Copeia, 2007(2), pp. 364–377

A New Species of *Pteropsaron* (Teleostei: Trichonotidae: Hemerocoetinae) from the Western Pacific, with Notes on Related Species

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***Pteropsaron springeri*, new species, is described from 18 specimens collected from the Philippines and Indonesia. It differs from all other species of the *Pteropsaron/Osopsaron* complex in that the first dorsal fin has only three spines and is displaced anteriorly to lie over the posterior end of the occiput. The proximal ends of the pterygiophores lie against the second and third neural arches, which are bent forward to form horizontal processes that accommodate the pterygiophores. Based on a synapomorphy in the suspensorium, we suggest that the relationships of *Pteropsaron* and related genera (subfamily Hemerocoetinae) lie with the Creediidae and Trichonotidae, and not with the Percophidae, where they have traditionally been placed. An abbreviated key is provided to the family Trichonotidae as we construe it, which contains three subfamilies: the Creediinae, Hemerocoetinae, and Trichonotinae. We tentatively recognize eight genera in the Hemerocoetinae: *Hemerocoetes*, and the "*Pteropsaron*-like" genera *Acanthaphritis*, *Osopsaron*, *Pteropsaron*, *Dactylopsaron*, *Enigmapercis*, *Matsubaraea*, and *Squamicreedia*, although the relationship of the former to the latter seven needs further investigation. The species of *Osopsaron* and *Pteropsaron* are treated briefly, and some new information is presented. We provisionally place two species in *Osopsaron* (*O. verecundum* and *O. karlik*) and seven species in *Pteropsaron* (*P. evolans*, *P. formosensis*, *P. heemstrai*, *P. incisum*, *P. natalensis*, *P. neocaledonicus*, and *P. springeri*).**

THE suborder Trachinoidei is a poorly defined group of perciform fishes, most of which are bottom dwellers and inhabit shallow to moderately deep tropical waters. Nelson (2006:403) recognized 13 families, but it is unlikely that all of them together comprise a monophyletic group (see Mooi and Johnson, 1997). Among the families usually placed in this suborder is the Percophidae, characterized by a depressed head, large eyes with a narrow interorbital space, spinous dorsal fin (when present) separated from soft dorsal, soft dorsal and anal fins long-based, pelvic fin with one spine and five segmented rays, and a wide interpelvic space. Nelson (2006) recognized three subfamilies of Percophidae: Percophinae, with a single genus and species, *Percophis brasiliensis*; Bembropinae, with two genera, *Bembrops* and *Chrionema*, comprising 17 and six currently recognized species, respectively; and Hemerocoetinae, with 23 currently recognized species placed prior to 1996 in ten genera, *Hemerocoetes* and the remaining nine genera, which we herein refer to as the "*Pteropsaron*-like" hemerocoetines: *Acanthaphritis, Branchiopsaron, Dactylopsaron, Enigmapercis, Matsubaraea* (with synonym *Cirrinasus*), *Osopsaron, Pteropsaron, Spinapsaron,* and *Squamicreedia*. We find no convincing evidence to relate these three "subfamilies" and believe that the Percophidae is a paraphyletic assemblage. As noted by Nelson (1986), *Hemerocoetes* shares a distinctive, specialized configuration of the suspensorium with members of the families Creediidae and Trichonotidae, wherein the ectopterygoid is long and rodlike, the endopterygoid (Nelson's mesopterygoid) forms the floor of the orbit, and both are largely free from one another and from other bones of the suspensorium (Nelson, 1985:fig 1, 1986:fig 1). We have confirmed that this configuration also characterizes the "*Pteropsaron*-like" hemerocoetine genera (Fig. 1) and thereby constitutes a complex synapomorphy of the Creediidae, Trichonotidae, and Hemerocoetinae as suggested previously by Johnson (1993). Accordingly, we recommend that these three groups be united as subfamilies in the expanded family Trichonotidae. Nelson (1985, 1986, 2006) presented convincing evidence for monophyly of the Creediinae (e.g., all uniquely possess a distinctive inverted bowl-shaped pelvis) and Trichonotinae (e.g., all uniquely possess a single expanded, blade-like supraneural that fits tightly between the dorsally diverging first and second neural spines), but not for the Hemerocoetinae. Like creediines, *Hemerocoetes* lacks dorsal spines and pterygiophores, but all other members of that subfamily, i.e., the "*Pteropsaron*-like" hemerocoetines, share a distinctive modification of the spinous dorsal fin (see below) in which three to seven spines are supported by an equal number of extremely reduced and abnormally crowded pterygiophores

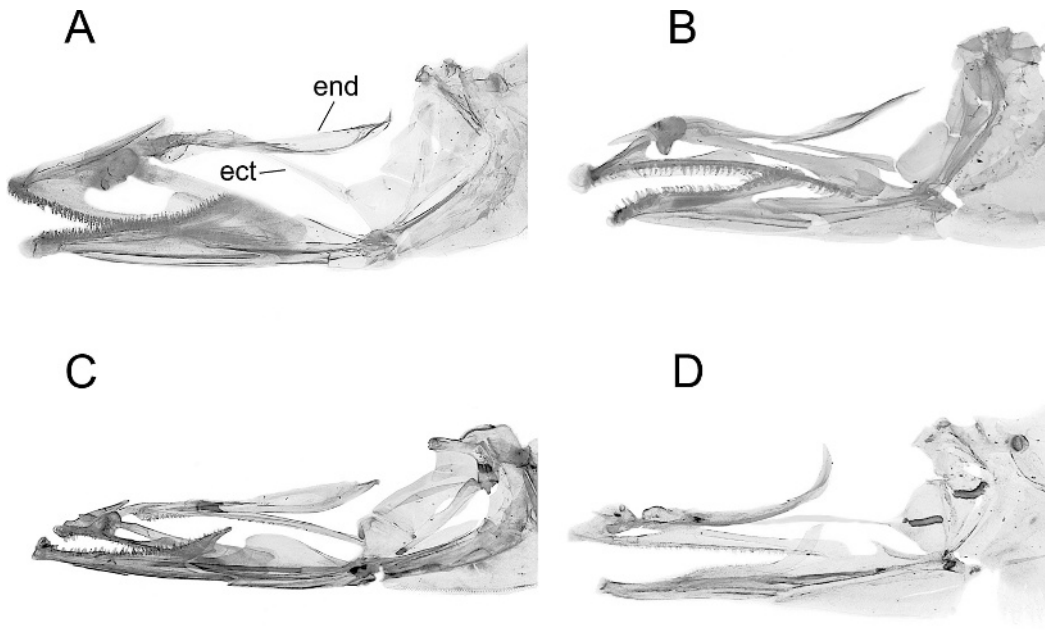

Fig. 1. Jaws and suspensorium in four species of Trichonotidae (*sensu lato*); (A) *Hemerocoetes monopterygius*, USNM 214077, 147.0 mm SL; (B) *Pteropsaron springeri*, USNM 368827, 28.2 mm; (C) *Trichonotus setiger*, USNM 265627, 85.0 mm; (D) *Limnichthys* sp., USNM 265325, 26.5 mm. ect—ectopterygoid; end—endopterygoid.

that comprise only proximal–middle radials, the distal radials being absent; as a consequence, the spines also appear crowded and, like the pterygiophores, never extend over more than two interneural spaces. Because *Hemerocoetes* lacks dorsal spines, its traditional placement within Nelson's Hemerocoetinae remains unsupported, although we have no doubt that it belongs within the Trichonotidae based on the shared suspensorial configuration. It shares the absence of dorsal spines with the Creediinae, but we have no other evidence to support a close relationship between those two and await more detailed osteological investigation of trichonotids and their putative relatives to elucidate this question.

