

A Revision of the Holocentrid Fish Genus *Ostichthys*, with Descriptions of Four New Species and a Related New Genus

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(Received July 23, 1981)

Abstract The genera of the Myripristinae consist of *Myripristis*, *Ostichthys*, *Plectrypops*, *Corniger*, and a new monotypic genus, *Pristilepis*, which is proposed for the soldierfish first described as *Holotrachys oligolepis* by Whitley (1941). This genus is distinguished from the other genera principally by having well-developed nasal bones as adults which extend anteriorly to the median upper lip (believed to be a neotenic character), a long narrow premaxillary groove, 29 vertebrae, and the vomerine teeth in a subtriangular to elliptical patch. *P. oligolepis* is known from Western Australia, Lord Howe Island, Easter Island, Hawaii, Japan and Réunion, thus appearing to be antitropical in its distribution. The following species of *Ostichthys* are recognized: *O. japonicus* (Cuvier) (*Holotrachys major* Whitley appears to be a junior synonym), the type species, known from the western Pacific and Andaman Sea; *O. acanthorhinus*, a new species from the Gulf of Oman, Arabian Sea, and Bali Is., distinctive in having a sharp spine anteriorly on each nasal bone and a high gill-raker count of $10 \sim 12 + 16 \sim 18$; *O. sandix*, a new species from the Hawaiian Islands similar to the preceding two in possessing $3 \frac{1}{2}$ scales above the lateral line, but differing from *O. japonicus* in having 15 or 16 lower-limb gill rakers (*O. japonicus* has $12 \sim 14$) and the last two dorsal spines about equal in length (last spine is longer in *O. japonicus*); *O. hypsipterygion*, a new species from Japan related to *O. sandix*, differing in having a higher spinous dorsal fin, 13 lower-limb gill rakers, and 15 pectoral rays; *O. kaianus* (Günther) (*Myripristis guezeti* Postel is a junior synonym) from the western Pacific and Indian Oceans; *O. archiepiscopus* (Valenciennes) (*Myripristis pillwaxii* Steindachner is a junior synonym) from Hawaii, Japan and Réunion (hence antitropical); *O. delta*, a new species from Réunion and Samoa, unique in having XI dorsal spines; and *O. trachypoma* (Günther) (*Myripristis fulgens* Poey is a junior synonym) from the western Atlantic. Keys are given to the genera of the Myripristinae and the species of *Ostichthys*.

The family Holocentridae was divided into two distinctive subfamilies, the Holocentrinae (squirrelfishes) and the Myripristinae (soldierfishes) by Nelson (1955) on the basis of the structure of the swim bladder and auditory bullae. Externally the two subfamilies are readily distinguished by the different shape of the body and fins (body more ovate in the Myripristinae, the third anal spine shorter) and by the presence of a long stout spine at the angle of the preopercle of the Holocentrinae (lacking in the Myripristinae except for *Corniger* and to a slight degree on some *Ostichthys*).

From a study of recent and fossil otoliths, Frizzell and Lamber (1961) concluded that the differences between these two groups, and their independent evolution since at least Middle Eocene time, are sufficient to warrant elevating

them to family rank. However, recent authors, such as Woods and Sonoda (1973), have maintained them as subfamilies.

During the course of our study of the soldierfishes, we became aware of taxonomic problems at both the generic and specific levels. The largest and most difficult genus, *Myripristis*, was ably revised by Greenfield (1974) and modified by Randall and Guézé (1981).

From the literature the remaining genera of the subfamily are: *Corniger* Agassiz, with a single Atlantic species, *C. spinosus* Agassiz; the related *Plectrypops* Gill (*Holotrachys* Günther, placed in synonymy by Lamber, 1963), with one Atlantic and one Indo-Pacific species; and *Ostichthys* Cuvier, with one Atlantic and an uncertain number of Indo-Pacific species.

Some confusion has arisen from the use of

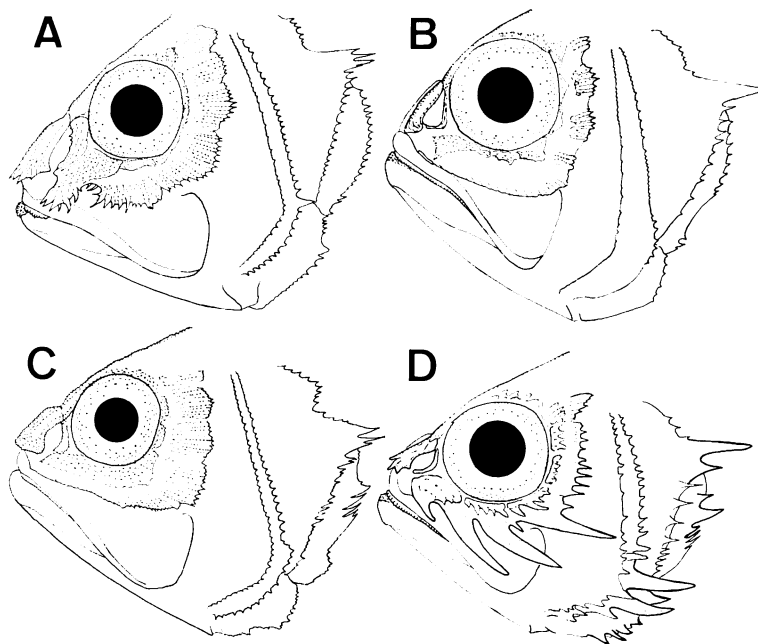


Fig. 1. Side view of heads of four genera to show the shape of the nasal bone and serrations and/or spinations of the suborbital bones and opercular bones. A: *Pristilepis oligolepis*. B: *Ostichthys japonicus*. C: *Plectrypops lima*. D: *Corniger spinosus*. Drawing by T. Shimizu.

Myripristis for species of *Ostichthys*, and occasionally vice versa as by Ogilby (1908) who described *O. spiniceps* (= *M. hexagonus*, Randall and Guézé, 1981) from the Great Barrier Reef, Whitley (1940), and Munro (1967) who placed four of six species of *Myripristis* from New Guinea in *Ostichthys*.

Steindachner (1902) described *Beanea trivittata* as a new genus and species from the Red

Sea and suggested an affinity with *Myripristis*. Norman (1957) included *Beanea* as a valid genus of the Holocentridae. The following characters were reported for this fish: pelvic rays I, 5; dorsal rays VII–I, 9; anal rays IV, 8; pectoral rays 14; lateral-line scales 25; branchiostegal rays 7; smooth body scales below lateral line; and three dark brown stripes on head and body. The fish was noted to live among the spines of the sea urchin *Diadema*. With the exception of IV anal spines (which we suspect is an error) these characters fit the Apogonidae, not the Holocentridae. *Beanea* appears to represent an earlier name for *Siphamia* Weber. We asked Dr. Rainer Hacker of the Naturhistorisches Museum in Vienna to examine the type of *Beanea trivittata* for us. He reported that he was unable to locate this fish.

The second and third authors commenced a study of Japanese species of *Ostichthys*, but soon realized they had to investigate the genus on a world-wide basis. The first author became interested in the genus when he found three different species in Hawaii, whereas only one, identified as *O. japonicus* (Cuvier) by Gosline and Brock (1960), was then known from these islands.

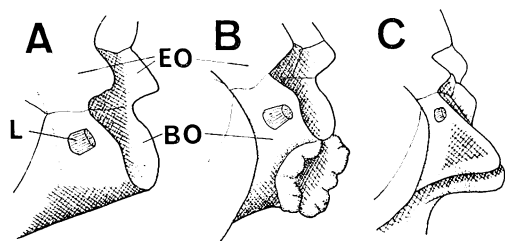


Fig. 2. Posteroventral view of basioccipital. A: *Pristilepis* and *Plectrypops*, without protuberance. B: *Ostichthys japonicus*, with crown-like protuberance. C: *Corniger*, with a deep groove. BO, basioccipital; EO, exoccipital; L, Baudelot's ligament. Drawing by T. Shimizu.

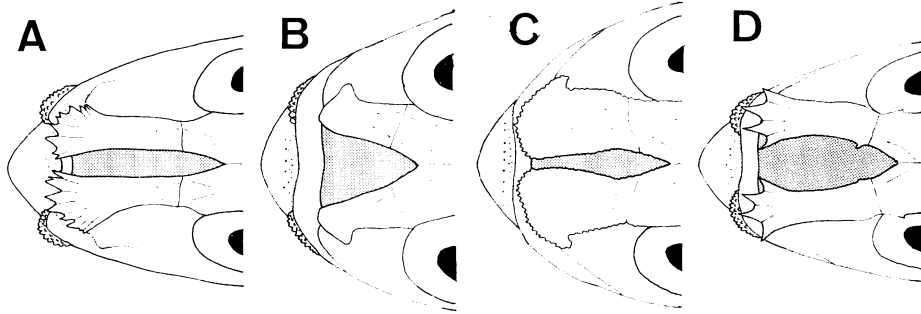


Fig. 3. Top view of heads of four genera to show the shape of premaxillary groove (dotted area). A: *Pristilepis oligolepis*. B: *Ostichthys japonicus*. C: *Plectrypops lima*. D: *Corniger spinosus*. Drawing by T. Shimizu.

Further study by us revealed that none of the three Hawaiian species is *O. japonicus*, and one could not remain tained in *Ostichthys* (assigned here to *Pristilepis*, gen. nov.).

The divergent species was first described as *Holotrachys oligolepis* by Whitley (1941); it has usually been misidentified as *Ostichthys japonicus* (Cuvier) or *O. pillwaxii* (Steindachner). The nasal and lachrymal (first suborbital) bones of this fish are very different in shape from those of *Ostichthys* (see Fig. 1A, B). The basioccipital lacks a protuberance (present on *Ostichthys*, *Myripristis*, and *Corniger*, see Fig. 2A, B, C), and the median dorsal gap for the ascending process of the premaxilla (henceforth called premaxillary groove) is long and narrow (Fig. 3A) instead of broad and V-shaped as in *Ostichthys* (Fig. 3B) or rhomboidal as in *Plectrypops* (Fig. 3C). Furthermore, this fish has 29 vertebrae in contrast to 26 for *Ostichthys* and *Myripristis* and 27 for *Corniger* and *Plectrypops*.

