1906: 295 (description). Norman, 1927: 35, fig. 9 (description). Norman, 1931: 601 (note). Norman, 1934: 250, fig. 191 (short description, distribution). Kamohara, 1934: 1201 (short description). Okada and Matsubara, 1938: 423, pl. 105, fig. 1 (key, distribution). Kuronuma, 1940: 43 (key, description). Smith, 1949: 157, fig. 306 (short description). Kamohara, 1950: 241, fig. 182 (short description). Munro, 1955: 259, pl. 49, 749 (short description). Mat-

subara, 1955 : 1262 (key, distribution). Kamohara, 1958 : 62 (list). Nielsen, 1961 a : 122 (note, distribution). Kamohara, 1964 : 82 (list, distribution). Chen and Weng, 1965 : 60, fig. 39 (key, description). Shen, 1967 : 186, figs. 62-65 (description, distribution). Amaoka, 1969 : 221, fig. 94 (description).

Trachypterophrys raptator Franz, 1910 : 60, pl. 7, fig. 54 (original description, type locality : Fukuura, Japan). Jordan, Tanaka and Snyder, 1913 : 315 (short description). Kamohara, 1931 : 93 (list).

Chascanopsetta raptator Hubbs, 1915 : 452 (note).

Chascanopsetta gilchristi Von Bonde, 1922 : 7 (original description, type locality : Natal, off south-east Africa). Barnard, 1925 : 390 (short description).

Chascanopsetta maculata Von Bonde, 1922 : 8, pl. 2, fig. 1 (original description, type locality : Natal, off south-east Africa).

Chascanopsetta microstoma Kuronuma, 1940 : 51, fig. 7 (original description, type locality : Heta, Sagami Bay). Matsubara, 1955 : 1262 (key, distribution).

Chascanopsetta normani Kuronuma (in cotype), 1940 : 40, fig. 4 (original description, type locality : Heta, Sagami Bay).

Chascanopsetta galatheae Nielsen, 1961 b : 220, pl. 14, figs. a-c (original description, type locality : off Natal).

Chascanopsetta blumenalia Shen, 1967 : 187, figs. 66-70 (original description, type locality : off Hong Kong, South China Sea).

Material : HUMZ 35523-35525, 145.0-237.2 mm in SL, HUMZ 35527, 35531, 35532, 35535-35538, 133.0-236.5 mm, off Cape Ashizuri, Kochi Pref., November 18, 1974. HUMZ 49481, 183.2 mm, Mimase, Kochi Pref., November 15, 1975. HUMZ 51827, 51828, 138.2-281.8 mm, Owase, Mie Pref., 350 m in depth, March 13, 1976. HUMZ 52142, 185.5 mm, Miya, Aichi Pref., March 23, 1976. HUMZ 58731, 58740, 135.6, 139.3 mm, off Shimoda, Kochi Pref., 428 m in depth, October 25, 1976. HUMZ 58763, 129.0 mm, Mimase, Kochi Pref., October 23, 1976. HUMZ 71454, 161.5 mm, off Onahama, Fukushima Pref., 200-300 m in depth, November 13, 1977. HUMZ 7672, 113.5 mm, off Heta, Suruga Bay, February 18, 1969. NSMT-P 7466, 9660, 9663, 9683, 9687, 9688, 9692, 9699, 9704, 113.5-180.2 mm in SL, off Heta, Suruga Bay, November 28, 1969. BSKU 29711, 267 mm in SL, Okinawa Trough (29° 20.3′N, 127° 20.5′E), 315-330 m in depth, December 18, 1979. BSKU 29778, 263 mm, Okinawa Trough (30° 28.89′N, 127° 50.59′E), 320-360 m, October 28, 1979. BSKU 32501, 212 mm, Okinawa Trough (25° 48.0′N, 124° 25.5′E), 420-400 m, September 14, 1979. BSKU 33099, 303.8 mm, Okinawa Trough (25° 59.0′N, 125° 51.0′E), 430 m, October 10, 1979. BSKU 34102, 197.8 mm, Okinawa Trough (30° 28.89′N, 127° 50.59′E), 320-360 m, October 28, 1979. BSKU 34132, 298.0 mm, Okinawa Trough (31° 02.49′N, 128° 14.71′E), 400-435 m, October 30, 1979. BSKU 34763, 34765, 311.0, 271.5 mm, Okinawa Trough (29° 23.0′N, 127° 25.5′E), 450-475 m, December 18, 1979. BSKU 34780, 34781, 247.5, 221.8 mm, Okinawa Trough (29° 20.3′N, 127° 20.5′E), 315-330 m, December 18, 1979. NMS-P8111116, 185.0 mm in SL, off Thailand, Andaman Sea (7° 9.16′N, 98° 3.50′E), 270 m in depth, November 9, 1981. ZMC-P 853092, 853094, 853100 (paratypes of *C. galatheae*), 137.3-155.3 mm in SL, off Natal (25° 20′S, 35° 17′E), 575-595 m in depth.

Diagnosis : A subspecies of *Chascanopsetta* with lower jaw always shorter than head, 1.01-1.36 in head ; tip of lower jaw projecting slightly beyond upper