The new species described in this paper clearly belongs in the ''*Pteropsaron*-like'' hemerocoetines, but generic assignment within that group is problematic in the absence of a comprehensive phylogenetic analysis of the component species. The new species most closely resembles species currently placed in *Pteropsaron* and *Osopsaron*, but differs in some respects from all of them, primarily in the extreme anterior placement of the spinous dorsal fin. Based on characters discussed below, we place it in *Pteropsaron* and provide comparative information on the other nominal species in the group. We include a key to the genera or generic groups of the Trichonotidae and to the species of *Osopsaron* and *Pteropsaron*.

Materials and Methods

All lengths are standard lengths unless otherwise stated. Head length is measured from the tip of the snout to the posterior end of the opercle. Eye diameter is measured horizontally. Institutional abbreviations follow Leviton et al. (1985) except that RUSI is now SAIAB. The abbreviation HLIP refers to the Honolulu laboratory of the National Marine Fisheries Service.

Pteropsaron springeri, new species

Figures 1B, 2–5

Holotype.—USNM 367912, male, 27.5 mm, Pacific, Philippines, Negros Is. E of Bais, 9°36′58″N, 123°10′05″E, 0–120 feet (0–56 m), 17 June 1978, V. G. Springer.

Paratypes.—AMS I.21918–036, female, 26.5, Philippines, Caban Is., 13°35′N, 120°50′E, 1980, D. Hoese; BPBM 34996, 2 females, 16.0–23.5, Indonesia, Flores, Off Maumere, Basir Sari Islet and reef (sand spit, sloping sand, and rubble at base of drop-off, 155 feet (73 m), 4 Nov. 1991, B. C. Russell, J. E. Randall, and R. M. Pyle; USNM 288848, male, 25.7, Philippines, Negros Is., mouth of Bais Bay, bottom at base of near vertical drop-off, 9°37′N, 123°10′E, 30–35 m, 17

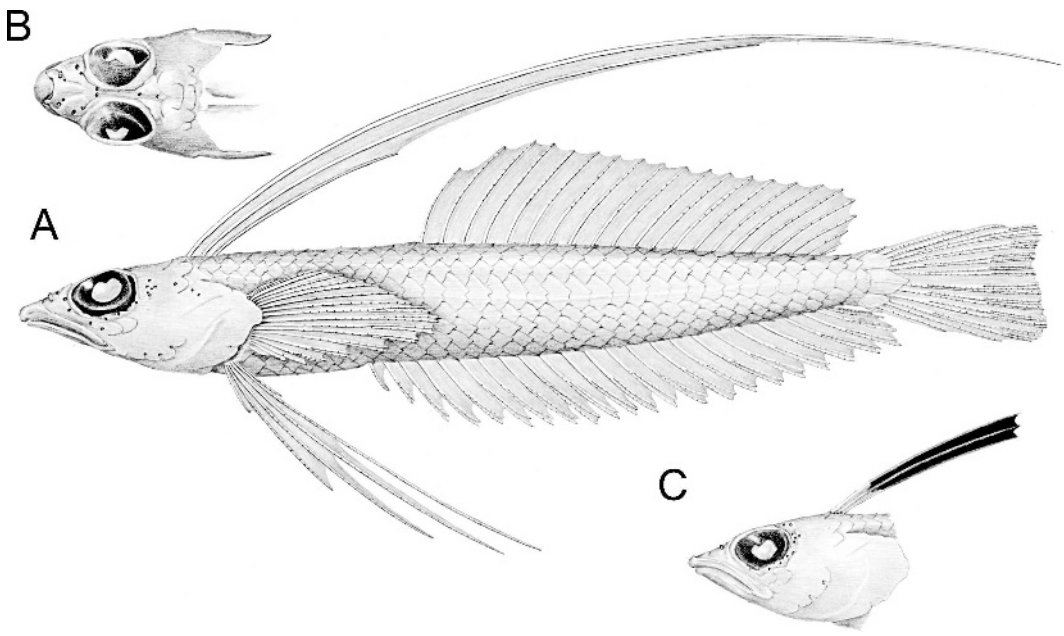

Fig. 2. *Pteropsaron springeri*. (A) Holotype, USNM 367912, male, 27.5 mm SL; (B) same, dorsal view of head and snout; (C) paratype, AMS I21918, female, 26.5 mm SL.

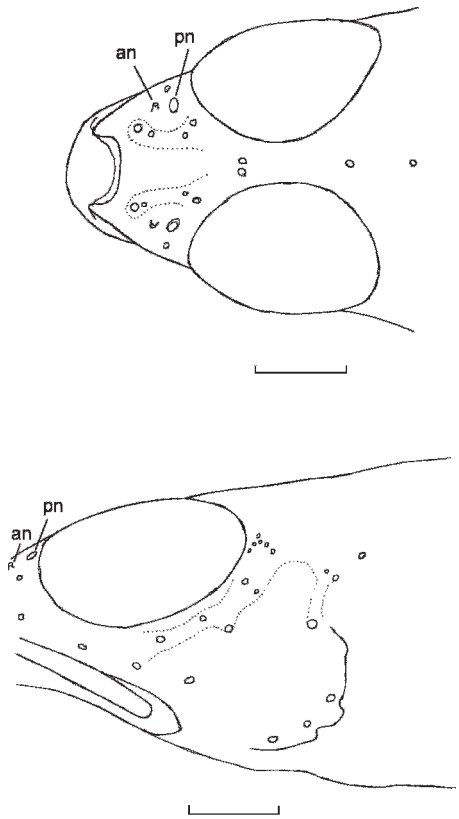

Fig. 3. Head pores in *Pteropsaron springeri*, holotype. an—anterior nostril; pn—posterior nostril. Scale bar = 1 mm.

May 1987, R. Winterbottom and G. D. Johnson; USNM 288849, male, 29.1, Philippines, Bais Bay, 9°37′N, 123°10′E, 24–37 m, 15 May 1987, R. Winterbottom, G. D. Johnson et al.; USNM 288850, 8 females, 2 males, Philippines, Visayas, Negros Oriental, Cebu Strait, north side of North Bais Bay near main channel, 18–35 m, 19 May 1987, R. Winterbottom, G. D. Johnson, et al.; USNM 368827, male (cleared and stained), same data as USNM 288850; WAM P29714-003, male, 24.5, Indonesia, Flores, Selar Pangabatang, 8°30′S, 122°30′E, 5–20 m, R. Kuiter.