In the present paper we propose the generic name *Pristilepis* for this species and recognize a total of eight species of *Ostichthys*, four of which are described as new.

Materials and methods

Types and other specimens for this study have been examined at the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS, SU); Central Marine Fisheries Research Institute, Mandapam Camp, India (CMFRI); Department of Zoology, University of Hawaii, Honolulu (UH); Laboratory of

Marine Zoology, Faculty of Fisheries, Hokkaido University, Hakodate (HUMZ); Department of Biology, Faculty of Sciences, Kochi University, Kochi (BSKU); Biological Laboratory, Kochi Senior High School, Kochi (KSHS); Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Muséum National d'Histoire Naturelle, Paris (MNHN); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); U.S. National Museum of Natural History, Washington, D.C. (USNM); Department of Zoology, University Museum, University of Tokyo, Tokyo (ZUMT).

Loans of specimens have been received from the Australian Museum, Sydney (AMS); British Museum (Natural History), London [BM(NH)]; Field Museum of Natural History, Chicago (FMNH) and the School of Marine and Atmospheric Science, University of Miami (UMML).

Type specimens of the new species of *Ostichthys* have been deposited in the Bernice P. Bishop Museum, British Museum (Natural History), California Academy of Sciences, Field Museum of Natural History, J.L.B. Smith Institute of Ichthyology of Rhodes University (RUSI), National Science Museum, Tokyo (NSMT-P), University Museum of the University of Tokyo, and the U.S. National Museum of Natural History.

Counts of gill rakers were made on the first gill arch. The count of the rakers of the upper limb is given first, followed by the lower-limb count: the raker at the angle is included in the lower-limb count.

The scales dorsally on the body adjacent to the dorsal fin are about 1/2 to 3/4 the height of

the scales of the row below. In counting the rows of scales above the lateral line to the base of the spinous portion of the dorsal fin the uppermost row is recorded as 1/2.

When no method of length measurement is indicated, standard length (SL) is implied. This length was taken from the most anterior point of the snout (generally the lateral part of the upper jaw, as this is notably anterior to the medial part of the upper lip on these fishes, though on juveniles the front of the nasal bones may be most anterior) to the base of the caudal fin. Head and snout length measurements were also taken to the most anterior point of the snout. Care was taken to close mouths of specimens completely before making these measurements or adjusting for protruding upper jaws if the mouths could not be closed. The posterior point for head length measurements was the end of the opercular membrane, not the opercular spine, because there is too much variation in spine length. Upper jaw length was measured from the most posterior point of the maxilla to the middle of the front of the upper lip. Length of the caudal peduncle is the horizontal distance between rear base of anal fin and base of caudal fin. Caudal concavity is the horizontal distance between verticals at the distal ends of the longest and shortest caudal rays. Dorsal spines were measured to the edge of the uppermost scales of the back, not to the extreme base. Dorsal spines of *Pristilepis* and *Ostichthys* are significantly longer in smaller individuals; thus a difference in relative spine length may not be of significance unless specimens of equal or near-equal size are compared. Dorsal soft rays and anal spines and rays, on the other hand, were measured to the base of these elements (usually detectable when a bright light is transmitted from behind or by radiographs).

Vertebral counts were made by radiographs of adults. The rhynchichthys stage of all genera of this subfamily have an autogenous U_2 centrum, but it is fused in the adult except *Pristilepis* (ascertained by dissection of all genera). The autogenous U_2 in the adult *Pristilepis* is included in the vertebral count while the fused U_2 of other genera is excluded.

Proportional measurements in Table 3 are given as a percentage of the standard length. The most important of these measurements are

expressed in the text of descriptions as quotients of convenient larger value, rounded to the nearest 00.5.

In the descriptions of new species, the data in parenthesis apply to paratypes.

Key to the genera of the Myripristinae

- 1a. Dorsal spines XI; notch completely dividing dorsal fin to back between spines X and XI. Lower-limb gill rakers 19 to 32. Scales finely to moderately ctenoid..... *Myripristis*
- 1b. Dorsal spines XII (except one Indian Ocean species of *Ostichthys* with XI); dorsal fin continuous, though deeply notched between spinous and soft portions. Lower-limb gill rakers 11~18. Scales coarsely ctenoid...2
- 2a. Two greatly enlarged spines at corner of preopercle. First to third suborbital bones with enormous posteriorly-directed spines (Fig. 1D) *Corniger*
- 2b. No greatly enlarged spine at corner of preopercle. First to third suborbital bones without enormous posteriorly-directed spine...3
- 3a. Premaxillary groove broadly V-shaped (Fig. 3B) *Ostichthys*
- 3b. Premaxillary groove rhomboidal (Fig. 3A, C, D)4
- 4a. Lateral-line scales 28~30. First suborbital bone with a sharp spine overhanging upper jaw (Fig. 1A). A small toothpatch on medial face of premaxillary symphysis (Fig. 4) *Pristilepis*, gen. nov.
- 4b. Lateral-line scales 32~42. First suborbital bone without spine overhanging upper jaw (Fig. 1C). No toothpatch on medial face of premaxillary symphysis..... *Plectrypops*

Pristilepis gen. nov.

(New Japanese name: Yase-ebisu zoku)

Type-species: *Holotrachys oligolepis* Whitley, 1941.

Monotypic genus, represented by *P. oligolepis* (Whitley).

Diagnosis. Pelvic rays I, 7; dorsal rays XII, 14 or 15, the last spine the shortest and not closely applied to soft portion of fin; lateral-line scales 28~30; upper-limb gill rakers 6 to 8 (usually 6 or 7); vertebrae 11+18=29; basioccipital lacking a protuberance; premaxillary

groove long and narrow; the margins of the nasal bones parallel; nasal bones large, even in adults, the front projecting anterior to median part of upper lip when mouth is closed; lachrymal (first suborbital) well developed, projecting antero-ventrally beyond lower edge of maxilla, the margin with prominent spinules and a deep notch posteriorly; second to fourth suborbitals coarsely serrate but without spines; angle of preopercle of adults without a large spine; postorbital bones not large, their length 2.3~2.5 in orbit diameter of adults; a small tooth patch on medial face of upper jaw at symphysis (Fig. 4); vomerine teeth in a subtriangular to elliptical patch; depth of body 2.2~2.5 in SL.

See also the species description below.

Remarks. The rhynchichthys stage of the Myripristinae is characterized by a rostral projection of the nasal bones (see Fig. 15). These bones in adults of *Pristilepis oligolepis* still project anterior to the upper lip, suggesting a neotenic character. We believe the higher number of vertebrae and autogenous U₂ centrum of this genus is also primitive. *Pristilepis* may, therefore, be the most primitive of the recent genera of the subfamily.

Etymology. Named *Pristilepis* from the Latin for saw scale, in reference to the coarsely ctenoid scales of this fish.

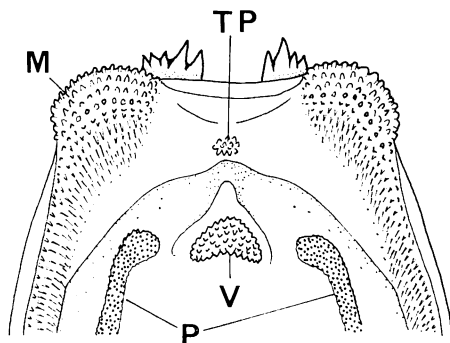


Fig. 4. Ventral view of palate of *Pristilepis oligolepis*. M, maxilla; P, palatine teeth; TP, tooth patch on medial face of upper jaw symphysis; V, vomerine teeth. Drawing by T. Shimizu.

***Pristilepis oligolepis* (Whitley)**

(Japanese name: Yase-ebisu)

(Figs. 1A, 2A, 3A, 4, 5, Pl. 1A, B)

Holotrachys oligolepis Whitley, 1941: 28, fig. 9 (type locality, between Cape Naturalist and Geraldton, Western Australia).

Description (proportional measurements based on 14 specimens 116~251 mm; see also generic diagnosis above). Dorsal rays XII, 14~15 (usually 15); anal rays IV, 11~12 (usually 11); pectoral rays 15~16 (usually 15), the upper two

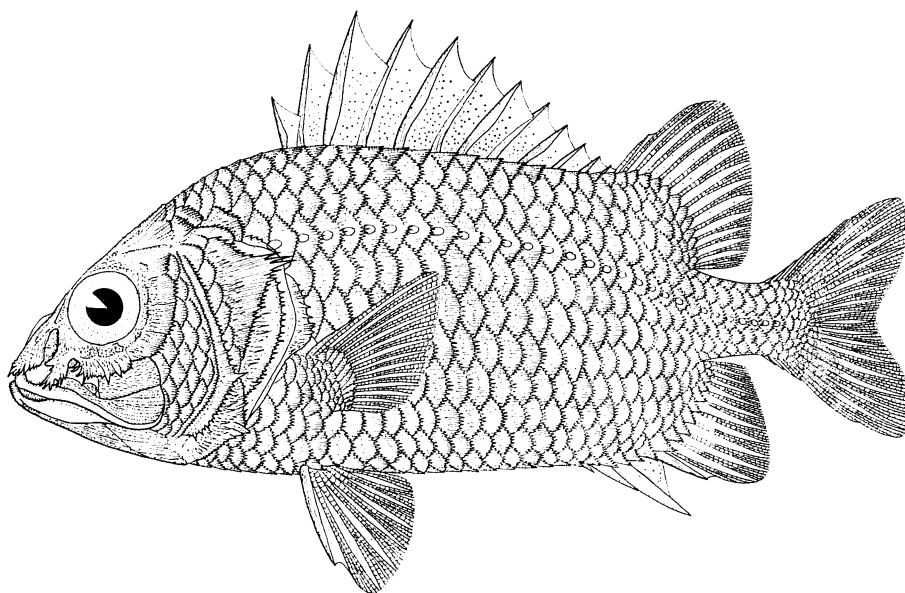


Fig. 5. Adult of *Pristilepis oligolepis*, BSKU 50003, 197.4 mm, Kochi, Japan. Drawing by T. Shimizu.

and lowermost unbranched; branched caudal rays 17; upper procurent caudal spines 4, lower 3; lateral-line scales 28~30; scales above lateral line 2 1/2; scales below lateral line 8; gill rakers 6~8+13~14; branchiostegal rays 8.