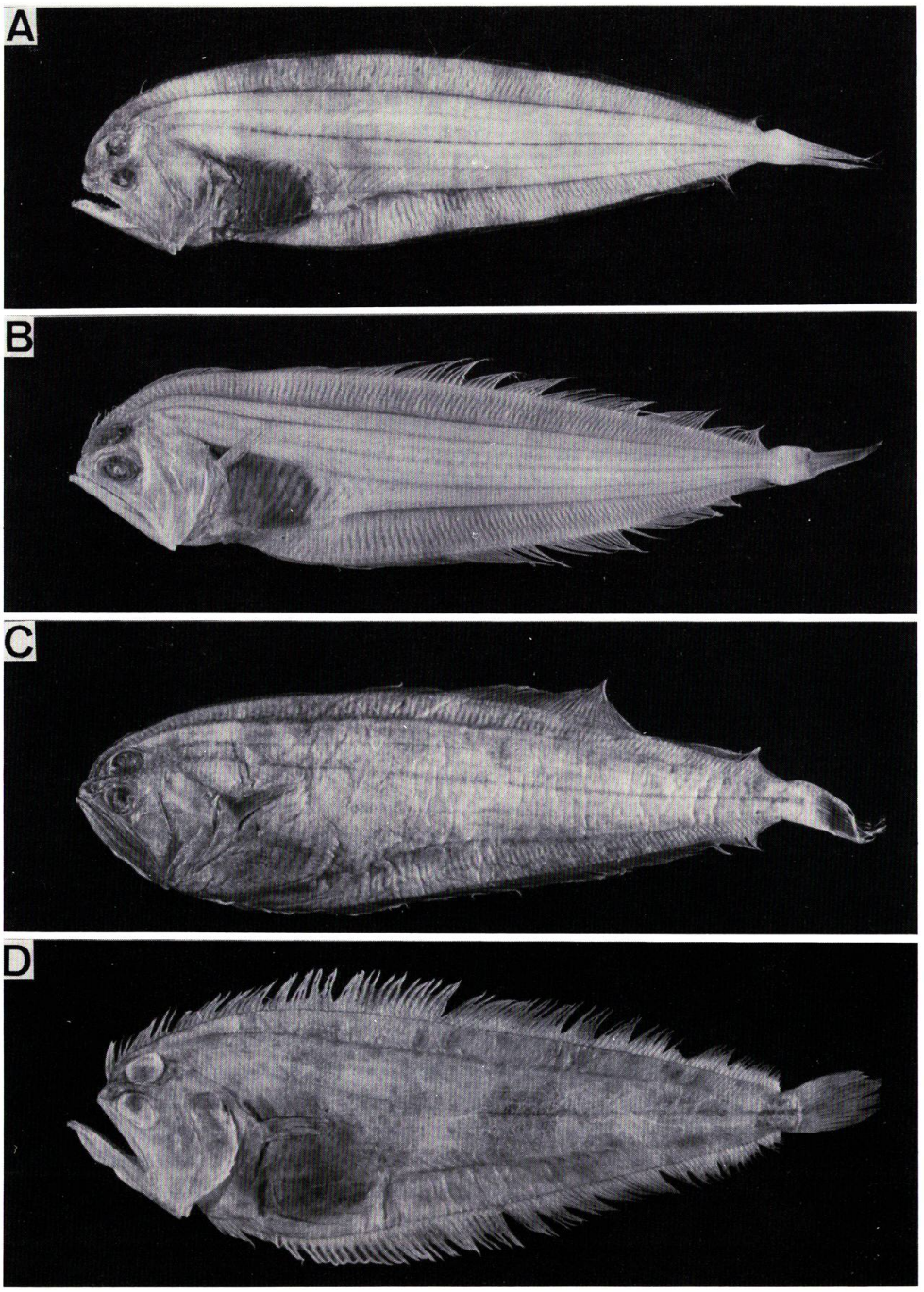

Fig. 3. *Chascanopsetta lugubris lugubris*, young-HUMZ 35524,145.0 mm SL (A); young-P853100 (a paratype of *C.galatheae)*, 155.3 mm SL (B); adult-HUMZ 35527, 236.5 mm SL (C). *C. lugubris danae*, HUMZ 100189, 247 mm SL (D).

jaw ; upper jaw 1.29-1.69 in head (Figs. 6, 7) ; no or 1-4 vestigial gill rakers (Fig. 5).

Description : Dorsal fin rays 115-125 ; anal fin rays 79-86 ; pectoral fin rays 14-17 on ocular side, 12-16 on blind side ; scales in lateral line 152-205 ; gill rakers on first arch 0+0-4 ; vertebrae 16-18+37-41=54-58.

Head 4.63-5.66 in SL ; depth 2.93-4.02. Snout 5.18-6.31 in head length ; upper eye diameter 3.01-4.25 ; lower eye diameter 3.26-3.95 ; interorbital width 11.2-23.1 ; upper jaw 1.29-1.48 (1.36-1.69 in smaller specimens, less than 140 mm in SL) on ocular side, 1.3-1.45 (1.31-1.69) on blind side ; lower jaw 1.01-1.18 (1.09-1.36) on ocular side, 1.01-1.17 (1.08-1.32) on blind side ; depth of caudal peduncle 3.19-4.54 ; curve width of lateral line 1.37-1.87 ; longest dorsal ray 2.19-3.0 ; longest anal ray 2.13-2.93 ; pectoral fin 1.60-2.10 on ocular side, 2.54-3.65 on blind side ; pelvic fin 2.58-4.21 on ocular side, 2.74-3.65 on blind side.

Body elongate, elliptical, strongly compressed and flexible, highest nearly at posterior margin of abdominal cavity, its depth about equal to 1.5 head length ; dorsal and anal contours gently arched or almost horizontal except for head region. Caudal peduncle very narrow in depth, about 1/5 depth of body.

Head rather small in size, much longer than half depth of body ; upper profile with a slight concavity in front of interorbital region, and it roundly rises after somewhat convex shape before middle of upper eye. Snout blunt and rather short, about equal to 2/3 eye diameter. Eyes moderate in size, separated by a narrow flat space, their width about 1/3 to 1/4 eye diameter ; upper eye slightly in advance of the lower or both about at same vertical. Nostrils on ocular side closely set in front of upper margin of lower eye, anterior one tubular with a rather long flap posteriorly, posterior one more or less tubular with flap ; nostrils on blind side setting below origin of dorsal fin, anterior one tubular, without flap, posterior one not tubular.

Mouth oblique and large in size, about equally developed on each side ; maxillary slender and not curved, extending well beyond lower eye ; lower jaw slightly projecting beyond the upper when mouth is closed (Fig. 8, C). Teeth uniserial in both jaws and slender ; those on upper jaw becoming rather small on posterior half ; those on lower jaw curved to inner side, and depressible, some posterior ones smaller than others. Gill rakers on first arch absent or rudimentary, disklike in shape, none on upper limb (Fig. 5, D). Scales small, cycloid on both sides ; fins except for caudal fin, jaws, snout, and interorbital area scaleless. Lateral line equally developed on both sides with a low flat-topped curve above pectoral fin, its height about 1/5 to 1/6 its width.

Dorsal fin starting slightly on blind side, before horizontal through lower margin of upper eye ; fin rays except for anterior some rays gradually higher in middle part of body, then evenly decreasing in height posteriorly ; some anterior rays slightly elongate, free from fin membrane except for their bases ; all rays simple. Anal fin beginning slightly in rear of base of pectoral fin, and first ray connecting to last pelvic fin ray on ocular side by a low membrane ; anal fin similar in shape and structure to dorsal fin. Pectoral fins asymmetrical and slender, all rays simple. Pelvic fin on ocular side inserted below and backward tip of isthmus ; third ray on ocular side opposite to first on blind side. Caudal fin slender and rounded posteriorly, inner 13 rays branched, but others simple.

Vent opens on blind side, between last pelvic ray and origin of anal fin. Genital papilla on opposite side of vent.

In alcohol, general ground color on ocular side of body dark brown with numerous small dark spots; peritoneum light blue; vertical fins dusky; paired fins paler than body. Blind side of body pale brownish with light blue on peritoneum portion.

Distribution: Western Pacific and Indian Oceans, 270-595 m in depth.

Remarks: Since the present species was described by Alcock (1894) based on a specimen from the Bay of Bengal, there are many synonyms for it, as shown in the list.

Trachypterophrys raptator Franz, 1910 and *Chascanopsetta gilchristi* Von Bonde, 1922 were distinguished from *C. lugubris* in having a flat-topped curve of the lateral line (Hubbs, 1915; Von Bonde, 1922). But the curve of a sharp angle as shown in Alcock's figure of the type of *C. lugubris* is clearly an abnormal condition, since the curve in the type is normally flat-topped on the blind side of the body (Norman, 1934).

Though *Chascanopsetta maculata* Von Bonde, 1922 is probably characterized by having darker spots all over body, our specimens of *C. lugubris* exhibit color variation including presence and absence of spots on body.