Diagnosis.—*Pteropsaron springeri* differs from all other species in the *Pteropsaron/Osopsaron* complex in having only three dorsal spines, which are displaced anteriorly to lie over the posterior end of the skull, and the associated modification of the anteriormost three pterygiophores and neural spines. It is further distinguished by number of fin spines/rays and vertebrae (Table 1).

Description.—Morphometric characters (figures in parentheses represent holotype): preanal 2.1–2.8 (2.5), snout to first dorsal 3.1–5.0 (4.8), snout to second dorsal 1.6–2.4 (2.1), head 3.0–4.2 (3.8), depth of head 6.3–7.4 (7.4), depth at caudal peduncle 14.3–20.4 (16.2), longest dorsal spine 3.4–7.6 for females, 0.8–1.4 (0.9) for males, pectoral fin 4.3–6.0 (5.5), pelvic fin 1.5–3.2 (2.5), all in SL; snout 3.6–5.2 (16.1), eye 3.3–4.7 (3.3)

in head. Meristic characters: dorsal-fin rays III, 20–23 (III, 21); anal-fin rays 24–25 (25); pectoral-fin rays 17; lateral-line scales 36–37 , scale rows between dorsal and anal fins 8; vertebrae 35–36. To 30 mm SL.

Body elongate, deepest near branchial region, tapering toward tail; anus anterior to midlength. Trunk and tail entirely covered by large, cycloid scales; lateral-line scales posterior to tip of pectoral fin with single notch in posterior margin; three enlarged scales covering base of caudal fin, middle scale largest of the three and largest scale on body, posterior end pointed and somewhat asymmetrical, point being above medial axis of scale. Two dorsal fins, well separated. First dorsal fin with three spines, greatly elongate in males (Fig. 2A), first spine extending to or beyond end of caudal fin when depressed; second spine about 2/3 length of first spine, third spine somewhat less than half the length of second spine, fin without pigment; dorsal spines shorter in females (Fig. 2C), about equal in length, reaching origin of second dorsal fin when depressed, fin black. Elements of first dorsal fin closely spaced, pterygiophores closely applied to each other, fin displaced far anteriorly, lying over posterior end of skull. Base of second dorsal fin extending from near midbody, slightly posterior to level of anal-fin origin nearly to base of caudal fin. Base of anal fin extending from anus nearly to base of caudal fin, its rays branched. Pectoral fin broad, extending beyond anus when appressed, some of middle rays branched. Pelvic fin elongate, about twice length of pectoral fin, rays unbranched, fourth ray longest.

Head depressed, without scales except for two below middle of eye and a few adjacent to and immediately in front of first dorsal fin. Snout acute and triangular in lateral profile, its rounded tip overhanging lower jaw; broadly triangular in dorsal view (Fig. 2B); broad premaxillary groove bounded on each side by maxillary spines. Posterior nostril a simple opening directly in front of eye; anterior nostril in a short tube, its aperture much smaller than that of posterior nostril, directly anterior to posterior nostril, closer to posterior nostril than to tip of maxillary spine. Infraorbital canal in holotype (Fig. 3, lower) with one pore immediately below posterior nostril, near mid-eye level; four pores along upper jaw, the last located directly above rictus; postorbital portion of canal with three pores along posteroventral margin of eye, two pores adjacent and directly posterior to the second and third of these pores, cluster of six small pores in line with and above the preceding pores at about mid-eye level. Supraorbital canal

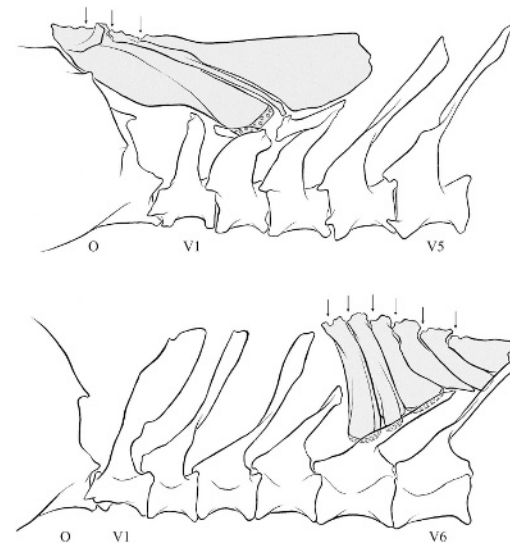

Fig. 4. Spinous dorsal-fin pterygiophores and anterior vertebrae of *Pteropsaron springeri*, USNM 368827, 28.2mm SL (upper); and *P. heemstrai*, USNM 265323 (lower). O—occiput; V—vertebra. Shading delineates pterygiophores; arrows indicate insertion points of dorsal spines.

(Fig. 3, upper) with two pores at anterior end anteromedial to anterior nostril, two pores side by side posteriomedial to posterior nostril, two pores side by side in anterior interorbital space, a median pore in posterior interorbital space and another median pore directly behind the preceding one. Three mandibular pores. Preopercular canal (Fig. 3, lower) with four pores, three along posteroventral margin of preopercle and one at upper end somewhat displaced from the previous three. Two pores in temporal canal just before origin of opercular flap (Fig. 3, lower). Eye large, dorsolateral in position, diameter about equal to or slightly greater than snout length, dorsal operculum present; interorbital narrow. Mouth moderately large, posterior end of maxilla below middle of eye; upper jaw protractile, projecting beyond lower, anterior end of maxilla produced into a stout spine. Gill opening large, opercular membranes of each side meeting at a point about level with posterior edge of eye. Posterior part of opercle with an extensive membranous flap, reaching base of pectoral fin; a weak opercular spine present, not extending beyond edge of opercular flap. Premaxillary teeth small, conical, uniserial; a row of small teeth on palatines, anterior ones largest; dentary teeth multiserial, the inner teeth largest, extending ventrally at anterior end onto exposed external surface of mandible. Tongue broad at base, narrowing anteriorly, with a median, longi-

Fig. 5. *Pteropsaron springeri*; male (upper) and female (lower). Photo by R. H. Kuiter, Flores, Indonesia, on steep sand slope at 20 m depth.

TABLE 1. MERISTIC CHARACTERS IN SPECIES OF *Osopsaron* AND *Pteropsaron*, NUMBER OF SPECIMENS IN PARENTHESES (L INDICATES VALUES TAKEN FROM LITERATURE, NUMBER OF SPECIMENS NOT GIVEN).