Body moderately deep, the depth 2.2~2.5 in SL and compressed, the width 1.95~2.4 in depth; head length (to end of opercular membrane, not opercular spine) 2.4~2.5 in SL; snout moderately short, 3.8~4.2 in head; eye large, the orbit diameter 3.05~4.1 in head; interorbital width narrow, 5.5~7.5 in head; least depth of caudal peduncle 4.3~4.75 in head.

Mouth large, lower jaw slightly projecting, gape diagonal, maxilla extending to or slightly beyond a vertical at hind edge of eye; upper jaw length 1.75~1.95 in head; teeth in villiform bands in jaws, bands broader and thicker anteriorly, symphysis of upper jaw with a broad toothless gap (except for a very small round interior medial patch) into which the anterior part of lower jaw fits; villiform teeth in a narrow band on palatines, anterior end of which curves abruptly a short distance medially; tongue edentate; gill rakers not long, the longest (usually at angle) slightly shorter than longest gill filaments on first arch (may be longer than gill filaments on juveniles).

External bones of head rugose, free margins of suborbital, postorbital, and opercular bones and lower edge of second to fourth branchiostegal rays with numerous spinules; one or a pair of enlarged spines of variable length posteriorly on opercle; corner of preopercle of adults with no enlarged spines (one or two spinules may be slightly enlarged); juveniles with a prominent spine at angle of preopercle.

Scales coarsely ctenoid, ctenii arising from strong ridges on posterior surface of scales; each scale of adults with 10 to 24 ctenii (fewer in juveniles); scales dorsally on head extending forward slightly anterior to a vertical at upper end of preopercle; preopercle with 4 diagonal rows of scales; base of opercle with a single row of scales; spinous portion of dorsal fin without scales; anal fin and soft portion of dorsal fin with a basal scaly sheath (scales not adhering to fins); caudal and pectoral fins with small scales basally; no scales in axil of pectoral fins; pelvic fins with a mid-ventral posterior projection from base of 2 moderately large scales, the more posterior one

somewhat pointed, with 3 small lateral scales.

Origin of dorsal fin above upper base of pectoral fins; third or fourth (usually the third) dorsal spines longest, 1.85~2.45 in head (relatively longer in smaller individuals; the longest spine of a 64 mm specimen 1.6 in head); last dorsal spine shortest and well separated from first dorsal ray; longest dorsal ray (third or fourth) 2.15~2.45 in head; origin of anal fin below base of last two dorsal spines; first anal spine very small; third anal spine longest and very stout, 2.4~2.9 in head; longest anal ray (second or third) 2.05~2.3 in head; caudal fin small, 1.9~2.15 in head, forked, caudal concavity 4.3~5.3 in head; pectoral fins slightly longer than pelvic fins, fourth or fifth rays the longest, 1.75~2.0 in head; origin of pelvic fins below base of pectoral fins, their length 1.85~2.2 in head.

Color in alcohol light brown, some specimens with a small whitish spot on each scale, opercular and fin membranes pale. Color in life bright red with a small white spot on each scale, thus forming longitudinal rows.

Remarks. This species has most often been misidentified as *Ostichthys japonicus* (as by Fowler, 1928, in part; Gosline and Brock, 1960, in part; and Randall, 1970) or *O. pillwaxii* (as by Masuda et al., 1975; Allen et al., 1976; and Tinker, 1978).

It is known from western Australia at a latitude of about 27°S, Japan from Sagami Bay southward, the Hawaiian Islands, Lord Howe Island, and Easter Island. Paul Guézé (personal communication) has collected it at Réunion. It is of interest to note that none of these localities is tropical; thus *P. oligolepis* may be antitropical in its distribution.

Masuda et al. (1975) reported that this species is occasionally caught in gill nets off Wakayama Prefecture at depths of about 50~100 m. Guézé's specimens from Réunion have also been taken mainly in gill nets; he has given us the depth range there of 100~200 m. Depth range extends 14 m to 220 m (see material examined).

Material examined. WESTERN AUSTRALIA: AMS E. 2479, 131.6 mm, holotype of *Holotrachys oligolepis*. LORD HOWE ISLANDS: BPBM 14857, 148.9 mm, from a bottom mainly of coral rubble in 46 m. EASTER ISLAND: BPBM 6603, 2: 231~251 mm, in 18.5 m on rocky bottom. HAWAIIAN IS-

LANDS: ANSP 86824, 116 mm, Honolulu; ANSP 90629, 2: 170~210 mm, Honolulu; BPBM 3701, 3: 203~241 mm, Honolulu; BPBM 8491, 174 mm, rotenone from a cave in 23 m, Moku Manu, Oahu; BPBM 10965, 202 mm, gill net in 92 m, Barber's Point, Oahu; BPBM 13960, 3: 59.8~86.6 mm, trawls, north of Oahu; BPBM 13986, 64 mm, south of Molokai; BPBM 22710, 127 mm, by a trap, Kaneohe Bay, Oahu; USNM 52746, 250 mm; UH 3052, 203 mm, Honolulu; SU 9810, 217 mm, Honolulu. JAPAN: BSKU 50003, 197.4 mm, Kochi fish market; FMNH 73568, 222 mm, Sagami Sea; FMNH 73569, 247 mm, Idzu Sea; KSHS 17566, 17567, 17570~17572 (caudal peduncle severed), 17573, 17575, 7: 157.7~252.1 mm, Arita, Kushimoto, Wakayama Pref.; KSHS 17568, 17569, 2: 162.1~208.3 mm, Cape Shionomisaki, Kushimoto; ZUMT 3743, 229.3 mm, Tokyo; ZUMT 4494, 202 mm, Tokyo fish market; ZUMT 24193, 223.6 mm, locality unknown.

Genus *Ostichthys* Jordan and Evermann

Ostichthys Jordan and Evermann, 1896: 846

(type species, *Myripristis japonicus* Cuvier in Cuvier and Valenciennes, 1829, by original designation; proposed as a subgenus).

Diagnosis. Pelvic rays I, 7; dorsal rays XI to XIII (usually XII), 12~14; last dorsal spine longer or shorter than penultimate spine; lateral-line scales 28~30; vertebrae 11+15=26; basioccipital with an odd crown-shaped protuberance; premaxillary groove V-shaped, broadly open anteriorly; nasal bones of adults not projecting anterior to median upper lip (except a small horizontal spine on *O. acanthorhinus*); lachrymal (first suborbital) not projecting below edge of maxilla; second to fourth suborbitals coarsely serrate but without spines; angle of preopercle of adults with or without a small stout spine; postorbital bones not large, their length contained about 2 to 3 times in orbit of adults; no small tooth patch on medial face of upper jaw at symphysis; villiform teeth in a V-shaped patch (apex of V anterior) on vomer (except for some specimens of *O. delta* with a near-triangular patch); depth of body 2.0~2.35 in SL.

Table 1. Counts of fin rays and lateral-line scales of species of *Pristilepis* and *Ostichthys*.

	Dorsal rays							Anal soft rays			Pectoral rays				Lateral-line scales			
	XI	XII	XIII	12	13	14	15	10	11	12	14	15	16	17	27	28	29	30
<i>P. oligolepis</i>		36				17	19		32	4		30	6			4	25	5
<i>O. acanthorhinus</i>		9	2		8	3		2	9				8	3		3	8	
<i>O. japonicus</i>		39	1	2	33	5		4	35	1			9	31		29	8	3
<i>O. hypsipterygion</i>		3			3				3			3				2	1	
<i>O. sandix</i>		5			5				5				4	1		5		
<i>O. delta</i>	5				4	1		4	1				2	3	4	1		
<i>O. kaianus</i>		27		1	26				27			1	25	1		19	7	1
<i>O. archiepiscopus</i>		13			5	7	1		12	1		13				1	8	4
<i>O. trachypoma</i>		40		2	36	2		3	34	3	2	36	2			6	31	3

Table 2. Counts of the gill rakers of species of *Pristilepis* and *Ostichthys*.

	Upper limb						Lower limb								Total											
	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>P. oligolepis</i>	6	13	1					12	8						3	11	6									
<i>O. acanthorhinus</i>					3	7	1					1	6	4								1	2	4	3	1
<i>O. japonicus</i>		3	31	5	1			4	25	11						6	20	12	2							
<i>O. hypsipterygion</i>			3					3									3									
<i>O. sandix</i>		1	1	3						4	1							1	1	2	1					
<i>O. delta</i>		3	1					3	1							3		1								
<i>O. kaianus</i>		1	6	20					13	12	2						1	5	9	10	2					
<i>O. archiepiscopus</i>		4	6	3				2	8	3						1	2	2	8							
<i>O. trachypoma</i>			2	11	25	2			2	13	15	10						2	5	13	11	7	2			

Remarks. Jordan (1919) and Norman (1957) attributed the authorship of *Ostichthys* to Langsdorf in Cuvier and Valenciennes (1829). However, the Langsdorf's name, as *Ostichthys aureus*, was only a passing reference in Cuvier's accounts of *Myripristis japonicus*. It is clear that Cuvier was merely mentioning this as a manuscript name and attached no nomenclatural significance to it.