C. microstoma described by Kuronuma (1940) based on a single specimen (129.5 mm in SL) from Sagami Bay, Japan, differs from *C. lugubris* in having a very small mouth (length of upper jaw 1.68 in head length), though it resembles *C. lugubris* in meristic counts (Table 2). This type is a small specimen just after metamorphosis. In *C. lugubris* the mouth is still fully undeveloped at a size less than about 140 mm in SL (Amaoka, 1971). Thirteen specimens shorter than 140 mm in SL examined here have small mouth (length of upper jaw 1.36-1.69 in head) (Figs. 6, 7), and resemble *C. microstoma*. From such a fact, it is judged that the type of *C. microstoma* is a young specimen of *C. lugubris*.

Kuronuma (1940) described a new species *C. normani*, based on two specimens

Table 2. Comparison between 2 subspecies of *C. lugubris*, and between *C. lugubris* and its related nominal species.

Subspecies or species	*C. luguburis lugubris*		*C. lugubris danae*	*C. galatheae*	*C. microstoma*	*C. normani*
Specimens	13	23	15	3 of paratypes	holotype*	cotype*
SL (mm)	129-140	143-311	135-277	137-155	129.5	157.5
In head:						
Upper jaw	1.36-1.69	1.29-1.47	1.12-1.27	1.29-1.52	1.68	1.21
Lower jaw	1.09-1.36	1.01-1.18	0.92-1.03	1.04-1.28	1.39	0.97
Dorsal fin rays	117-122	115-125	114-120	124-127	120	123
Anal fin rays	79-86	80-86	80-87	85-88	83	88
Pectoral fin rays	14-16	14-17	13-18	15-18	15	15
Scales in lateral line	152-189	166-205	155-205	181-195	187	215
Gill rakers	0+1-3	0+0-4	0+1-5	0+0-5	—	—
Vertebrae	17+37-40 =54-57	16-18+37-40 =54-57	16-18+37-40 =55-57	17-18+39-41 =57-58	—	17+41 -58

Asterisks marking specimens cited from data in the original descriptions

from Sagami Bay. This species was described as being different from *C. lugubris* in having the tip of the lower jaw projecting well beyond the tip of the upper jaw, and the length of the lower jaw longer than the head length. But the cotype of *C. normani*, which has a short lower jaw not greatly projecting, can not be clearly separated from specimens of *C. lugubris* (Table 2). Thus, it is regarded as a synonym of the latter. While the holotype of *C. normani* is synonymized with *C. prognathus* Norman in this paper.

C. galatheae Nielsen, 1961 was distinguished from *C. lugubris* in having a rather larger number of the dorsal and anal fin rays (D 122–127, A 84–89). However, the former species can not be clearly separated from the latter species by the counts of these fin rays, though our specimens of *C. lugubris* have relatively few numbers of fin rays (D 115–125, A 79–86). Moreover, during our examinations of three paratypes of *C. galatheae* (Fig. 3, B), it was found that there are no differences between both species except for a little larger number of modes of the dorsal and anal rays (Table 2).

Shen (1967) described a new species *C. blumenalia* on the basis of a single specimen collected from off Hong Kong, which is different from *C. lugubris* by having a transparent body, a small number of teeth on the both jaws, short head, a rather narrow body, and a small number of scales in the lateral line. However, as shown in the morphometric characters and coloration of our specimens of *C. lugubris*, these characters are so variable that they actually are of no value.

It is considered that this species had so many synonyms because of the wide ranges of morphometric characters, which are due to the flexible body, change of body form during the metamorphosis, decreasing of body size during the metamorphosis, and a difficulty of accurate measurements, and also because of rather wide range of meristic characters, which may result from the wide distribution of this species.

The present specimens from the Indian and Pacific Oceans are somewhat separable from specimens from both sides of the Atlantic Ocean on the basis of the size of mouth, as shown in the key, Table 2, and Figs. 6, 7. They, therefore, were regarded as subspecies in the present paper.

Chascanopsetta lugubris danae Bruun, 1937
Fig. 3, D

Chascanopsetta lugubris danae Bruun, 1937: 126, pl. 1, fig. 1 (original description, type locality: eastern Atlantic, 8° 26′N, 15° 11′W). Poll, 1959: 317, fig. 108 (description).

Chascanopsetta lugubris Deubler and Rathjen, 1958: 132 (note).

Material: SIO 77-381, 156.2 mm in SL, off Gabon (0° 15′S, 8° 47′E), eastern Atlantic, March 15, 1949. UNC 1340, 273.0 mm in SL, western Atlantic (24° 17′N, 82° 25′W), 366 m in depth, March 12, 1957. UNC 1341, 202.3 mm, western Atlantic (27° 39′N, 79° 50′W), 329.4 m in depth, January 31, 1957. UNC 1342, 135.2 mm, western Atlantic (29° 55′N, 80° 12′W), 338.6-348 m in depth, August 7, 1956. UNC 1849, 182.0 mm, western Atlantic (28° 36′N, 79° 54′W), 403 m in depth, July 30, 1957. UNC 1850, 275.5 mm, western Atlantic (24° 28′N, 83° 28′W), 384 m in depth, June 16,

1956. HUMZ 100188-100193, 226-277 mm in SL, near Ascension Island (11° 37′S, 05° 13′W), 160-460 m in depth, November 11, 1982. SOSC uncatalogued 3 specimens, 211.1-276 mm in SL, eastern Atlantic (03° 32′S, 09° 53′E), 400 m in depth, September 7, 1963.

Diagnosis: A subspecies of *Chascanopsetta* with lower jaw usually longer and rarely a little shorter than head, 0.92-1.03 in head; upper jaw 1.12-1.27 in head (Figs. 6, 7); 1-5 vestigial gill rakers (Fig. 5).

Description: Dorsal fin rays 114-120; anal fin rays 80-87; pectoral fin rays 15-17 on ocular side, 14-16 on blind side; scales in lateral line 155-205; gill rakers on first arch 0+1-5; vertebrae 16-18+37-39=54-56.

Head 4.4-5.1 in SL; depth 2.66-3.56. Snout 4.57-5.78; upper eye diameter 3.45-4.19; lower eye diameter 3.38-4.11; interorbital width 11.9-17.8; upper jaw 1.12-1.27 on ocular side, 1.18-1.26 on blind side; lower jaw 0.92-1.03 on ocular side, 0.92-1.04 on blind side; depth of caudal peduncle 3.77-4.73; curve width of lateral line 1.55-1.85; longest dorsal ray 2.21-3.05; longest anal ray 2.34-3.00; pectoral fin 1.58-1.94 on ocular side, 2.52-3.14 on blind side; pelvic fin 2.7-3.79 on ocular side, 3.0-3.62 on blind side.

The present specimens resemble other Pacific specimens in general appearance, and meristic and morphometric characters, except for characters as shown in diagnosis. In coloration, body and fins in the former may be paler than those in the latter, when fresh specimens of both were compared.

Distribution: Atlantic Ocean, 160-460 m in depth.

Remarks: The name *C. lugubris danae* was given to the Atlantic specimen by Bruun (1937) on the basis of slight differences of proportional measurements. But Deubler and Rathjen (1958) pointed out that their Atlantic specimens are not different from the Indo-Pacific form, due to apparent wide variation in morphometric data. When the present specimens from both sides of Atlantic Ocean are directly compared with Indo-Pacific specimens, they are somewhat separable from each other by slightly longer upper and lower jaws, and the fact that the tip of the lower jaw is somewhat well projected, as shown in the key, Table 2, and Figs. 6 and 7. Therefore, the Atlantic form was regarded as a subspecies under the name, *C. lugubris danae* Bruun.