Species	Dorsal spines	Dorsal rays	Anal rays	Vertebrae
O. karlik	V–VI (L)	18–20 (L)	22–23 (L)	32 (2)
O. verecundum	IV–V (4)	19–20 (5)	23–24 (5)	32–33 (5)
P. evolans	VI (L + 1)	21–22 (L + 1)	25–27 (L + 1)	35 (1)
P. formosensis	V (20)	20–22 (20)	24–27 (20)	—
P. heemstrai	V–VI (3)	20–22 (3)	24–25 (3)	34 (3)
P. incisum	V (12)	18–20 (12)	22–23 (12)	32 (12)
P. natalensis	IV–V (6)	18–20 (6)	22–25 (6)	33 (4)
P. neocaledonicus	IV (L)	14–15 (L)	23 (L)	—
P. springeri	III (17)	20–23 (12)	24–25 (14)	35–36 (15)

tudinal dorsal ridge and a lateral ridge on each side.

Spinous dorsal pterygiophores three (Fig. 4, upper), comprising only proximal–middle radials, distal radials absent (or perhaps fused in early ontogeny), the three crowded and all inclined acutely forward: the first broad along its entire length, its anterodorsal corner resting on back of occiput; the second quite narrow and closely embraced by the first and third; the third narrow anterodorsally, broadening substantially posteroventrally (proximally). The three pterygiophores inserting together anterior to the fourth neural spine, which is subequal in length to the fifth and succeeding neural spines. Neural spines of the first two vertebrae absent and that of the third absent or greatly truncated; dorsomedial portions of the neural arches of the second and third vertebrae bent acutely forward to form horizontal processes that accommodate (and partially embrace) the proximal end of the modified pterygiophores. The first pterygiophore supporting the first spine in supernumerary and the second in serial association, the second pterygiophore supporting the second spine in supernumerary and the third in serial association, third pterygiophore supporting the third spine in supernumerary association and thus having no serially associated spine.

Color in life reddish brown, with faint darker blotches dorsolaterally and iridescent blue markings above and below lateral line (Fig. 5). First dorsal fin of male clear, that of female almost entirely black, except for most proximal portion. Second dorsal and anal fins of male clear proximally, faintly yellowish in middle, and light blue at distal edge. Eye with a yellow–orange horizontal stripe across middle, and a broad, dark reddish cap dorsally.

Habits.—Underwater photos taken by R. H. Kuiter at Flores, Indonesia show both male (Fig. 5, upper) and female (Fig. 5, lower) perched tripod-like on their pelvic fins, with the dorsal fin erected. The dorsal fin is flicked rapidly up and down, probably for territorial and/or mating displays. Such signaling was observed by Kuiter (pers. comm.) at the time he took the photos and by the second author when collecting specimens in the Philippines.

Distribution.—Known from the central Philippines, the island of Flores in Indonesia, and probably Palau in depths of 18–73 m. This species occurs in shallower water than any of the other species of the *Pteropsaron/Osopsaron* complex. Other species have been collected in bottom trawls, but all the known specimens of *P. springeri* were collected by divers with rotenone. The specimen photographed at 50–60 m depth at Turtle Cove, Palau (Omura, 1993) and identified only as Percophidae sp. was not collected, but it appears to be *P. springeri*.

Etymology.—Named for our colleague, Victor G. Springer, who first collected this species and recognized it as representing an undescribed species. In recognition of his many contributions to our knowledge of Indo-Pacific reef fishes, and his unselfish and steadfast dedication to the growth and well being of the collections and the advancement of ichthyology at the National Museum of Natural History.

Comparisons.—As discussed above, we do not believe that the family Percophidae as currently recognized (Nelson, 2006) is a natural group and propose instead that the closest relatives of its subfamily Hemerocoetinae are the Creediidae and Trichonotidae.

Based on the distinctive configuration of the spinous dorsal-fin complex, the new species clearly belongs to the ''*Pteropsaron*-like'' hemerocoetines, which currently comprise 18 species originally placed in ten genera: *Acanthaphritis, Branchiopsaron, Dactylopsaron, Enigmapercis, Hemer-*

ocoetes, Matsubaraea, Osopsaron, Pteropsaron, Spinapsaron, and *Squamicreedia*. Suzuki and Nakabo (1996) placed *Branchiopsaron* and *Spinapsaron* in the synonymy of *Acanthaphritis*, reducing the count to eight genera. Within this group, the new species is most closely related to *Acanthaphritis*, *Osopsaron*, and *Pteropsaron*, with which it shares an anterior, spine-like extension from the ventrolateral corner of the head of the maxilla. *Dactylopsaron, Enigmapercis, Matsubaraea,* and *Squamicreedia* lack such a spine—we do not treat these four genera further here. The relationship of *Hemerocoetes* (containing five species found only in New Zealand) to the other seven genera remains uncertain, because it lacks a spinous dorsal fin. It does, however, share a maxillary spine with *Acanthaphritis*, *Osopsaron*, and *Pteropsaron*. The latter three genera, containing 13 species, are very similar, and the distinction between them is not clear. Suzuki and Nakabo (1996:447) stated that *Acanthaphritis* is ''clearly separated from *Pteropsaron* and *Osopsaron* in having a barbel on the snout tip in males and five dorsal spines; *Osopsaron* differs from *Pteropsaron* in having scales on the cheek.'' These characters are all problematic. A barbel is easily lost, as apparently happened in the lectotype of *Acanthaphritis grandisquamis* (Suzuki and Nakabo, 1996:443), and if present only on males does not help to identify females. The number of dorsal spines varies among the species and does not seem to distinguish them as discrete groups. The cheek is covered with scales in all four species of *Acanthaphritis*: *A. barbata*, *A. grandisquamis, A. ozawai*, and *A. unoorum*, and in *Pteropsaron verecundum*. Jordan and Starks (1904:600) put *P. verecundum* in a new genus, *Osopsaron*, which they distinguished from *Pteropsaron* by the cheek scales and by the low fins. The remaining species all lack cheek scales (*P. springeri* has two scales under the eye, but most of the cheek is naked), and all but one (*Osopsaron karlik*) have elongate dorsal spines in males. We confirmed the sexual basis of the long vs. short dorsal spines in two species (*Pteropsaron springeri*, USNM 28885, and *P. natalensis*, USNM 345625) by opening the body cavity. In both cases, the specimen with elongate dorsal spines had a testis, and the specimen with short dorsal spines had eggs. We did not examine other species but assume the condition is similar. Two specimens of *Osopsaron verecundum* (USNM 160488, with short dorsal spines) both appeared to contain testes, indicating that males of this species do not have elongate dorsal spines.

A definitive solution to the generic placement of these species will require further morphological and phylogenetic analysis, which is beyond the scope of this paper, but we make provisional assignments based on the following characters. The four species of *Acanthaphritis* have cheek scales, a snout barbel in males, and short dorsal spines in both sexes; we recognize the genus on the basis of these characters. *Osopsaron verecundum* has cheek scales but apparently lacks a snout barbel in males, and we retain this species in *Osopsaron*, which stands somewhat between *Acanthaphritis* and the other species. The remaining eight species lack cheek scales, and all but one have elongate dorsal spines in males. The exception is *Osopsaron karlik*, which we provisionally retain in *Osopsaron* based on the short dorsal spines, although it differs from the type species, *O. verecundum*, in lacking cheek scales. The remaining seven species, including the one described here, are placed in *Pteropsaron*, based on the elongate dorsal spines. Two of them, *Pteropsaron evolans* and *P. heemstrai*, have elongate, unbranched anal rays. The remaining species have branched anal rays that are not notably elongate. Nevertheless, we treat them all here as *Pteropsaron*.