Key to the species of *Ostichthys*

- 1a. Scales above lateral line to middle of spinous portion of dorsal fin 3 1/2..... 2
- 1b. Scales above lateral line to middle of spinous portion of dorsal fin 2 1/2 5
- 2a. Anterior end of nasal bones without a forward-directed spine (except juveniles). Gill rakers 7~11+12~17. No spine at

Table 3. Proportional measurements of type specimens of four species of

	<i>O. acanthorhinus</i>								<i>O.</i>
	Holo-type	Paratypes							Holo-type
	FMNH 70251	BPBM 22766	BM (NH) 1979. 11.14.2	FMNH 70252	FMNH 83910	RUSI 10693	NSMT-P 18632	CAS 44993	HUMZ 62836
Standard length (mm)	178.0	48.1	112.0	119.2	125.6	128.2	129.3	166.4	147.1
Depth of body	47.3	48.7	48.9	49.2	50.0	48.0	50.3	49.5	45.1
Width of body	22.3	18.1	20.4	20.1	22.3	21.5	22.5	22.2	21.1
Head length	43.0	45.1	44.2	44.3	43.9	44.5	45.1	43.1	39.2
Snout length	8.1	8.4	8.4	8.6	7.3	8.3	8.1	7.6	8.0
Orbit diameter	13.2	14.1	13.9	13.6	13.9	13.5	13.9	12.8	13.7
Interorbital width	7.5	9.3	8.3	7.7	7.8	7.8	8.1	7.4	6.6
Upper jaw length	24.9	23.9	24.3	25.3	25.6	25.2	25.3	24.4	22.8
Least depth of caudal peduncle	9.0	8.9	9.6	9.4	9.0	9.2	9.7	9.3	9.0
Length of caudal peduncle	12.5	12.5	12.3	12.4	13.2	12.8	12.8	12.0	9.6
Snout to origin of dorsal fin	45.4	45.7	45.2	42.8	45.0	45.3	45.5	43.8	43.4
Snout to origin of anal fin	71.6	70.0	74.1	73.7	73.0	72.6	75.0	75.7	78.5
Snout to origin of pelvic fins	41.2	43.2	46.8	45.3	43.4	42.5	42.8	43.6	40.2
Length of first dorsal spine	8.0	14.7	10.3	7.4	10.0	9.4	8.0	9.6	9.8
Length of longest dorsal spine	17.6	27.7	19.6	19.9	18.3	20.7	20.9	17.8	20.9
Length of eleventh dorsal spine	4.1	6.9	5.4	5.2	4.1	5.1	4.5	4.7	6.2
Length of twelfth dorsal spine	4.6	7.7	7.8	6.0	6.4	7.4	5.2	5.5	4.8
Length of longest dorsal ray	19.4	21.9	21.3	21.2	21.3	20.1	20.5	18.9	19.2
Length of third anal spine	15.6	19.1	16.9	15.9	17.4	17.2	17.0	15.6	17.2
Length of longest anal ray	18.6	21.6	21.4	20.8	broken	20.8	22.3	18.8	18.3
Length of caudal fin	24.1	26.0	24.6	25.1	26.0	23.9	25.7	22.7	22.0
Caudal concavity	9.7	10.6	10.1	10.5	11.3	10.8	11.5	10.4	8.2
Length of pectoral fin	27.0	28.1	27.3	26.8	26.8	26.5	28.4	25.6	27.1
Length of pelvic spine	16.1	22.9	19.7	16.8	17.7	18.2	19.1	abnormal	15.0
Length of pelvic fin	23.3	26.8	24.4	23.6	24.0	22.9	24.9	broken	21.3

- corner of preopercle notably larger than spinules along entire margin 3
- 2b. Anterior end of each nasal bone with a sharp forward-directed spine projecting to or beyond median upper lip. Gill rakers 10~12+16~18. A short stout spine at corner of preopercle (Gulf of Oman, Arabian Sea and Bali Is.)
 *O. acanthorhinus*, sp. nov.
- 3a. Height of 2nd suborbital bone (measured vertically below eye center) is high, about half of orbit. Last dorsal spine definitely longer than penultimate one, twice to three times longer than it. Pectoral rays 16~17, mostly 17 (western Pacific, Andaman Sea and Austraria) *O. japonicus*
- 3b. Height of 2nd suborbital bone is low, about one-third or one-fourth of orbit. Last dorsal spine subequal to or slightly longer than penultimate one. Pectoral

Ostichthys expressed as percentage of the standard length.

<i>hypsiprygion</i>		<i>O. sandix</i>					<i>O. delta</i>				
Paratypes		Holo-type	Paratypes				Holo-type	Paratypes			
NSMT-P 18641	BPBM 26362	BPBM 22708	BPBM 10963	BM (NH) 1979. 11.14.1	ZUMT 54238	USNM 220898	BPBM 20050	MNHN 1980- 1499	NSMT-P 19159	USNM 223716	MNHN 1980- 1500
156.6	140.8	203.5	170.2	192.8	208.0	213.5	150.4	121.0	139.0	139.2	148.0
47.1	38.3	47.8	47.0	47.2	49.9	48.7	43.1	42.1	42.3	42.8	42.5
22.4	21.5	22.1	21.9	20.8	21.6	21.0	20.8	20.7	19.2	21.5	22.3
41.4	39.5	40.9	40.2	41.8	42.3	40.8	39.4	39.8	38.1	39.0	39.2
8.7	7.1	8.7	9.1	9.6	9.9	8.7	8.2	8.8	8.1	8.8	9.3
13.4	14.9	12.8	13.5	13.6	13.5	12.7	12.5	12.8	13.3	12.9	12.0
6.8	5.3	5.6	6.1	5.3	6.5	6.2	6.1	5.7	5.3	6.3	6.1
22.5	23.2	23.2	23.5	23.1	24.3	24.0	20.6	20.4	20.7	20.8	20.4
9.6	8.9	9.5	9.6	9.4	9.8	9.8	8.9	8.4	8.3	8.5	8.3
8.3	9.0	9.8	10.6	10.1	9.9	10.7	10.7	10.2	9.9	9.7	10.5
44.7	44.0	43.7	43.2	43.0	47.5	44.1	43.2	42.3	40.2	41.8	39.8
73.2	76.6	77.5	74.1	76.8	75.0	77.3	79.4	79.2	80.0	78.5	81.1
40.5	42.3	44.5	42.3	43.3	44.5	45.1	43.7	47.8	45.4	46.6	49.2
11.1	10.0	10.4	9.7	9.9	8.9	10.8	11.4	9.8	11.8	10.9	9.5
22.7	22.3	18.7	17.9	18.6	18.0	18.1	18.1	18.3	18.7	17.7	17.0
6.4	7.6	6.8	7.6	6.8	7.9	6.9	8.2	7.4	8.1	8.9	7.8
5.3	6.3	7.1	7.5	6.9	8.0	6.9	6.4	6.2	6.0	6.7	6.0
19.3	broken	20.3	21.7	22.0	20.9	22.2	19.4	broken	19.6	18.7	19.8
19.0	19.0	16.7	17.0	18.2	17.9	16.9	20.6	20.8	21.3	abnormal	18.7
18.5	broken	broken	20.4	22.4	20.2	19.8	20.9	19.4	20.0	20.2	19.8
20.8	broken	23.6	24.1	24.9	23.8	24.4	23.0	22.3	22.8	broken	21.4
9.1	broken	10.9	10.4	10.2	11.6	10.3	10.6	10.0	10.6	—	9.1
25.0	26.6	24.6	25.3	27.0	26.1	27.1	28.5	25.2	27.0	26.3	25.5
14.7	16.8	15.5	15.6	14.8	16.0	14.8	15.4	15.6	15.0	15.4	15.6
20.7	23.8	23.1	23.4	22.8	23.1	23.3	23.2	23.0	22.4	23.0	23.2

- rays 15~17, mostly 15 or 16..... 4
- 4a. Pectoral rays 15~16, mostly 15. Lower-limb gill rakers 13. Predorsal scales about 7. Largest dorsal spine 1.8~1.9 in head (Japan).....*O. hypsipterygion*, sp. nov.
- 4b. Pectoral rays 16~17, mostly 16. Lower-limb gill rakers 15 or 16. Predorsal scales about 5. Largest dorsal spine 2.2~2.35 in head (Hawaiian Islands)...*O. sandix*, sp. nov.
- 5a. Dorsal spines XI. Upper procurent spiniform caudal rays 5 and lower rays 4. Lateral-line scales 27 or 28 (usually 27). Origin of anal fin beneath soft portion of dorsal fin (Réunion and Samoa)...*O. delta*, sp. nov.
- 5b. Dorsal spines XII. Upper procurent spiniform caudal rays 4 and lower rays 3. Lateral-line scales 28 to 30. Origin of anal fin beneath spinous portion of dorsal fin..... 6
- 6a. A half scale directly anterior to upper half of first pored scale of lateral line. Pectoral rays 14~16, modally 15. Lateral-line scales 28~30, modally 29..... 7
- 6b. No half scale anterior to first lateral-line scale. Pectoral rays 15~17, modally 16. Lateral-line scales 28~30, modally 28 (western Pacific and Indian Oceans)...*O. kaianus*
- 7a. Last dorsal spine shorter than penultimate spine and not closely applied to soft portion of fin. Dorsal profile of head straight. Snout not short, 3.7~4.3 in head. Gill rakers 7~9+13~15 (Hawaii, Japan and Mascarene Islands).....*O. archiepiscopus*
- 7b. Last dorsal spine longer than penultimate spine and closely applied to soft portion of fin. Dorsal profile of head moderately convex. Snout short, 4.6~5.6 in head. Gill rakers 8~11+14~17 (western Atlantic).....*O. trachypoma*

Ostichthys acanthorhinus sp. nov.

(Figs. 6, 7)

Myripristis kaianus (non Günther) Tholasilin-gam, Venkataraman and Krishna Kartha, 1964: 277 (off Alleppey, Kerala coast of India).

Holotype. FMNH 70251, 178.0 mm, male, Gulf of Oman (25°05'N, 56°52'E), 272~291 m, bottom sticky gray clay and mud, trawl, "Anton Bruun" Cruise 4B, Station 264A, Loren P. Woods, 0706-0806 hours, 2 December 1963.