On the other hand, Deubler and Rathjen (1958) noted that the Atlantic larvae which were reported by Bruun (1937) and them, may be an early stage of an undescribed species of this genus in having a larger number of anal rays (87-90). However, species of the genus *Chascanopsetta* have apparent wide ranges in meristic counts (anal rays 79-88 in *C. lugubris lugubris*, 80-87 in *C. lugubris danae*). Thus, these larvae should be identified as *C. lugubris danae*..

Chascanopsetta prognathus Norman, 1939
"ukeguchi-zaragarei"
Fig. 4, A

Chascanopsetta prognathus Norman, 1939: 100, text fig. 31 (original description, type locality: Maldive area, Indian Ocean). Nielsen, 1961: 222 (key).

Chascanopsetta normani Kuronuma (in holotype), 1940: 40, fig. 3 (original description, type locality: off Heta, Suruga Bay. Matsubara, 1955: 1262 (key, distri-

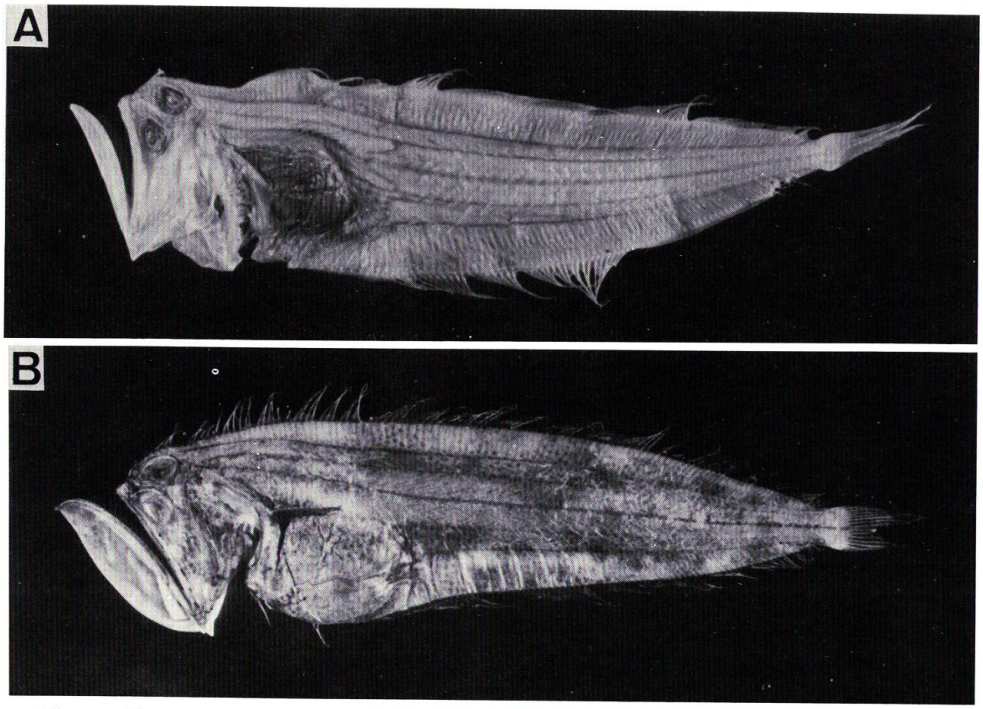

Fig. 4. *Chascanopsetta prognathus*, BSKU 29582, 190.0 mm SL (A). *C. crumenalis*, HUMZ 99788, 231.1 mm SL (B).

bution).

Material: BMNH 1939.5.25: 1738 (holotype), 174.3 mm in SL, St 145, Maldive area, Indian Ocean, 494 m in depth, May 25, 1939. NSMT-P 7102, 168.5 mm, Suruga Bay, September 16-20, 1968. BSKU 29582, 32532, 190 mm, 170.8 mm, Okinawa Trough (25° 47.5′N, 124° 30.7′E), 550-500 m in depth, September 15, 1979.

Diagnosis: A species of *Chascanopsetta* with the lower jaw projecting about 1/5 to 1/7 of its whole length; upper jaw 1.00-1.02 in head length, lower jaw 0.78-0.81 (Figs. 6, 7); scales in lateral line 185-215; 2-4 vestigial gill rakers (Fig. 5).

Description: Dorsal fin rays 124-133 (133 in holotype); anal fin rays 86-93 (93); pectoral fin rays 15-17 (17) on ocular side, 15-16 (15) on blind side; scales in lateral line 185-196 (195); gill rakers on first arch 0+2-4 (0+3); vertebrae 17-18+42-44=59-61 (17+44=61).

Head 4.8-5.51 (4.8) in SL; depth 3.75-3.93 (3.77). Snout 5.01-5.1 (5.04) in head length; upper eye diameter 3.11-3.59 (3.59); lower eye diameter 3.31-3.56 (3.56); interorbital width 12.5-13.5 (12.5); upper jaw 1.00-1.02 (1.01) on ocular side, 1.00-1.05 (1.0) on blind side; lower jaw 0.78-0.81 (0.79) on ocular side, 0.78-0.83 (0.78) on blind side; depth of caudal peduncle 3.53-5.19 (5.19); curve width of lateral line 1.39-1.65 (1.65); longest dorsal ray 1.78-2.56 (2.56); longest anal ray 1.72-2.49 (2.49); middle caudal fin ray 1.15-1.28 (1.2); pectoral fin 1.18-1.53 (1.53) on ocular side, 2.13-2.88 (2.88) on blind side; pelvic fin 2.91-3.67 (3.67) on ocular

side, 2.99-3.67 (3.67) on blind side.

Body elongate, strongly compressed and flexible, highest at posterior corner of mandible and evenly decreasing backward in depth (except for abdominal cavity). Body depth a little deeper than 1/4 of SL. Caudal peduncle very narrow, about 1/5 to 1/7 depth of body.

Head small, about equal to 2/3 depth of body; upper profile with a deep concavity in front of interorbital space, and rather steeply rising before upper eye. Snout blunt and short, much shorter than eye diameter. Eyes rather large, separated by a narrow concave space, its width about 1/3 to 1/5 of eye diameter; both eyes about at same vertical or upper eye slightly before the lower. Nostrils on ocular side located in front of upper margin of lower eye, anterior one tubular with a rather long flap posteriorly, posterior one not tubular without flap; nostrils on blind side setting below origin of dorsal fin, anterior tubular with a slight flap, posterior not tubular without flap.

Mouth oblique, extremely large, about equally developed on each side; maxillary slender and slightly curved, extending far beyond posterior margin of lower eye, the vertical line through middle of maxillary just below posterior margin of lower eye, upper jaw about as long as or a little shorter than head. Lower jaw longer than head, its tip projecting well beyond tip of the upper when mouth closed, its projecting length beyond the upper about equal to 1/5 of the whole length. Mandibular membrane very thin and voluminous, forming a distinct gular pouch (Fig. 8, E). Dentition about equally developed on both sides; teeth uniserial in both jaws, small, slender, curved inward and depressible, no distinct canines; those on upper jaw evenly decreasing in size to posterior part; teeth on lower jaw stronger than those on upper jaw. Gill rakers on first arch rudimentary, none on upper limb (Fig. 5, E). Scales very small and deciduous, cycloid on both sides; fins except for caudal fin, jaws, snout and interorbital area naked. Lateral line equally developed on both sides of body, with a very low, flat-topped curve above upper gill opening, its height 4.5-6.2 in the width.