As noted above, all species of the *Pteropsaron*-like hemerocoetines that we have examined have the dorsal spines crowded and supported by equally crowded pterygiophores that comprise only proximal–middle radials. Adjacent pterygiophores vary little in breadth, and, starting with the first, each pterygiophore supports a spine in supernumerary and serial association, until the last, which has no serially associated spine. In the species of *Osopsaron* and *Pteropsaron*, we have observed three distinct patterns of pterygiophore/neural spine association. In most species, the very small, four- to seven-pterygiophore complex inserts between neural spines 5 to 7, its posterodorsally sloping proximal base resting on the distal end of the anterodorsal surface of neural spine 6, which is bent slightly backward relative to the others. In *P. heemstrai* (Fig. 4, lower), the larger, six-pterygiophore complex inserts between the shortened neural spine of vertebra 4 and that of vertebra 6, which is of normal length; its posterodorally sloping proximal base rests along most of the anterodorsal surface of the posteriorly inclined neural spine 5 and that of the distal end of neural spine 6. The most highly modified condition is seen in the three-pterygiophore complex of *P. springeri* (Fig. 4, upper), wherein the spinous dorsal fin is placed far forward, as described above. Here the relatively large, three-pterygiophore complex is inclined sharply forward between the posterodorsal corner of the occiput and the fourth neural spine, the first three neural spines are absent, and the dorsomedial portions of the second and third neural arches are bent acutely forward with the proximal bases of the pterygiophores resting directly over or between them.

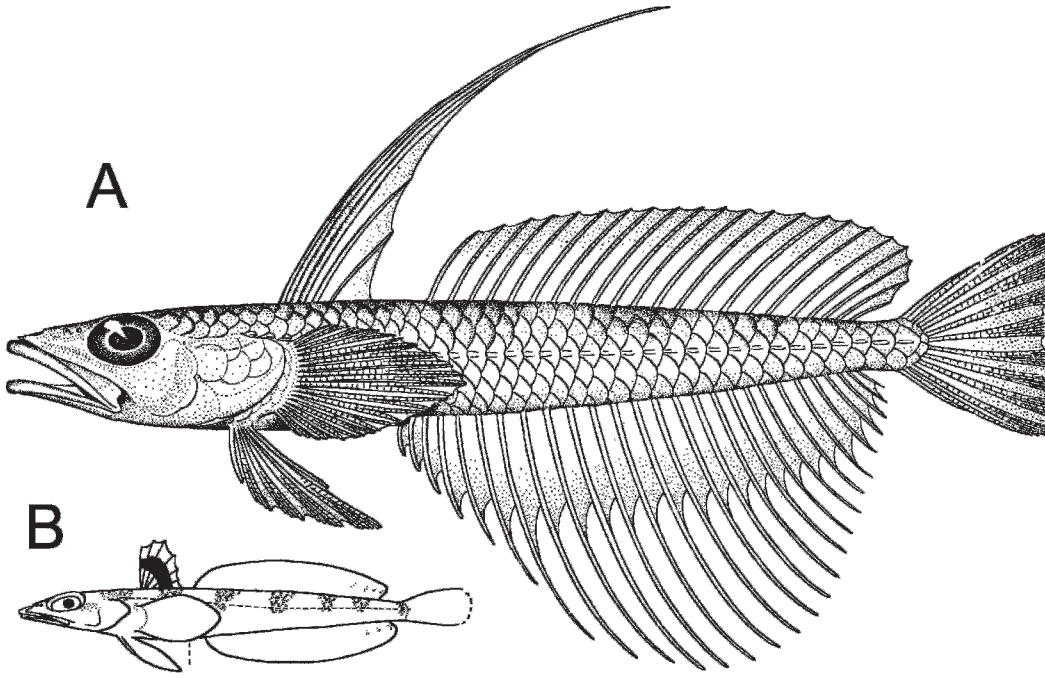

Fig. 6. *Pteropsaron evolans*. (A) Male, from Jordan and Snyder, 1902:fig. 2; (B) female, from Nakabo, 2002:1065.

Pteropsaron evolans **Jordan and Snyder, 1902**
Figure 6

Pteropsaron evolans Jordan and Snyder, 1902:471, fig. 2.

Material examined.—USNM 50008, holotype, male, 60.5 mm, Japan, Sagami Bay, 60 fm (110 m).

Diagnosis.—D. VI, 21–22; A. 25–27; vertebrae 35. No dorsal operculum on eye. Cheek naked. Dorsal spines elongate in males (Fig. 6A), first four spines progressively longer, fourth spine the longest, fifth and sixth much shorter, longest spine 48% SL in holotype, the fin unpigmented; dorsal spines in females short, reaching anterior end of soft dorsal fin when depressed, fin with a black band at about mid-length (Fig. 6B); rays of soft dorsal fin unbranched. Middle anal rays elongate in male, all anal rays unbranched. To 70 mm SL (Masuda et al., 1984:290).

Distribution.—Japan, from Sagami Bay to Tosa Bay.

Remarks.—Senou et al. (1998) photographed male and female specimens at depths of 17–70 m. The female was described as having ''a yellow stripe running from the snout tip to the base of the caudal fin on the middle of the side of the body, 7 orange–red vertical bands from the occipit [sic] to the caudal peduncle, and a broad black band on the first dorsal fin'' (Nakabo, 2002:1587). The male is reddish with about six broad bars of deeper red and areas of light bluish reflections dorsally and on the head.

Pteropsaron formosensis **(Kao and Shen, 1985)**
Figure 7

Osopsaron formosensis Kao and Shen, 1985:175, figs. 1, 2.

Diagnosis.—D. V, 20–22; A. 24–27; P_1 18–19; LL scales 32–35. Dorsal operculum on eye. Cheek

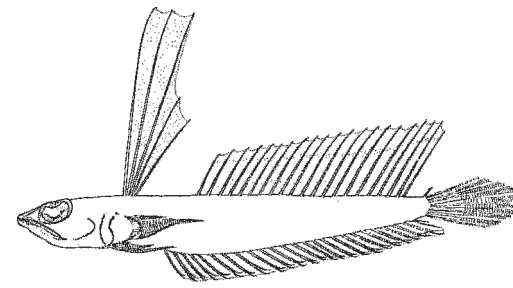

Fig. 7. *Pteropsaron formosensis*, from Kao and Shen, 1985:fig. 2.