Paratypes. CMFRI 117/1, 143.5 mm, India, Kerala, off Alleppey, 330~366 m, M.F.V. "Kalava," T. Tholasilin-gam, G. Venkataraman, and K. N. Krishna Kartha, April 1963; FMNH 70252, 119.2 mm, Gulf of Oman (25°32'N, 57°06'E), 162~256 m, bottom green mud, trawl, "Anton Bruun" Cruise 4B, Station 254A, Loren P. Woods, 30 November 1963; FMNH 70253, 44.0 mm, Gulf of Oman (25°12'N, 56°49'E), 206 m, bottom gray soft mud, trawl, "Anton Bruun" Cruise 4B, Station 263A, Loren P. Woods, 2 December 1963; BPBM 22766, 48.1 mm, and USNM 220899, 120.2 mm, same data as preceding; FMNH 83910, 125.6 mm; BM(NH) 1979.11.14.2, 112.0 mm; CAS 44993, 166.4 mm, RUSI 10693, 128.2 mm, and NSMT-P 18632, 129.3 mm, all with same data as holotype.

Diagnosis. Scales above lateral line to mid-base of spinous portion of dorsal fin 3 1/2; no half scale anterior to first lateral-line scale; dorsal profile of head nearly uniformly convex; anterior end of each nasal bone with a sharp forward-directed spine; a spine at corner of preopercle; pectoral rays 16 or 17 (usually 16); lateral-line scales modally 29; gill rakers 10~12+16~18; last dorsal spine slightly longer than penultimate spine; depth of body 2.0~2.1 in SL; head length 2.2~2.3 in SL; dorsal profile of head convex; snout short, 5.15~6.0 in head; least depth of caudal peduncle 4.6~5.05 in head.

Description. Dorsal rays XII, 14, first soft-ray unbranched (13 or 14, two of paratypes with XIII spines); anal rays IV, 11, all soft-rays branched (10 or 11, usually 11); pectoral rays 17 (16 or 17, usually 16, the upper 2 and lower 1 or 2 unbranched); pelvic rays I, 7; branched caudal rays 17; upper spiniform procurent caudal rays 4; lower spiniform procurent caudal rays 3 (one paratype with 4); lateral-line scales 28 (28 or 29, usually 29); no half scale anterior to upper half of first pored scale; scales above lateral line to origin of dorsal fin 4, 3 1/2 below dorsal spines II to XI; scales below lateral line to origin of anal fin 7; circumpeduncular scales 14; median predorsal scales 5 or 6; median pre-pelvic scales about 12; gill rakers 11+17 (10~12+16~18); pseudobranchial filaments 31 (23 in 40 mm paratype to 32 in 166.4 mm paratype); branchiostegal rays 8, the first slender, medial to the second; vertebrae 11+15.

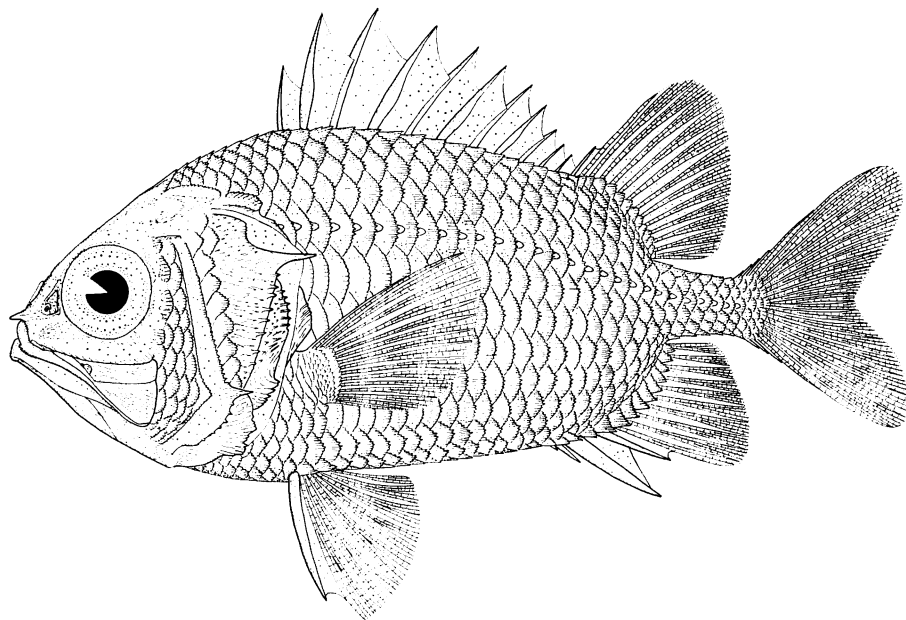


Fig. 6. Holotype of *Ostichthys acanthorhinus*, FMNH 70251, 178.0 mm, Gulf of Oman. Drawing by T. Shimizu.

Body moderately deep, depth 2.1 (2.0~2.1) in SL and compressed, width 2.1 (2.2~2.7) in depth; head length 2.3 (2.2~2.3) in SL; dorsal profile of head nearly uniformly convex; snout very short, 5.3 (5.15~6.0) in head; eye large, orbit diameter 3.25 (3.2~3.35) in head; interorbital space slightly convex, width 5.75 (4.85~5.85) in head; caudal peduncle slender and significantly longer than deep, least depth 4.8 (4.6~5.05), length 3.45 (3.45~3.6) in head.

Mouth large, lower jaw slightly projecting, gape diagonal, maxilla extending posterior to eye (except small juveniles); posterior end of maxilla broad, combined height of maxilla and supramaxilla 4.2~4.5 in head; upper jaw length 1.7 (1.7~1.9) in head; teeth in villiform bands in jaws, broader and thickened anteriorly; knob-like anterior end of lower jaw fitting into toothless symphyseal notch in upper jaw when mouth is closed; villiform teeth on vomer in a V-shape, apex anterior; villiform teeth in a narrow band on palatines, anterior end curving medially to a hook shape; tongue edentate; nasal fossa large, subtriangular, directly in front of orbit; gill rakers long, longest at angle or next to one at angle, about 1.5 in orbit diameter; gill filaments long, the longest on first gill arch about 1.7 to

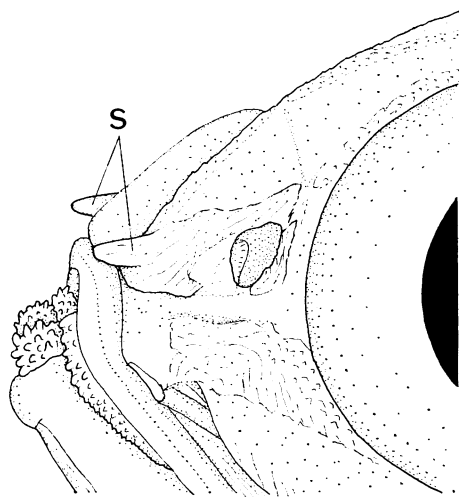


Fig. 7. Oblique anterodorsal view of nasal area of the holotype of *Ostichthys acanthorhinus*. S, nasal spine. Drawing by T. Shimizu.

1.8 in orbit diameter.

External bones of head rugose, ridged and spiniform, free margins of suborbitals, postorbitals, opercle, subopercle, interopercle, double margin of preopercle and lower edges of second to fourth branchiostegal rays with numerous spi-

nules; front of each nasal bone with a sharp cylindrical spine which projects horizontally forward or slightly diagonally downward anterior to median part of upper lip, spines relatively longer on juveniles than adults; a prominent stout spine posteriorly on opercle; a spine at corner of preopercle, well developed on juveniles, slightly developed on adults; suborbital depth below center of eye 3.7~3.9 in orbit diameter; length of longest postorbital bone about 3 in orbit diameter.

Scales coarsely ctenoid, ctenii arising from strong ridges on posterior surface of scales; scales of body of holotype with 14 to 30 ctenii, anterior scales with a higher number of ctenii than posterior; scales dorsally on head extending forward to a vertical slightly anterior to upper end of preopercular margin; preopercle with 4 diagonal rows of scales; base of opercle with a single row of scales; spinous portion of dorsal fin without scales; soft portion and anal fin with a basal scaly sheath, scales not adhering to fins; base of caudal and pectoral fins with small scales; axil of pectoral fins without scales; pelvic fins with a mid-ventral posterior projection from the base of 3 moderately large scales, the posterior scale somewhat pointed, with 3 small lateral scales.

Origin of dorsal fin over first lateral-line scale; third or fourth dorsal spines longest, 2.45 (2.15~2.4) in head (1.65 in head of 48.1 mm paratype); last dorsal spine a little longer than penultimate spine, its length 3.8 (2.5~4.0) in longest dorsal spine; space between last dorsal spine and first dorsal ray about half as broad as space between last two dorsal spines; longest dorsal ray (second or third) 2.2 (2.05~2.3) in head; origin of anal fin below base of last two dorsal spines; first anal spine very small; third anal spine the longest and very stout, 2.75 (2.35~2.8) in head; longest anal ray (first to third) 2.3 (2.0~2.3) in head; caudal fin small, 1.8 (1.7~1.9) in head; caudal fin forked, caudal concavity 4.45 (3.9~4.4) in head; pectoral fins longer than pelvic fins, fourth or fifth rays longest, 1.6 (1.6~1.7) in head; origin of pelvic fins below or slightly anterior to upper pectoral base; first and second pelvic rays the longest, 1.85 (1.7~1.95) in head.

Color in alcohol light brown, the various membranes a little paler. The largest of two juveniles of FMNH 70253 with blackish pigment basally on interspinous membranes of

dorsal fin. Color in life entirely red with no white markings.

Etymology. Named *acanthorhinus* from the Greek in reference to the sharp spine anteriorly on each nasal bone.