Dorsal fin starting slightly on blind side, before horizontal line through interorbital region, some anterior rays slightly elongated, more or less stronger, and their distal 1/2 to 2/3 free from fin membrane; all rays simple. Anal fin starting below base of pectoral fin, and first ray connecting to last pelvic fin on ocular side by a low membrane; anterior rays not elongated, and all rays simple. Pectoral fin very asymmetrical, slender, that on ocular side a little longer than or as long as 2 times of that on blind side. Pelvic fin on ocular side inserted below and backward from tip of isthmus, first ray on blind side opposite to space between second and third rays, or to third ray on ocular side. Caudal fin slender, rather long, its length about 3 times of depth of caudal peduncle; inner 13 rays branched. Tip of interhaemal spine not projecting, but visible just after pelvic fin on blind side.

Vent opens on blind side, between last pelvic ray and origin of anal fin. Genital papilla on opposite side of vent.

In alcohol, general ground color on ocular side of body pale brownish or pale grayish without markings, peritoneum dark blue with narrow pale brownish bands; vertical fins and paired fins on ocular side dusky, anterior dorsal rays more or less pale.

Distribution: Sagami Bay, Okinawa Trough, Maldive area, 494-550 m in

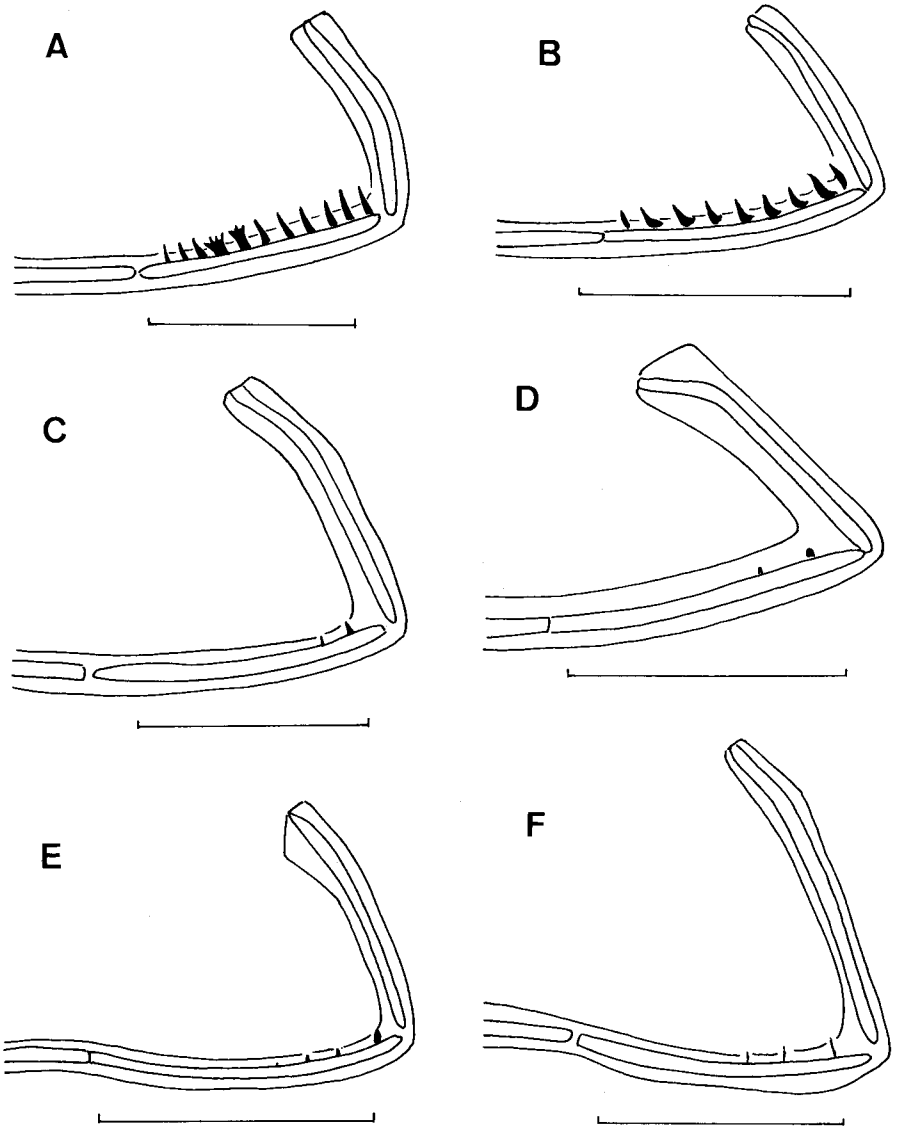

Fig. 5. Gill rakers on the first arch of *Chascanopsetta* species and subspecies. A, *C. prorigera*; B, *C. microgrnathus*; C. *C. lugubris danae*; D, *C. lugubris lugubris*; E, *C. prognathus*; F, *C. crumenalis*. Each scale indicates 10 mm.

depth.

Remarks: The three specimens collected from Japan and its adjacent waters were compared with the holotype of *C. prognathus* Norman, 1939 from the Maldive area, Indian Ocean. They agree well with the holotype in projecting degree of the lower jaw, lengths of upper and lower jaws, rather large numbers of meristic characters and condition of mandibular membranes (Table 3), but they are clearly distinct from *C. lugubris* by the above characters.

Table 3. Comparison between *C. prognathus* Norman and *C. normani* Kuronuma.

Species	*C. prognathus*		*C. normani*	
Specimens	holotype	3 present specimens	holotype*	cotype*
Standard length	174.3	168.5-190.0	179.0	157.5
In SL:				
Head length	4.8	5.42-5.57	5.62	5.18
Body depth	3.77	3.75-3.93	3.47	3.80
In head length:				
Upper eye	3.59	3.11-3.48	3.96	3.78
Snout	5.04	5.01-5.10	4.14	4.02
Upper jaw	1.01	1.00-1.02	1.08	1.21
Lower jaw	0.79	0.78-0.81	0.87	0.97
Dorsal fin rays	133	124-129	124	123
Anal fin rays	93	86-90	86	88
Pectoral fin rays	17	15-16	16	15
Scales in lateral line	195	185-196	207	215
Gill rakers	0+3	0+2-4	—	—
Vertebrae	17+44=61	17-18+42-43 =59-60	16+42=58	17+41=58

Asterisks marking specimens cited from data in the original description

On the other hand, *C. normani* described by Kuronuma (1940) on the basis of two specimens from Heta, Sagami Bay was synonymized with *C. lugubris* by Amaoka (1969). However, these present specimens of *C. prognathus* agree well with the description of the holotype of *C. normani* Kuronuma, 1940, but not with the cotype of *C. normani* which has rather short upper and lower jaws (Table 3). It, therefore, was thought that the holotype of *C. normani* is a synonym of *C. prognathus*, but the cotype is of *C. lugubris*.