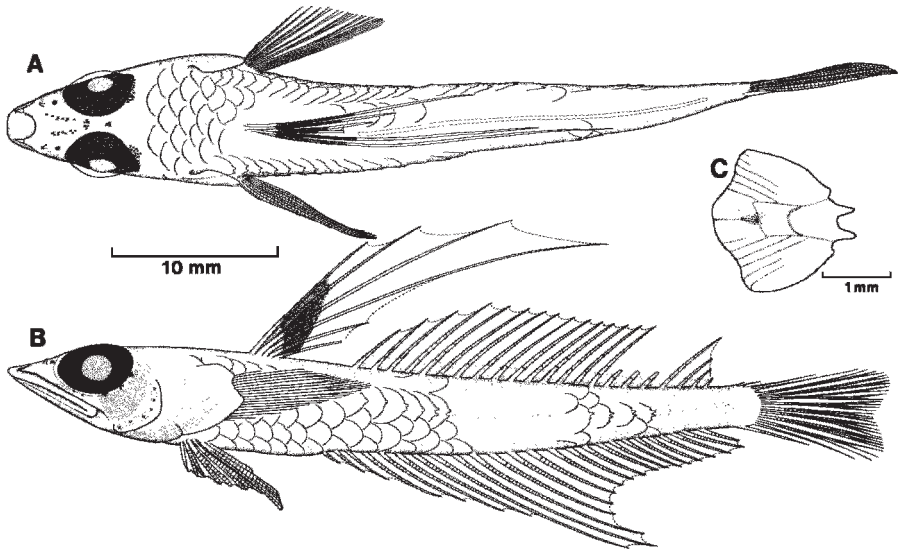

Fig. 8. *Pteropsaron heemstrai*, from Nelson, 1982:fig. 1.

naked. Dorsal spines elongate, apparently in both sexes, first three approximately equal length, fourth and fifth much shorter, longest spine 40–55% SL, membrane black. Soft dorsal rays increase in length from anterior to posterior. Anal fin lower than dorsal, all rays branched. In life with two yellow stripes on side of body, an oblique yellow bar on opercle, two yellow stripes on dorsal fin, yellow stripe on distal part of anal fin, yellow stripe on upper and lower caudal rays, yellow spot on pectoral base, and narrow yellow bars on posterior end of preopercle and behind eye (Suzuki et al., 1996). To 55 mm SL (Nakabo, 2002:1066).

Distribution.—Taiwan and southern Japan.

Remarks.—No material examined in this study. The type series consists of 20 specimens. The longest dorsal spine reportedly measured 40.2–54.9% TL. The authors did not give the sex of the specimens, but the fact that all of them had elongate dorsal spines suggests little or no sexual dimorphism in this character. We place the species in *Pteropsaron* because of the long dorsal spines. Described from Taiwan, the species was recorded from Japan by Suzuki et al. (1996), who also provided a photograph of a fresh specimen.

***Pteropsaron heemstrai* Nelson, 1982**
Figure 8

Pteropsaron heemstrai Nelson, 1982:2, figs. 1, 2.

Material examined.—SAIAB 15927, paratype, female, 38.3, South Africa, Natal, 30°20′S, 30°44′E, 143 m, A. D. Connell; USNM 368829, male, 55, Indian Ocean, Somalia, 11°24′N, 51°35′E, 75–175 m, ANTON BRUUN cr. 9, sta. 463, 17 Dec. 1964.

Diagnosis.—D. V–VI, 20–22; A. 24–25; pectoral rays 19; vertebrae 34. No dorsal operculum on eye. Cheek naked. Dorsal spines elongate in males, the first four spines progressively longer, the fourth spine the longest, the fifth and sixth much shorter; longest dorsal spine 49% SL; dorsal fin of male with a black band on middle portion, basal and distal parts pale; dorsal fin of female short, entirely black. Anal rays unbranched, middle rays elongate in male. Body with six faint dorsal bands. To 55 mm SL.

Distribution.—Western Indian Ocean, South Africa, and Somalia.

Remarks.—This species resembles *P. evolans* in the following characters: dorsal operculum on eye absent; dorsal spines much longer in males than females; first four dorsal spines in males progressively longer, with the fourth spine the longest; anal rays unbranched, with middle rays elongate in males. The Somalian specimen has slightly fewer dorsal spines (V vs. VI), dorsal rays (20 vs. 21–22), and anal rays (24 vs. 25) than either of the South African types reported by Nelson (1982), but with only one specimen available, we cannot judge the significance of the difference.

***Pteropsaron incisum* Gilbert, 1905**
Figure 9

Pteropsaron incisum Gilbert, 1905:647, pl. 87.

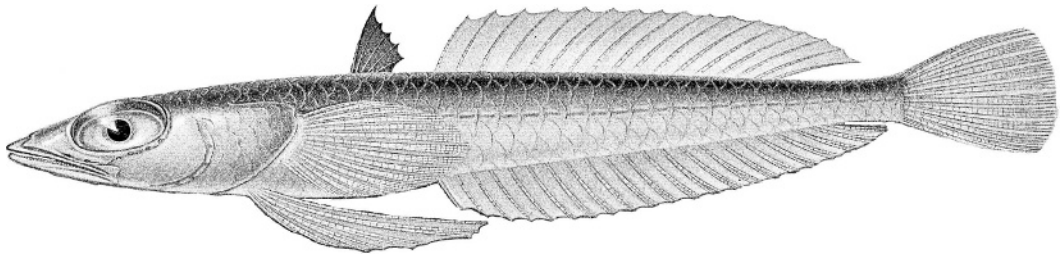

Fig. 9. *Pteropsaron incisum*, from Gilbert, 1905:pl. 87.

Material examined.—BPBM 24260, male, 47 mm, Hawaiian Islands, Molokai, Pailolo Channel, 21°02′N, 156°46′W, 216 m, TOWNSEND CROMWELL, cr. 40, sta. 66, 19 Nov. 1968; BPBM 24871, male, 37 mm, Hawaiian Islands, Molokai, Kaiwi Channel, 21°08′N, 157°30′W, 156 m, TOWNSEND CROMWELL, cr. 61, sta. 100, 31 Oct. 1972; HLIP 838, 2 females, 22–24.5 mm, Hawaiian Islands, Penguin Bank, south of Molokai, 21°09.6′N, 157°25.1′W, 183 m, TOWNSEND CROMWELL, cr. 35, sta. 33, 7 April 1968; HLIP 839, 6 males, 28.5–32 mm, same data as HLIP 838; USNM 51621, holotype, female, 41 mm, Hawaiian Islands, Laysan Island, 173–220 fm (317–403 m), ALBATROSS sta. 3957, 22 May 1902; USNM 51659, paratype, ca. 40 mm, same data as holotype; USNM 126132, paratype, female, 31 mm, Hawaiian Islands, Laysan Island, 116–168 fm (212–307 m), ALBATROSS sta. 3966, 23 May 1902; BPBM 23681, 12 males, 38–51.5 mm, Hawaiian Islands, Maui, Pailolo Channel, 21°02′N, 156°45′W, 241–254 m, TOWNSEND CROMWELL cr. 35, sta. 15, 31 Oct. 1967.