Remarks. Ten of the 11 type specimens of *O. acanthorhinus* were taken by trawling at the north-western end of the Gulf of Oman, within the depth range of 206~290 m. They were preserved by the late Loren P. Woods. The life color note was provided by Woods (personal communication, 13 March 1970) from a kodachrome taken by him. One specimen was taken off the Kerala coast of India in 330~336 m from the M.F.V. "Kalava."

Two specimens of *Ostichthys* collected off Bali (BM (NH) 73.4 and 111.0 mm) were recently sent to us by Peter J. P. Whitehead of the British Museum (Natural History). We identify these as *O. acanthorhinus* and thus extend the range of this species to Indonesia. However, we do not designate them as paratypes. Although agreeing in meristic data and most measurements, these specimens have a larger eye (15.8% for the 73.4 mm specimen and 15.3% for the 111.0 mm specimens) and significantly shorter eleventh and twelfth dorsal spines, third anal spines and dorsal and anal soft rays. We believe these differences are only a manifestation of geographic variation, reflecting the distance between Bali and the western Indian Ocean.

Differential diagnosis. This species is readily distinguished from all other *Ostichthys* by the pair of forward-projecting nasal spines at all sizes. These spines may occur on small juveniles of at least some other species of the genus (juveniles unavailable for all species of *Ostichthys*). *O. acanthorhinus* is also distinctive in having the highest gill-raker count for the genus. It is perhaps most closely related to the allopatric *O. japonicus*, sharing with it such characters as 3 1/2 scales above the lateral line and a short snout.

Ostichthys japonicus (Cuvier)
(Japanese name: Ebisu-dai)
(Figs. 1B, 2B, 3B, 8, Pl. 1C)

Myripristis japonicus Cuvier in Cuvier and Valenciennes, 1829: 173, pl. 58 (type locality, Japan).
Holotrachys major Whitley, 1950: 33, fig. 5 (type locality, New South Wales). New synonymy.

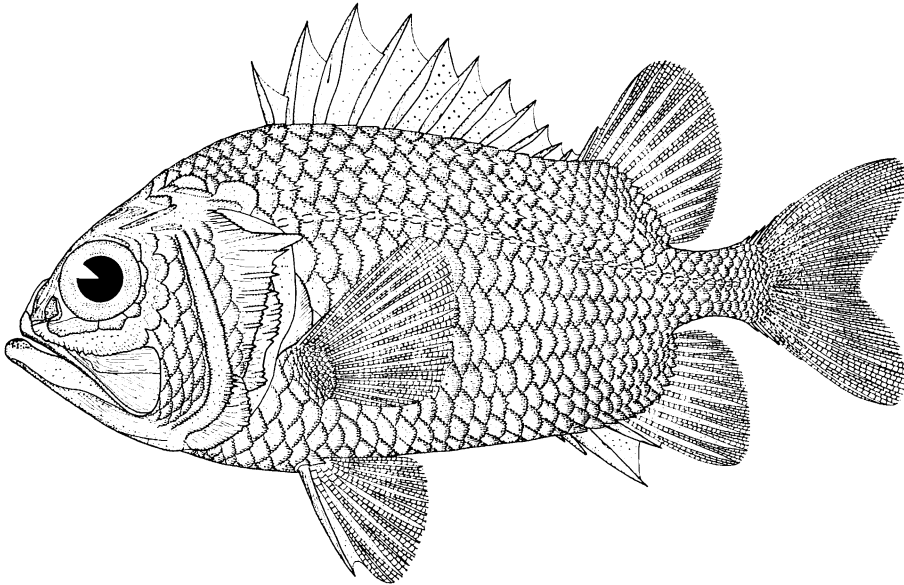


Fig. 8. Adult of *Ostichthys japonicus*, HUMZ 62563, 176.3 mm, Kochi, Japan. Drawing by T. Shimizu.

Description. Scales above lateral line to mid-base of spinous portion of dorsal fin $3\frac{1}{2}$; no half scale anterior to first lateral-line scale; dorsal profile of head nearly uniformly convex; no spine at anterior end of nasal bone of adults or subadults; no large spine at corner of preopercle of adults (but subadults may have a small spine at the angle); pectoral rays 15 to 17 (usually 17, rarely 15); lateral-line scales 28 to 30 (usually 28, rarely 30); gill rakers $7+10+12\sim14$; last dorsal spine distinctly longer than penultimate spine; space between last dorsal spine and first dorsal ray notably less than space between last two dorsal spines; depth of body $2.05\sim2.2$ in SL; head length $2.35\sim2.5$ in SL; snout short, $4.65\sim5.6$ in head; least depth of caudal peduncle $4.0\sim4.5$ in head.

Color when fresh: edges of scales red, the centers silvery pink; spinous portion of dorsal fin mottled light red and whitish; remaining fins with light red rays and pale membranes; iris red.

Remarks. *Ostichthys japonicus* is known from Japan, Taiwan, Korea and New South Wales, Australia. Recently Kyushin et al. (1977: 46, col. pl.) reported 4 specimens 227 to 345 mm collected in 110~130 m from the Andaman Sea as this species. We have examined the photographed specimens and believe these authors are correct in their identification.

Specimens for which the depth of capture is known have come from 90~194 m.

The holotype of *Holotrachys major* Whitley, which was taken in 194 m off New South Wales, was sent on loan by the Australian Museum. We could find no differences between it and our Japanese specimens of *Ostichthys japonicus*.

O. japonicus is a large species; our largest specimen measures 348 mm SL, 403 mm TL. Masuda et al. (1975: pl. 30 B) misidentified *O. kaianus* as the young of *O. japonicus* (amended in Masuda et al., 1980).

One specimen (BPBM 22765, 122 mm) collected by the first author and Robert P. H. Rutherford in 191 m off Manado, Celebes is provisionally identified as *O. japonicus*. It has all the meristic and most measurement data of *O. japonicus* but differs in its long dorsal and anal spines. The longest dorsal spine is 1.85 in head length (an *O. japonicus* of this size could be expected to have a dorsal spine length of about 2.1 in head length). Also the caudal peduncle is more slender, the least depth 4.9 in head length (compared to $4.0\sim4.5$ for other *O. japonicus*).

Material examined. JAPAN: BPBM 22269, 303 mm, Naha fish market, Okinawa; BSKU 2376~2378, 3: 117.4~133.0 mm, Mimase fish market, Kochi City; BSKU 3500, 115.8 mm, Urado, Kochi City; BSKU 7250, 100.7 mm,

Naha; HUMZ 41039, 167.2 mm, Nakahama fish market, Hamada City, Shimane Pref.; HUMZ 46734, 588.11, 62120, 3: 187.1~267.4 mm, Odawara fish market, Kanagawa Pref.; HUMZ 46736, 47678, 47689, 62563~65, 62606, 7: 122.8~232.3 mm, Mimase fish market; HUMZ 47681, 235.6 mm, Himi, Toyama Pref.; HUMZ 47995, 197.7 mm, 30°9'N, 124°13'E~31°31'N, 127°53'E; HUMZ 49426, 160.8 mm, Yahatahama fish market, Ehime Pref.; HUMZ 62836, 147 mm, Naha fish market; KSHS 439, 4806, 2: 126.6~133.4 mm, Mimase fish market; KSHS 10701, 159.2 mm, Kaminokae, Kochi Pref.; KSHS 17305~06, 27307, 3: 143~348 mm, Tatsukushi, Kochi Pref.; RMNH 5418, 2: 247 mm, probably from Japan and a smaller mutilated specimen from Nagasaki; USNM 59804, 91 mm, Kochi; USNM 151681, 132 mm, Japan. CHINA: MNHN 91.661, 201 mm, Shanghai; USNM 148370, 229 mm, Shanghai. HONG KONG: CAS 44677, 173 mm, 150 miles west of Hong Kong; CAS 62657, 4: 135~144 mm, Aberdeen fish market; SU 61174, 145 mm, fish market. TAIWAN: CAS 13610, 91 mm, Formosa Strait (25°N, 120°E); SU 49370, 111 mm, Taiwan. AUSTRALIA: AMS IB 2166, 222.8 mm, holotype of *Holotrachys major*, trawled between Port Kembla and Waltamolla, New South Wales, 106 fathoms. ANDAMAN SEA: HUMZ 33517, ca. 330 mm.

Ostichthys hypsipterygion sp. nov.

(New Japanese name: Hiredaka-ebisu)

(Fig. 9, Pl. 2A)

Holotype. HUMZ 62836, 147.1 mm, Naha fish market, Naha City, Okinawa Pref., Japan, perhaps by hook and line, near Okinawa Island, Takeshi Shimizu, 13 April 1977.

Paratypes. BPBM 26362, 140.8 mm, female, Naha fish market, perhaps by hook and line, near Okinawa Island, Takeshi Yamakawa, 4 November, 1975; NSMT-P 18641, 156.6 mm, Naha fish market, perhaps by hook and line, near Okinawa Island, Keiichi Matsuura, 8 March 1974.

Diagnosis. Scales above lateral line to mid-base of spinous portion of dorsal fin 3 1/2; no half scale anterior to first lateral-line scale; no spine at anterior end of nasal bones of adults; no enlarged spine at corner of preopercle; pectoral rays 15; lateral-line scales 28~29; gill

rakers 8+13=21; last two dorsal spines subequal; depth of body 2.1~2.6 in SL; head length 2.4~2.6 in SL; dorsal profile of head slightly convex; snout 4.8~5.6 in head; least depth of caudal peduncle 4.3~4.4 in head.

Description. Dorsal rays XII, 13, first unbranched; anal rays IV, 11, all branched; pectoral rays 15, upper two and lowermost unbranched (left side of one specimen 16); pelvic rays I, 7; branched caudal rays 17; upper spiniform procurent caudal rays 4; lower spiniform procurent caudal rays 3; lateral-line scales 28 (28~29), no half scale anterior to upper half of first pored scale; scales above lateral line to origin of dorsal fin 4, 3 1/2 below dorsal spines II to XI; scales below lateral line to origin of anal fin 8; circumpeduncular scales 13 (13~14); median predorsal scales 7 (6); medial prepelvic scales about 12; gill rakers 8+13; pseudobranchial filaments 21 (17~21); branchiostegal rays 8, the first slender, medial to the second; vertebrae 11+15.