This species also is closely related to *C. crumenalis* (Gilbert and Cramer, 1897) in having the tip of the lower jaw projecting well beyond that of the upper jaw, large mouth, both jaws long, and a thin mandibular membrane forming a gular poach (Fig. 8, E). Though Norman (1939) noted that the present species lacks a gular poach, the mandibular membrane of the this species could not be discriminated from that of *C. crumenalis* in form, although it differed in size. This species is intermediate between *C. lugubris* and *C. crumenalis* in developmental degree of the mandibular membrane (Fig. 8) and in length of the lower jaw (Figs. 6, 7). The mandibular membranes of these species are different from other species of this genus having a rather thick membrane.

Chascanopsetta crumenalis (Gilbert et Cramer, 1897)
Fig. 4, B

Pelecanichthys crumenalis Gilbert and Cramer, 1897: 433, pl. 47 (original description, type locality: Kaiwi Channel, Hawaiian waters). Jordan and Ever-

mann, 1905: 510, fig. 226 (description). Gilbert, 1905: 690 (note). Fowler, 1928: 93 (short description). Norman, 1934: 252, fig. 193 (short description, distribution). Gosline and Brock, 1960: 148, 149 (key, note). Tinker, 1978: 454, 2 figs. (note, distribution).

Material: USNM 48738 (holotype), 211.3 mm in SL, SU-CAS 4933 (paratype), 177.2 mm in SL, Kaiwi Channel, Hawaiian waters, December, 1891. HUMZ 99788, 99789, 231.1 mm, 195.5 mm, central Pacific (19° 56.9′N, 155° 00.3′W), 379 m in depth, February 7, 1983.

Diagnosis: A species of *Chascanopsetta* with the lower jaw projecting about 1/3-1/4 of its whole length; upper jaw 0.92-0.95 in head length, lower jaw 0.65-0.77 (Figs. 6, 7); 1-3 slender gill rakers (Fig. 5).

Description: Dorsal fin rays 121-122 (122 in holotype); anal fin rays 84-86 (86); pectoral fin rays 14-17 (14) on ocular side, 13-17 (13) on blind side; scales in lateral line 209-241 (241); gill rakers on first arch 0+1-3 (0+1); vertebrae 17+40=57 (17+40=57).

Head 4.4-5.1 (4.81) in SL; depth 3.45-4.14 (3.58). Snout 4.63-5.55 (4.99) in head length; upper eye diameter 3.51-3.91 (3.6); lower eye diameter 3.48-3.75 (3.6); interorbital width 14.5-18.2 (14.6); upper jaw 0.92-0.95 (0.92) on ocular side, 0.91-0.95 (0.91) on blind side; lower jaw 0.65-0.77 (0.65) on ocular side, 0.63-0.74 (0.64) on blind side; depth of caudal peduncle 3.46-3.95 (3.46); curve width of lateral line 1.32-1.74 (1.68); longest dorsal ray 2.45-2.76 (2.45); longest anal ray 2.44-2.78 (2.44); middle caudal fin ray 1.37-1.63; pectoral fin 1.54-1.80 (-) on

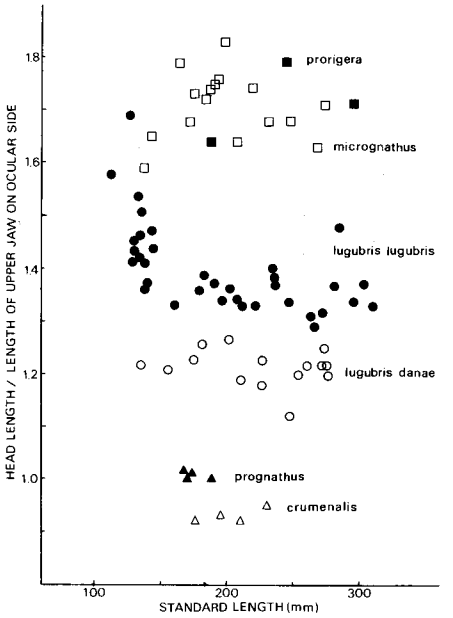

Fig. 6. Relation of ratio of lower jaw length in head length to SL in *Chascanopsetta* species and subspecies.

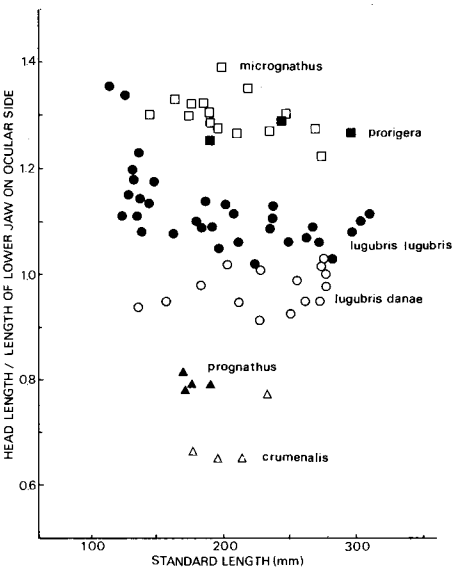

Fig. 7. Relation of ratio of upper jaw length in head to SL in *Chascanopsetta* species and subspecies.

ocular side, 3.1–5.16 (5.16) on blind side; pelvic fin 2.44–3.61 (2.44) on ocular side, 2.44–3.48 (2.44) on blind side.

Body elongate, elliptical, extremely thin, highest at posterior end of mandible, and gently decreasing backward in depth; body depth much deeper than 1/4 of SL.

Head rather large, about 1.2–1.3 in body depth; upper profile with a slight concavity in front of lower margin of upper eye, and gently arched above eye. Snout blunt and rather long, shorter than eye diameter. Eyes rather large, separated by a narrow, concave space, its width about 1/4 of eye diameter; both eyes about at same vertical line. Nostrils on ocular side in front of interorbital region, anterior one tubular with a flap posteriorly, posterior one not tubular without flap; nostrils on blind side below origin of dorsal fin, anterior tubular with a short flap, posterior not tubular without flap.

Mouth oblique, extremely large, about equally developed on each side; maxillary feeble and slender, and slightly curved, extending far beyond posterior margin of lower eye, the vertical line through anterior 1/3 of maxillary just below posterior margin of lower pupil, upper jaw a little longer than head. Lower jaw much longer than head, its tip projecting well beyond tip of the upper when mouth closed, the portion decurved and falciform, its length beyond the upper about equal to 1/4 of the whole length; retroarticular well projecting backward, forming a slender process, its posterior tip extending to middle of pelvic fin base. Mandibular membranes very thin and voluminous, forming a distinct gular poach (Fig. 8, F). Dentition about equally developed on both jaws; teeth on both jaws small, slender, depressible and curved inward, and in uniserial or irregularly biserial in places, those on inner row larger than those on outer row; teeth on upper jaw slightly smaller than those on lower jaw; posterior 1/3 of both jaws toothless. Gill rakers on first arch rudimentary or almost absent, none on upper limb (Fig. 5, F). Scales fine, cycloid on both sides, fins except for caudal fin, jaws, snout, interorbital area and small triangular area below lower eye naked. Lateral line equally developed on both sides of body with a curve above upper gill opening, anterior portion of curve very low and gradually increasing height to posterior, its highest height about 6.5–7.0 in width.