Diagnosis.—D. V, 18–20; A. 22–23; P_1 17–18; vertebrae 32. No dorsal operculum on eye. Cheek naked. Dorsal spines elongate in males, first spine slender, much longer than others, reaching posterior part of second dorsal fin when depressed (24–50% SL); second and third spines much shorter, reaching about half way to origin of second dorsal fin when depressed; fourth spine somewhat longer, reaching almost to second dorsal fin when depressed; fifth spine a little longer, reaching origin of second dorsal fin; fin unpigmented. Dorsal spines short in females, reaching about to origin of second dorsal fin; fin black. Anal rays unbranched. Anal fin and second dorsal fin relatively low, rays about equal in length. To ca. 52 mm SL.

Distribution.—Hawaiian Islands.

Remarks.—Parin (1985:360) examined specimens from BPBM 23681, 24260, and 24871 (as well as 23727, which we did not examine) and claimed that they represented an undescribed species. The meristic characters of these specimens are identical to those of the types of *P. incisum*, however, and we can find no other differences aside from the longer dorsal spines, a character known to be sexually dimorphic. We therefore conclude that they are males of *P. incisum*.

***Osopsaron karlik* Parin, 1985**
Figure 10

Osopsaron karlik Parin, 1985:358, fig. 1.

Material examined.—USNM 265048, 2 paratypes, 27–28 mm, Nazca Ridge, 25°27′S, 85°05.5′W, 330 m, 6 Oct. 1980, S. D. Chistikov.

Diagnosis.—D. V–VI, 18–20; A. 22–23; P_1 19–21; vertebrae 32. Dorsal operculum on eye. Cheek naked. Dorsal spines short, about equal in length, reaching origin of second dorsal fin when depressed; a large black spot in middle of fin, distal and proximal parts pale; second dorsal fin relatively low, rays about equal in height. Anal fin relatively low, rays about equal in height, all rays branched. To 42 mm SL (Parin, 1985:358).

Distribution.—Nazca Ridge, southeastern Pacific.

Remarks.—The 11 known specimens all have short dorsal spines, suggesting that the character is not sexually dimorphic in this species. It is also possible that they are all females; Parin did not report the sex of his specimens. The black spot on the dorsal fin is characteristic of females of some other species. We opened the body cavity of one of the two specimens available to us (USNM 265048) but were unable to determine the sex.

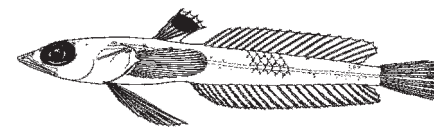

Fig. 10. *Osopsaron karlik*, from Parin, 1985:fig. 1.

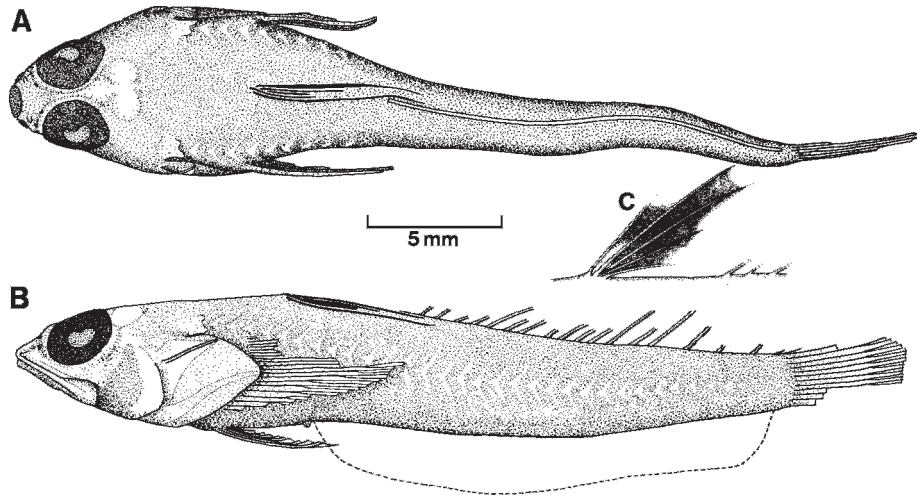

Fig. 11. *Pteropsaron natalensis*, from Nelson, 1982:fig. 3.

We take the conservative course and provisionally retain the species in *Osopsaron* because of the short dorsal spines.

Pteropsaron natalensis (Nelson, 1982)
Figure 11

Osopsaron natalensis Nelson, 1982:4, figs. 3, 4.

Material examined.—SAIAB 15062, 2 paratypes, 21.4–26.8 mm (larger specimen cleared and stained in alizarin), South Africa, Natal, off Kosi Bay, 13 Nov. 1979, A. D. Connell; USNM 345625, 2, 27 mm female, 35 mm male, off Gypsy Hill, Kwazulu–Natal, South Africa, 27°47′24′′S, 32°38′54′′E, 65–70 m, MEIRING NAUDE, 8 June 1988; USNM 368828, female, 31.8 mm, off Somalia, 11°24′N, 51°35′E, 75–175 m, ANTON BRUUN cr. 9, sta. 463, 17 Dec. 1964.

Diagnosis.—D. IV–V, 18–20; A. 22–25; P_1 18–19; vertebrae 33. Dorsal operculum on eye present. Cheek naked. Snout short and broadly rounded. In male, first three dorsal spines elongate, about equal in length, reaching posterior part of second dorsal fin when depressed; fourth and fifth spines much shorter, the fifth the shortest, reaching anteriormost rays of second dorsal fin when depressed; fin black; rays of second dorsal fin relatively long, posteriormost rays as long as or longer than anterior rays, their tips reaching slightly beyond midpoint of caudal fin when depressed. Dorsal spines of female short, in specimen examined their tips not reaching origin of second dorsal fin when depressed; fin black. Anal-fin rays shorter than those of second dorsal fin, their tips not reaching caudal fin when depressed; all rays branched. To 35 mm SL.

Distribution.—East African coast from Somalia to South Africa.

Remarks.—The three type specimens are all in poor condition, with damaged fins. The illustration of the holotype (Nelson, 1982:fig. 3) shows the second and third dorsal spines reaching past the origin of the second dorsal fin, suggesting that it may be a male with damaged spines. The anal fin in the holotype is completely missing, and the dorsal rays are all broken, with some missing. Nelson gives a vertebral count of 35 but then states that ''the stained paratype appears to have 7 precaudal and 26 caudal vertebrae,'' which add up to 33, not 35. All three of the USNM specimens have 33 vertebrae. Five of the six known specimens have five dorsal spines, the exception being the stained paratype, which appears to be intact but has only four spines. Our Somalian specimen has slightly fewer dorsal (18 vs. 19–20) and anal (22 vs. 23–25) rays than the South African specimens, but the small size of the sample precludes any conclusions about its significance. We place this species in *Pteropsaron* because of the long dorsal spines in the male. The species is distinguished by its short, broadly rounded snout.

Pteropsaron neocaledonicus Fourmanoir and Rivaton, 1979
Figure 12

Pteropsaron neocaledonicus Fourmanoir and Rivaton, 1979:419, fig. 11.