Body moderately deep, depth 2.2 (2.1~2.6) in SL, and compressed, width 2.1 (1.8~2.1) in depth; head length 2.6 (2.1~2.6) in SL; dorsal profile of head slightly convex; snout short, 4.9 (4.8~5.6) in head; eye large, orbit diameter 2.9 (2.6~3.1) in head; interorbital space slightly convex, width very narrow, 5.9 (6.1~7.4) in head; caudal peduncle slender, length subequal to depth, least depth 4.4 (4.3~4.4) and length 4.4 (4.1~5.0) in head.

Mouth large, lower jaw slightly projecting, gape diagonal, maxilla extending to a vertical at hind edge of eye; posterior end of maxilla broad, combined height of maxilla and supra-maxilla 4.4 (4.4~4.7) in head; upper jaw length 1.7 (1.7~1.8) in head; teeth in villiform bands in jaws, broader anteriorly; thickened knob-like anterior end of lower jaw fitting into a toothless gap at symphysis of upper jaw when mouth is closed; villiform teeth on vomer in a V-shape, with apex anterior; villiform teeth in a narrow band on palatines, anterior end of which curves medially; tongue edentate; nasal fossa large, triangular, directly in front of orbit; gill rakers moderately long, longest at angle 2.3 (2.1~2.7) in orbit diameter; gill filaments short, longest on first gill arch 2.9 (2.6~2.7) in orbit diameter.

External bones of head rugose, ridged and spiniform; free margins of the suborbitals,

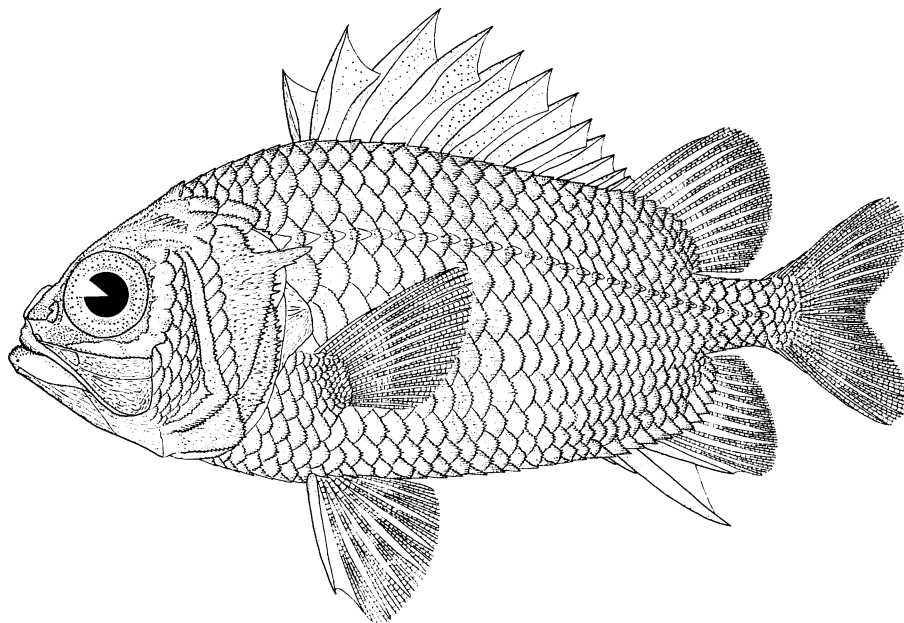


Fig. 9. Paratype of *Ostichthys hypsipterygion*, BPBM 26362, 140.8 mm, Okinawa, Japan. Drawing by T. Shimizu.

postorbitals, opercle, subopercle, interopercle, double margin of preopercle and lower edges of second to fourth branchiostegal rays with numerous spinules; a prominent spine posteriorly on opercle, extending well beyond opercular membrane; a small auxiliary spine below opercular spine, not extending posteriorly to opercular membrane; no spine at corner of preopercle; suborbital depth below center of eye 4.0 (3.6~4.9) in orbit diameter; length of longest postorbital bone about 3 in orbit diameter.

Scales coarsely ctenoid, ctenii arising from strong ridges on posterior surface of scales; scales of body of holotype with 12 to 33 ctenii, anterior scales with a higher number of ctenii than posterior; scales dorsally on head extending forward to a vertical about intermediate between upper end of preopercular margin and hind edge of orbit; preopercle with 5 diagonal rows of scales; base of opercle with a single row of scales; spinous portion of dorsal fin without scales; soft portion and anal fin with a basal scaly sheath, scales not adhering to fins; base of caudal and pectoral fins with small scales; axil of pectoral fins without scales; base of pelvic fins with a mid-ventral posterior projection consisting of 3 moderately large median scales and with 3

small lateral scales.

Origin of dorsal fin over first lateral-line scale; third dorsal spine longest, 1.8 (1.8~1.9) in head; last dorsal spine a little shorter than penultimate spine, its length 4.4 (3.7~4.3) in longest dorsal spine; space between last dorsal spine and first dorsal ray about equal to space between last two dorsal spines; longest dorsal ray, third, 2.0 (2.1) in head; origin of anal fin below base of last dorsal spine or first dorsal ray; first anal spine very small; third anal spine the longest and stout, 2.3 (2.1~2.2) in head; longest anal ray, second, 2.1 (2.2) in head; caudal fin small, 1.8 (2.0) in head; caudal fin forked, the caudal concavity 4.8 (4.5) in head; pectoral fins longer than pelvic fins, the fourth ray longest, 1.5 (1.5~1.7) in head; origin of pelvic fins below lower to middle pectoral base; first and second pelvic rays the longest, 1.8 (1.7~2.0) in head.

Color in alcohol yellow, all fin membranes, opercular membrane, membrane over premaxillary groove and mucous channels of head white.

Etymology. Named *hypsipterygion* from the Greek in reference to the high spinous dorsal fin.

Remarks. The three type specimens of *this* species, all of moderate size, were obtained at the Naha fish market; data on depth of capture,

maximum size attained, etc., are not available.

Differential diagnosis. *Ostichthys hypsipterygion* is similar to *O. sandix* from Hawaii and *O. japonicus* from Japan to Australia in having 3 1/2 scales above the lateral line and modally 28 lateral-line scales. It differs evidently from *O. sandix* in having 13 lower-limb gill rakers (*O. sandix* with 15~16) and the last dorsal spine intermediate between penultimate dorsal spine and first dorsal ray (closely applied to first dorsal ray in *O. sandix*). It differs from *O. japonicus* in having higher dorsal spines, the longest 1.8~1.9 in head (2.0~2.3 for *O. japonicus*), narrower suborbital depth (see Figs. 8, 9), 15 or 16 (usually 15) pectoral rays (*O. japonicus* has 16 or 17, usually 17), and the last two dorsal spines subequal (last dorsal spine of *O. japonicus* distinctively longer).

Ostichthys sandix sp. nov.
(Fig. 10)

Ostichthys japonicus (non Cuvier) Fowler, in part, 1928: 97 (Honolulu).

Holotype. BPBM 22708, 203.5 mm, female, Hawaiian Islands, Oahu, Waianae coast, off Campbell Industrial Park, 150~180 m, gill net at bottom, Thomas A. Clarke, 29 October 1969.

Paratypes. BM (NH) 1979.11.14.1, 192.8 mm, Honolulu market, John W. Thompson, no date of collection, but prior to 1925; ZUMT 54238, 208 mm, and USNM 220898, 213.5 mm, same data as preceding; BPBM 10963, 170.2 mm, Hawaiian Islands, Oahu, Waianae coast off Barber's Point, 84~94.5 m, gill net at bottom, Thomas A. Clarke, 19~20 April 1971.

Diagnosis. Scales above lateral line to mid-base of spinous portion of dorsal fin 3 1/2; no half scale anterior to first lateral-line scale; no spine at anterior end of nasal bones of adults or subadults; no enlarged spine at corner of preopercle; pectoral rays 16 or 17 (usually 16); lateral-line scales 28; gill rakers 7~9+15 or 16; last two dorsal spines subequal; depth of body 2.0~2.1 in SL; head length 2.35~2.5 in SL; dorsal profile of head nearly straight anteriorly, becoming convex on nape; snout 4.65~5.6 in head; least depth of caudal peduncle 4.2~4.45 in head.

Description. Dorsal rays XII, 13, the first unbranched; anal rays IV, 11, all branched; pectoral rays 16, upper two and lowermost unbranched (16 or 17, usually 16); pelvic rays

I, 7; branched caudal rays 17; upper spiniform procurent caudal rays 4; lower spiniform procurent caudal rays 3; lateral-line scales 28, no half scale anterior to upper half of first pored scale; scales above lateral line to origin of dorsal fin 4, 3 1/2 below dorsal spines II to XI; scales below lateral line to origin of anal fin 7; circum-peduncular scales 14; median predorsal scales 5; median prepelvic scales 13; gill rakers 9+15 (7~9+15 or 16); pseudobranchial filaments 24 (22~29); branchiostegal rays 8, the first slender, medial to the second; vertebrae 11+15.

Body moderately deep, depth 2.1 (2.0~2.1) in SL, and compressed, width 2.15 (2.15~2.3) in depth; head length 2.45 (2.35~2.5) in SL; dorsal profile of head nearly straight to a vertical above hind edge of eye, then convex on nape; snout short, 4.7 (4.3~4.7) in head; eye large, orbit diameter 3.2 (3.0~3.2) in head; interorbital width slightly convex, bony width 7.3 (6.5~7.9) in head; caudal peduncle slender, length slightly greater than depth, least depth 4.3 (4.2~4.45) in head, length 4.2 (3.8~4.3) in head.