Dorsal fin starting slightly toward blind side, above nostrils on blind side, some anterior rays slightly longer and more or less stronger than nearby others; these anterior rays free from fin membrane except for basal portion; other rays slender and long; all rays simple. Anal fin starting below slightly in rear of base of pectoral fin, and first ray connecting to base of last pelvic fin on ocular side by a low membrane running along ventral margin of body; all rays simple. Pectoral fins asymmetrical, slender, that on ocular side longer than 2 times of that on blind side; all rays simple. Pelvic fins mostly covered by posterior corners of mandibulars, that on ocular side inserted at near tip of isthmus, first ray on blind side opposite to third ray on ocular side. Caudal fin slender, upper and lower 2 rays simple. Tip of first interhaemal spine projecting just behind pelvic fin on blind side.

Vent opens on blind side, on space between last pelvic ray and first anal ray. Genital papilla opposite side to vent.

In alcohol, general ground color on ocular side of body yellowish brown without marking (holotype) and with traces of five or six rows of round brown spots (paratype); peritoneum dark blue with narrow yellowish brown bands. Tip of

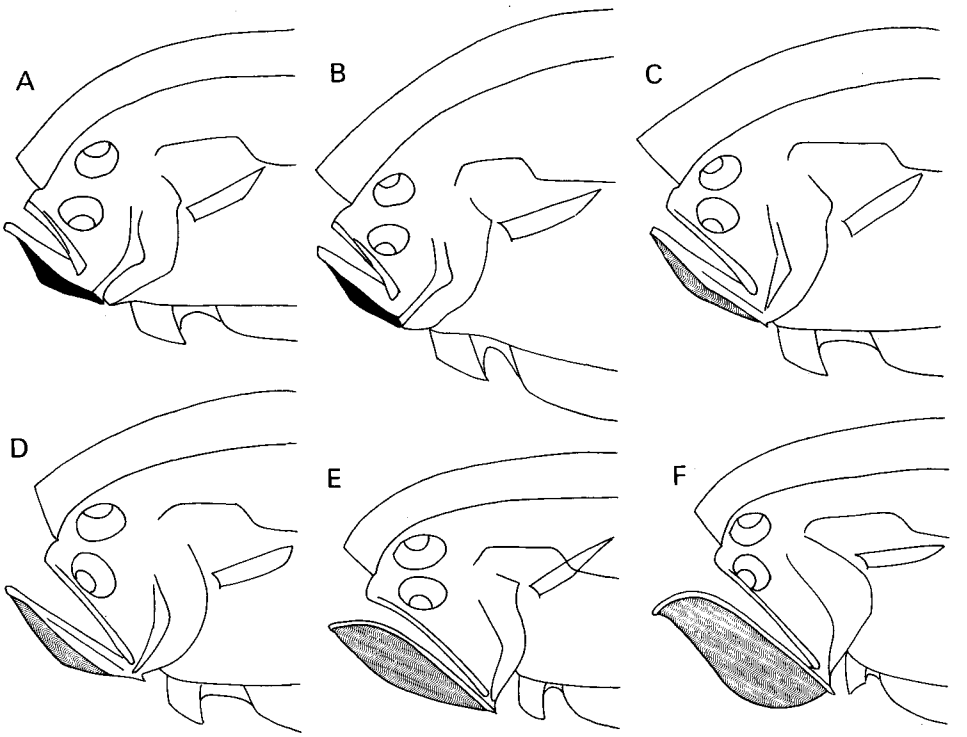

Fig. 8. Diagnostic characters of mouth in *Chascanopsetta* species and subspecies. A, *C. prorigera*; B, *C. micrognathus*; C, *C. lugubris lugubris*; D, *C. lugubris danae*; E, *C. prognathus*; F, *C. crumenalis*. Black area showing dilated bony lamella; wavy lines showing mandibular membrane.

lower jaw dark. Vertical fins dusky.

Distribution: Only Hawaiian waters, 443-640 m in depth.

Remarks: The present species is closely related to *C. prognathus* in having the lower jaw projecting far beyond the upper, mandibular membranes forming gular poach, and retroarticular portion extending backward to the pelvic fin. But it differs from the latter in the developmental degree of these characters and in the small number of the meristic characters.

It reaches the most specialized level in mouth characters among three closely related species (four types) of this genus. *C. lugubris* has the lower jaw slightly or not projecting beyond the upper and no gular poach (two subspecies), while *C. prognathus* has a fairly projecting lower jaw, forming a gular poach, and *C. crumenalis* has the most projecting lower jaw and a well-developed gular poach (Fig. 8, C-F).

Acknowledgments

We wish to thank J.T. Moyer, Tatsuo Tanaka Memorial Biological Station for his critical review of the manuscript, and the following persons for the loan of

holotypes or specimens: R. Arai, National Science Museum, Tokyo; D.M. Cohen, Los Angeles County Museum; W.N. Eshmeyer, California Academy of Sciences; R. H. Gibbs, Jr., U. S. National Museum; T. Iwai, Kyoto Univeristy; T. Iwamoto, California Academy of Sciences; L. Knapp, Smithsonian Institution, Oceanographic Sorting Center; K. Matsuura, National Science Museum, Tokyo; I. Nakamura, Kyoto University; J. Nielsen, Zoological Museum, Copenhagen; O. Okamura, Kochi University; R.H. Rosenblatt, Scripps Institution of Oceanography; R.J. Schwartz, University of North Carolina; T. Senta, Nagasaki University Nomo Marine Station; A.C. Wheeler, British Museum (Natural History). We are also grateful to T. Sato, Japan Marine Resources Research Center, K. Abe, Hokkaido Fisheries Experimental Station at Wakkanai, and to persons of T.S. Hokusei Maru of Hokkaido University, and the fishing boats 85th Chiyoki Maru, 53rd Shin-ei Maru and 2nd Kyoyo Maru, for supplying us with specimens.

References

Alcock, A. (1894). An account of a recent collection of bathybial fishes from the Bay of Bengal and from the Laccadive Sea. *Jour. Asiat. Soc. Bengal, Part 2*, **63** (2), 115-137, pls. 6-7, figs. 1-6.

Alcock, A. (1899). *A Descriptive Catalogue of the Indian Deep-sea Fishes in the Indian Museum. Being a Revised Account of the Deep-sea Fishes Obtained by the Royal Indian Marine Survey Ship Investigator*. iii+211 pp. Culcutta.

Amaoka, K. (1969). Studies on the sinistral flounders found in the waters around Japan. -Taxonomy, anatomy and phylogeny-. *Jour. Shimonoseki Univ. Fish.*, **18** (2), 65-340, figs. 1-131.

Amaoka, K. (1971). Studies on the larvae and juveniles of the sinistral flounders -II. *Chascanopsetta lugubris*. *Japan. J. Ichthyol.*, **18** (1), 25-32, figs. 1-3.

Amaoka, K. (1982). Bothidae. pp. 296-299. In Okamura, O., K. Amaoka and F. Mitani (ed.), *Fishes of the Kyushu-Palau Ridge and Tosa Bay*. 435 pp., 222 pls. Japan Fisheries Resource Conservation Association, Tokyo.