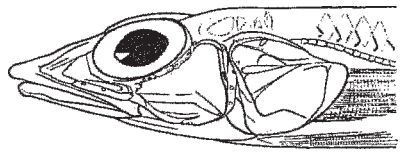

Fig. 12. *Pteropsaron neocaledonicus*, from Fourmanoir and Rivaton, 1979:fig. 11.

Diagnosis.—D. IV, 14–15; A. 23; P_1 18. To 45 mm SL.

Distribution.—New Caledonia, south of the Isle of Pines, 300 m.

Remarks.—No material examined in this study. This is a poorly known species; only a few meristic characters, a brief color description, and a drawing of the head were presented. We were unable to locate the specimens at the MNHN, where they were catalogued. Parin (1985:360) expressed doubt that the species belonged in *Pteropsaron* or even in the Hemerocoetinae, but gave no reasons. The illustration, however, looks much like *Pteropsaron*, and we see no basis for excluding *P. neocaledonicus* from the *Pteropsaron/Osopsaron* group. The illustration shows no evidence of cheek scales, and, although the length of the dorsal spines is not mentioned, we retain it in *Pteropsaron*, where it was originally placed.

Osopsaron verecundum (Jordan and Snyder, 1902)

Figure 13

Pteropsaron verecundum Jordan and Snyder, 1902:472, fig. 3.

Osopsaron verecundum, Jordan and Starks, 1904:600.

Material examined.—USNM 50009, holotype, 40.3 mm, Japan, Suruga Bay, ALBATROSS; USNM 160487, 2, 28.8–48.3 mm, southwestern Japan, off Goto Islands, 32°28′50″N, 128°34′40″E, 139 fm (254 m), ALBATROSS sta. 4900, 10 Aug. 1906; USNM 160488 (2 males, 46.5–49 mm, southwestern Japan, off Goto Islands, 32°32′N, 128°32′50″W, 95–106 fm (174–194 m), ALBATROSS sta. 4893, 9 Aug. 1906.

Diagnosis.—D. IV–V, 19–20; A. 23–24; vertebrae 32–33. No dorsal operculum on eye. Cheek scaled. Dorsal spines short, not reaching origin of second dorsal fin when depressed; fin black. Second dorsal and anal fins relatively low, anterior and posterior rays about the same length, anal rays branched. To 60 mm SL (Masuda et al., 1984:290).

Distribution.—Southern Japan.

Remarks.—This is the type species of *Osopsaron* and differs from all the other species in the *Osopsaron/Pteropsaron* group in possessing a full complement of cheek scales. In this it resembles the species of *Acanthaphritis* but differs in lacking a snout barbel in the male. The five specimens examined all have a short dorsal fin; two of them (USNM 160488) were examined internally and appeared to be males, indicating a lack of sexual dimorphism in the dorsal spines of this species.

AN ABBREVIATED KEY TO THE GENERA AND SPECIES OF TRICHONOTIDAE

1a. Lower jaw projects beyond upper ..... Trichonotinae (not treated further)
1b. Upper jaw projects beyond lower 2
2a. Row of cirri bordering lower jaw; spinous dorsal fin absent ..... Creediinae (not treated further)
2b. Lower jaw without cirri; spinous dorsal fin usually present (Hemerocoetinae) ... 3
3a. Anterior end of maxilla without a spine ..... *Dactylopsaron, Enigmapercis, Matsubaraea, Squamicreedia* (not treated further)
3b. Anterior end of maxilla with a spine 4
4a. A single dorsal fin with no spines ..... *Hemerocoetes* (New Zealand only, not treated further)
4b. Two dorsal fins 5
5a. Cheek scaled; dorsal spines short in both sexes, not reaching or barely

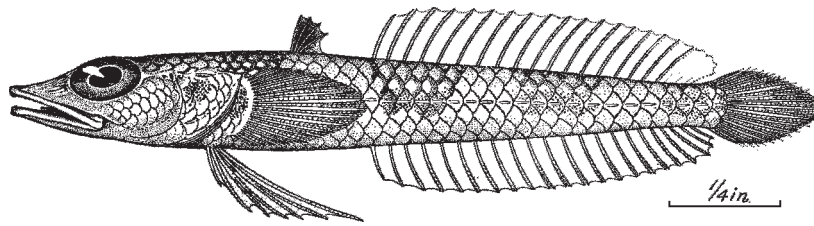

Fig. 13. *Osopsaron verecundum*, from Jordan and Snyder, 1902:fig. 3.

reaching origin of second dorsal fin when depressed 6
5b. Cheek naked; males of most species with some dorsal spines elongate, extending well beyond origin of second dorsal fin when depressed 7
6a. Fleshy barbel at tip of snout in males ..... *Acanthaphritis* (not treated further)
6b. Males without a fleshy barbel at tip of snout ..... ***Osopsaron verecundum*** (Japan)
7a. Origin of spinous dorsal fin well anterior to base of pectoral fin ..... ***Pteropsaron springeri*** (western Pacific)
7b. Origin of spinous dorsal fin above or behind base of pectoral fin 8
8a. Anal-fin rays unbranched, some elongate 9
8b. Anal-fin rays branched, not elongate 10
9a. Dorsal rays 20–22, anal rays 24–25, vertebrae 34 ..... ***Pteropsaron heemstrai*** (western Indian Ocean)
9b. Dorsal rays 21–22, anal rays 25–27, vertebrae 35 ..... ***Pteropsaron evolans*** (Japan)
10a. Dorsal rays 14–15 ..... ***Pteropsaron neocaledonicus*** (New Caledonia)
10b. Dorsal rays 18 or more 11
11a. Dorsal spines short in all known specimens, when depressed barely reaching origin of second dorsal fin, first dorsal fin with a discrete black spot on distal half ..... ***Osopsaron karlik*** (Nazca Ridge)
11b. Males with elongate dorsal spines, when depressed reaching to or beyond middle of soft dorsal fin 12
12a. No dorsal operculum on eye ..... ***Pteropsaron incisum*** (Hawaii)
12b. Eye with a dorsal operculum 13
13a. Snout short, broadly rounded in dorsal profile; dorsal rays 18–20, anal rays 22–25 ..... ***Pteropsaron natalensis*** (western Indian Ocean)
13b. Snout more acute; dorsal rays 20–22, anal rays 24–27 ..... ***Pteropsaron formosensis*** (Taiwan to Japan)

Acknowledgments

We thank the following for loan of specimens: P. Heemstra (SAIAB), M. McGrouther (AMS), B. Mundy (NMFS, Honolulu), J. Randall and A. Suzimoto (BPBM), and G. Allen (WAM). The cooperation and assistance of R. Winterbottom (ROM) in collecting the Philippine paratypes was invaluable. Figure 2 was drawn by P. Hollingsworth, Figure 4 by K. Darrow. J. Mounts helped in editing the figures. The photographs in Figure 5 were taken by R. Kuiter. J. Nelson advised us concerning priority of the family name Trichonotidae.

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