Mouth large, lower jaw slightly projecting, gape diagonal, maxilla extending to or slightly beyond a vertical at hind edge of eye; upper jaw length 1.75 (1.7~1.8) in head; posterior end of maxilla very broad, combined height of maxilla and supramaxilla about 4 in head; teeth in villiform bands in jaws which are broader anteriorly; thickened knob-like anterior end of lower jaw fitting into a broad toothless gap at symphysis of upper jaw when mouth is closed; villiform teeth on vomer in a V-shape, with apex anterior; villiform teeth in a narrow band on palatines, anterior end of which curves sharply medially; tongue edentate; nasal fossa large, subtriangular, directly anterior to eye; gill rakers moderately long, longest usually at angle about half orbit diameter; gill filaments not long, longest on first arch about one-third orbit diameter.

External bones of head rugose, ridged and spiniform, free margins of the suborbitals, postorbitals, opercle, subopercle, interopercle, double margin of preopercle, and lower edges of second to fourth branchiostegal rays with numerous spinules; a prominent spine or double spine posteriorly on opercle, usually extending posterior to opercular membrane; no spine at corner of preopercle, at least on adults; suborbital depth below center of eye 3.7 to 3.8 in orbit diameter;

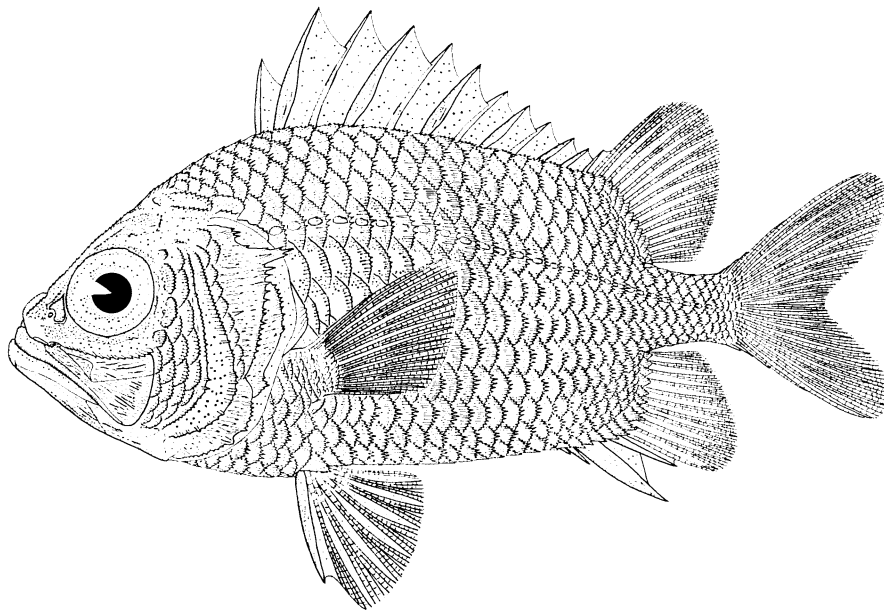


Fig. 10. Holotype of *Ostichthys sandix*, BPBM 22708, 203.5 mm, Oahu, Hawaiian Islands. Broken fins restored after paratypes. Drawing by T. Shimizu.

length of longest postorbital bone about 3 in orbit diameter.

Scales coarsely ctenoid, the ctenii arising from strong ridges on posterior surface of scales; scales of body of holotype with 9 to 20 ctenii, anterior scales with higher number of ctenii than posterior; scales dorsally on head extending forward to a vertical about intermediate between upper end of preopercular margin and hind edge of orbit; preopercle with 4 diagonal rows of scales; base of opercle with a single row of scales; spinous portion of dorsal fin without scales; soft portion and anal fin with a basal scaly sheath, scales not adhering to fins; caudal and pectoral fins with small scales basally; no scales in axil of pectoral fins; base of pelvic fins with a mid-ventral posterior projection consisting of 3 moderately large median scales and 3 small lateral scales.

Origin of dorsal fin over or slightly anterior to first lateral-line scale; third (third or fourth) dorsal spine longest, 2.2 (2.25~2.35) in head; last two dorsal spines subequal, their length 2.7 (2.25~2.6) in longest dorsal spine; space between last dorsal spine and first dorsal ray about half as great as space between last two dorsal spines; longest dorsal ray, third or fourth 2.0 (1.85~

2.0) in head; origin of anal fin below base of last dorsal spine or first dorsal ray; first anal spine very small; third anal spine the longest and very stout, 2.45 (2.3~2.4) in head; longest anal ray (second or third, both broken on holotype) 1.85~2.1 in head of paratypes; caudal fin small, 1.75 (1.65~1.8) in head, and forked, the caudal concavity 3.75 (3.65~4.1) in head; pectoral fins slightly longer than pelvic fins, the fourth or fifth rays longest, 1.65 (1.5~1.6) in head; origin of pelvic fins below lower to middle pectoral base; first and second pelvic rays longest, 1.75 (1.7~1.85) in head.

Color in alcohol light brown, fin membranes, opercular membrane, membrane over premaxillary groove, and mucous channels of head pale. Color when fresh light red.

Etymology. Named *sandix* from the Latin (derived from Greek) for red in reference to the life color.

Remarks. Only five specimens of this species have been collected, all from the Hawaiian Islands. Three of these are old Bishop Museum specimens obtained from the Honolulu market by J. W. Thompson sometime between the years 1901 and 1925. These specimens were among the Hawaiian *Ostichthys* identified by Fowler

(1928) as *O. japonicus*. They have been distributed to other museums. The remaining two specimens were taken with gill nets by Thomas A. Clarke at depth of about 90 to 164 m.

Differential diagnosis. *Ostichthys sandix* seems most closely related to *O. japonicus*, sharing with it such characters as 3 1/2 scales above the lateral line to the middle of the spinous portion of the dorsal fin and 28 lateral-line scales. It differs notably in having 15 or 16 lower-limb gill rakers (in contrast to 12~14 for *O. japonicus*), modally 16 instead of 17 pectoral rays, and the last two dorsal spines subequal (the last longer of *O. japonicus*).

***Ostichthys delta* sp. nov.**

(Fig. 11)

Holotype. BPBM 20050, 150.4 mm, female, Réunion, Baie de St. Paul, trammel net, Paul Guézé, drop off in 150 m, 20~21 October 1973.

Paratypes. MNHN 1980-1499, 1500, 2: 121.0~148.0 mm, Réunion, Baie de la Possession, 150~200 m, trammel net, Paul Guézé, 1972; NSMT-P 19159, 130.0 mm, and USNM 223716, 139.2 mm, same data as preceding.

Diagnosis. Dorsal spines XI (XII for other *Ostichthys*); scales above lateral line to mid-base of spinous portion of dorsal fin 2 1/2; no half scale anterior to first lateral-line scale; dorsal profile of head nearly straight; no spine at anterior end of nasal bone of adults; pectoral rays 16 or 17; lateral-line scales 27 or 28 (usually 27); gill rakers 7~8+13~14; upper spiniform procurent caudal rays 5 and lower spiniform procurent caudal rays 4 (other species of *Ostichthys* with 4 upper and 3 lower spiniform procurent caudal rays); last dorsal spine shortest; origin of anal fin beneath soft portion of dorsal fin; depth of body 2.3~2.4 in SL; snout 4.2~4.8 in head; caudal peduncle slender, the least depth 4.45~4.75 in head.

Description. Dorsal rays XI, 13 (13 or 14, usually 13), first unbranched; anal rays IV, 10 (10 or 11, usually 10), all branched; pectoral rays 16 (16 or 17), upper two and lowermost unbranched; pelvic rays I, 7 (I, 6 on right side of holotype); branched caudal rays 17; upper spiniform procurent caudal rays 5; lower spiniform procurent caudal rays 4; lateral-line scales 27 (27 or 28, usually 27); no half scale anterior to upper half of first lateral-line scale; scales above

lateral line to origin of dorsal fin 3, 2 1/2 below dorsal spines II to XI; scales below lateral line to origin of anal fin 7 1/2; circumpeduncular scales 13; median predorsal scales 5; median prepelvic scales about 12 (cannot be counted on holotype as it was slit in mid-ventral line, and scales missing in isthmus region); gill rakers 7+13 (7~8+13~14) (gill arches missing from USNM paratype); pseudobranchial filaments 23 (20~27); branchiostegal rays 8, first slender and medial to second; vertebrae 11+15.

Body not very deep, depth 2.3 (2.3~2.4) in SL and compressed, width 2.05 (1.9~2.25) in depth; head length 2.55 (2.5~2.65) in SL; dorsal profile of head from posterior to premaxillary groove to scaled region of nape nearly straight, then convex; snout short, 4.8 (4.2~4.7) in head; eye large, orbit diameter 3.15 (2.95~3.25) in head; interorbital width nearly flat (discounting longitudinal bony ridges), bony width 6.45 (6.2~7.2) in head; caudal peduncle slender, least depth 4.45 (4.6~4.75) in head.

Mouth large, lower jaw slightly projecting, gape diagonal, maxilla extending to a vertical at hind edge of eye; upper jaw length 1.9 (1.85~1.95) in head; posterior end of maxilla very broad, combined height of maxilla and supra-maxilla 3.8 in head of holotype; teeth in villiform bands in jaws which are broader anteriorly; thickened knob-like anterior end of lower jaw fitting into broad toothless gap at symphysis of upper jaw when mouth is closed; villiform teeth on vomer in a broad subtriangular patch, posterior border of which is indented only slightly; villiform teeth in a narrow band on palatines, anterior end of which projects slightly medially; tongue edentate; nasal fossa large, subtriangular, its center slightly below center of eye; gill rakers moderately long, longest at angle and the one above 2.4 in orbit diameter of holotype; gill filaments not long, longest on first arch about one-third orbit diameter.

External bones of head rugose, ridged and spiniform, free margins of suborbitals, postorbitals, opercle, subopercle, and double margin of preopercle with numerous well developed spinules; lower edges of branchiostegal rays without spinules; opercular spine poorly developed, barely extending posterior to opercular membrane; no spine at corner of preopercle, the spinule at angle is only slightly larger than