Barnard, K.H. (1925-1927). A monograph of the marine fishes of South Africa. *Ann. S. Africa Mus.*, **21**, 1-1065, pls. 1-37.

Brauer, A. (1906). Die Tiefseefische. I. Systematischer Teil. *Wiss. Ergebn.* "Valdivia", **15** (1), 1-432, figs. 1-176, pls. 1-18.

Bruun, A.F. (1937). *Chascanopsetta* in the Atlantic, a bathypelagic occurrence of a flatfish. *Vidensk. Medd. Dansk Naturh. Foren. Kbhvn.*, **101**, 125-135, fig. 1, pl. 1.

Chen, J.T.F. and H.T.C. Weng. (1965). A review of the flatfishes of Taiwan. *Dept. Biol., College of Sci., Tunghai Univ., Biol. Bull. 25* and *27, Ichthyol. Ser.*, (5), 1-103, figs 1-72.

Deubler, E.E. Jr. and W.F. Rathjen. (1958). Records of the flounder, *Chascanopsetta lugubris* Alcock, from the western Atlantic. *Copeia* **1958** (2), 132-133.

Fowler, H.W. (1928). The fishes of oceania. *Mem. Bernice P. Bishop Mus.*, **10**, i-iii+1-540, figs. 1-82, pls. 1-49.

Franz, V. (1910). Die japonischen Knochenfische der Sammlungen Haberer und Doflein. In Beiträge zur Naturgeschichte Ostasiens. Abhandlungen der math-phys. *Klasse der K. Bayer Akad. der Wiss., 4, Suppl. -Bd.* **1**, 1-135, figs. 1-7, pls. 1-11.

Gilbert, C.H. (1905). The aquatic resources of the Hawaiian Islands. Section II. -The deep-sea fishes. *Bull. U. S. Fish Comm. for 1903*, **23** (2), i-xi+575-713, figs. 230-276, pls. 66-101.

Gilbert, C.H. and F. Cramer. (1879). Report on the fishes dredged in deep water near the Hawaiian Islands, with descriptions and figures of twenty-three new species. *Proc. U. S. Nat. Mus.*, **19** (1114), 403-435, pls. 36-48.

Gosline, W.A. and V.E. Brock. (1960). *Handbook of Hawaiian Fishes*. 372 pp., 277 figs. Univ. of Hawaii Press, Honolulu.

Hubbs, C.L. (1915). Flounders and soles from Japan collected by the United States Bureau of Fisheries steamer "Albatross" in 1906. *Proc. U.S. Nat. Mus.*, **48** (2082), 449-496, pls. 25-27.

Hubbs, C.L. and K.F. Lagler. (1974). *Fishes of the Great Lakes Region.* i-xv+1-213 pp., 251 figs., 44 pls. Univ. Michigan Press, Michigan.

Jordan D.S. and B.W. Evermann. (1905). The aquatic resources of the Hawaiian Islands. Part I, The shore fishes. *Bull. U.S. Fish Comm. for 1903*, **23** (1), i-xxviii+1-574, figs. 1-299, pls. 1-65, color pls. 1-73.

Jordan, D.S. and A. Seale. (1906). The fishes of Samoa. Description of the species found in the archipelago, with a provisional check-list of the fishes of Oceania. *Bull. U. S. Bur. Fisher.*, **25** (1905), 173-455, figs. 1-3, pls. 33-53.

Jordan, D.S., S. Tanaka and J.O. Snyder. (1913). A catalogue of the fishes of Japan. *Jour. Coll. Sci., Imp. Univ. Tokyo*, **33** (1), 1-497, figs. 1-396.

Kamohara, T. (1931). Fishes in the vicinity of Kochi-City. *Zool. Mag.*, **43** (508, 509), 79-95. (in Japanese).

Kamohara, T. (1934). On the deep-sea fishes of Province Tosa. *Botany and Zoology*, **2** (7), 1196-1202. (in Japanese).

Kamohara, T. (1950). *Description of the Fishes from the Province of Tosa and Kishu, Japan.* 4+288+46+26 pp., 220 figs. Kochi Insatsu Co., Kochi. (in Japanese).

Kamohara, T. (1958). A catalogue of fishes of Kochi Prefecture (Province Tosa), Japan. *Rep. Usa Mar. Biol. St.*, **5** (1), 1-76.

Kamohara, T. (1964). Revised catalogue of fishes of Kochi Prefecture, Japan. *Ibid.*, **11** (1), 1-99, figs. 1-63.

Kuronuma, K. (1940). The heterosomate fishes collected in deep waters of Japan. *Bull. Biogeogr. Soc. Japan*, **10** (3), 29-61, figs. 1-7.

Matsubara, K. (1955). *Fish Morphology and Hierarchy.* Part II, v+816 pp., 247 figs. Ishizaki Shoten, Tokyo. (in Japanese).

Nielsen, J. (1961 a). Psettodoidea and Pleuronectoidea (Pisces, Heterosomata). *Atlantide Rep.*, (6), 101-127, figs 1-8, pl. 1.

Nielsen, J. (1961 b). Heterosomata (Pisces). *Galathea Rept.*, **4**, 219-226, figs. 1-3, pl. 1.

Norman, J.R. (1931). Notes on flatfishes (Heterosomata). -III. Collection from China, Japan, and the Hawaiian Islands. *Ann. Mag. Nat. Hist.*, (10) **8**, 597-604.

Norman, J.R. (1934). A systematic monograph of the flatfish (Heterosomata). 1. Psettodidae, Bothidae, Pleuronectidae. *Brit. Mus.*,1-459, figs. 1-317.

Norman, J.R. (1939). Fishes. John Murray Expedition, 1933-34. *Sci. Rep., Brit. Mus. (Nat. Hist.)*, **7** (1), 1-116, figs. 1-41.

Okada, Y. and K. Matsubara. (1938). *Key to the Fishes and Fishlike Animals of Japan, Including Kurile Islands, Southern Sakhalin, Bonin Islands, Ryukyu Islands, Korea and Formosa.* xl+584 pp., 113 pls. Sanseido Co., Tokyo and Osaka. (in Japanese).

Poll, M. (1959). Poissons V. -Teleosteens Acanthopterygiens. *Exp. Oceanogr. Belge Eaux Cot. Afr. Atl. sud. (1948-1949)*, **4** (3b), 1-417, figs. 1-127, pls. 1-7.

Shen, S.C. (1967). Studies on the flatfishes (Pleuronectiformes or Heterosomata) in the adjacent waters of Hong Kong. *Quart. Jour. Taiwan Mus.*, **20** (1, 2), 149-281, figs. 1-160.

Smith, J.L.B. (1949). *The Fishes of Southern Africa.* xvi+550 pp., 105 pls. Central New Agency, Cape Town.

Tinker, S.W. (1978). *Fishes of Hawaii. A handbook of the marine fishes of Hawaii and the Central Pacific Ocean.* xxxx+532+xxxvi pp., many figs., 16 pls. Hawaiian Service, Inc., Hawaii.

Von Bonde, C. (1922). The heterosomata (flat fishes) collected by the S.S. "Pickle". *Rep. Fish. Mar. Biol. Surv. S. Afr., 2, Spec. Rep.*, **2**, 3-29, pls. 1-6.