

## *Myopsaron nelsoni*, a New Genus and Species of Sandburrowers (Perciformes: Trichonotidae: Creediinae) from the Ogasawara Islands, Japan

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**Abstract** A new genus and species of the trichonotid subfamily Creediinae, *Myopsaron nelsoni*, is described based on 43 specimens, including 20 type specimens (22.1–36.3 mm in standard length), collected by sledge nets at the depths of 55–99 m off southern Chichi-jima Island, Ogasawara Islands, Japan. It is readily distinguished from the other genera of the subfamily by having some unique, apparently autapomorphic, features, e.g., the globular fleshy extension at the tip of upper jaw, discontinuous lateral line on body, higher number of precaudal vertebrae than caudal vertebrae ( $24-26+18-21=43-45$  vertebrae), and edentate premaxilla. *Myopsaron* is highly specialized, but, as well as *Creedia*, it appears to be nested within the basal creediines since it lacks several specializations found in all other creediines exclusive of the most primitive member, *Schizochirus*.

**Key words:** *Myopsaron nelsoni*, New genus and species, Creediinae, Ogasawara Islands.

Fishes of the Indo-Pacific trichonotid subfamily Creediinae (*sensu* Smith and Johnson, 2007) are small, slender sandy-bottom dwellers, comprising about 16 species belonging to the following seven genera (Nelson and Randall, 1985; Yoshino *et al.*, 1999; Nelson, 2006): *Apodocreeidia*, *Chalixodytes*, *Creedia*, *Crystalloodytes*, *Limnichthys*, *Schizochirus*, and *Tewara*. Although similar to their allies (i.e., trichonotines and hemerocoetines), the creediines are readily distinguished from the other trichonotids by several characters, e.g., upper jaw with fleshy extension, slightly protruding eye with infolding of cornea at orbit margin, and lateral line descending abruptly or gradually to ventral portion of caudal-fin base (Nelson, 1985). The creediines are primarily found on the flat, fine sandy bottoms of shallow coastal waters, but some (e.g., *Limnichthys rendahli* and *Creedia haswelli*) have been captured from more than 100 m depth (Nelson, 1978, 1983).

During a biological survey of the Ogasawara Islands and the adjacent waters carried out by TR/V *Seiyo-maru* of Tokyo University of Fish-

eries (now Tokyo University of Marine Science and Technology) in June 1995, 43 specimens of an unusual creediine fish (Figs. 1 and 2) were captured by sledge nets at depths of 55–99 m off the southern coast of Chichi-jima Island. Subsequently, a graduate-course student of the university on the cruise, T. Kanazawa (now at Oita Prefecture, Japan), kindly provided me an opportunity to examine these specimens. My research revealed that the specimens represented a new species that could not be placed in any existing genera. The creediine fish, herein described as new genus and species, is readily distinguished from all known members of the subfamily by several unique characters, i.e., globular-shaped fleshy extension at the tip of upper jaw, discontinuous lateral line on body, higher number of precaudal vertebrae than caudal vertebrae (viz.  $24-26+18-21=43-45$  vertebrae), and edentate premaxilla.

This species has been noticed briefly by Shimada (2002: 1588). He noted “Some specimens... have been collected from Ogasawara and Ryukyu Islands,” but mention of the Ryukyu

Islands was in error, and the species is hitherto known only by the Ogasawara specimens noted above.

### Materials and Methods

Institutional abbreviations follow Leviton *et al.* (1985). All fish lengths given are standard lengths (SL). Measurements were made with calipers under dissecting microscopes to the nearest 0.01 mm. The methods for measurements followed those of Hubbs and Lagler (1958), with exceptions given below (the snout tip refers to the mid-anteriormost point of the fleshy extension at the anterior tip of the upper jaw): body depth was measured at the dorsal-fin origin; pectoral- and pelvic-fin lengths were represented by the length of the longest ray of the respective fin; preanal and prepelvic length were measured from the snout tip to the base of the first segmented anal-fin ray and pelvic-fin spine, respectively; preanus length was measured from the snout tip to the anus; caudal-peduncle depth was measured at the anterior base of the anteriormost procurvent ray of the caudal fin. All fin ray elements were counted, including the uppermost rudimentary ray of the pectoral fin and the ultimate simple ray of the dorsal and anal fins. Count of longitudinal scales is the number of oblique scale rows (anterodorsal to posteroventral) and is taken from the anteriormost lateral-line scale posteriorly to the mid-base of the caudal fin (=posterior margin of hypural plate). Transverse scales were counted in two ways: upper transverse scales are the number of scale rows between the lateral line and the origin of the dorsal fin; lower transverse scales are the number of scale rows between the lateral line and the origin of the anal fin. Predorsal scales included all scales along the pre-dorsal midline. Gill rakers included the rakers on the outer surface of the first arch including all rudiments; they are given in the text in the form of the rakers on the upper arch (=epibranchial 1)+ lower arch (=ceratobranchial 1+hypobranchial 1). Osteological features were observed from radiographs and specimens cleared and counter

stained for bones and cartilages, following the methods of Dingerkus and Uhler (1977) or Potthoff (1984); precaudal vertebrae are the anterior vertebrae lacking a distinct haemal spine, whereas the others (including urostyle complex) were counted as caudal vertebrae. Osteological terminology followed those of Suda (1991, 1996), except as follow: intermuscular bones were identified as epineurals rather than epipleurals, following Johnson and Patterson (1993) and Patterson and Johnson (1995); anteriormost element of ethmoid region of skull was identified as vomer rather than prevomer; nomenclature of caudal skeleton elements followed that of Fujita (1989, 1990). Teeth on the lower jaw of the new species were quite minute and difficult to discern, and were confirmed in the cleared and stained specimens. Cephalic sensory canals were observed on the specimens stained with cyanine blue (see Saruwatari *et al.*, 1997). Sex was determined primarily externally (see "Sexual dimorphism" and Fig. 4), and, in some specimens, verified by internal examination. Observations and illustrations of osteological features and cephalic sensory systems were made using a dissecting microscope with a camera lucida. All photographs and line drawings were made by the author.

### *Myopsaron* gen. nov.

[New Japanese name: Nezu-sunaginpo zoku]

**Type species.** *Myopsaron nelsoni* Shibukawa, new species.

**Diagnosis.** The new genus *Myopsaron* is unique amongst the creediines in having: globular fleshy extension at tip of upper jaw; lateral line on body divided into 2 parts, with 3 (rarely 2 or 4) grooved scales in anterior series and 33–35 pored scales with distinct posterior lobe in posterior series; higher counts of precaudal vertebrae than caudal vertebrae (vertebral counts 24–26+18–21=43–45); edentate premaxilla. In addition, it is characterized by the following features: 14–16 dorsal-fin rays; 16–18 anal-fin rays; dorsal-plus anal-fin rays 30–34; both dorsal and anal fins restricted to posterior half of body; anal-fin

origin below first to third dorsal-fin rays; I, 3–4 (almost always I, 3) pelvic-fin rays; fourth pectoral- and first pelvic-fin rays greatly elongated and filamentous in male; all dorsal-, anal-, pectoral- and pelvic-fin segmented rays unbranched; 9 branched caudal-fin rays; 1 (rarely two) anal-fin pterygiophores anterior to first haemal spine; no teeth on vomer and palatine, 1 to 3 minute conical teeth on middle of dentary; 2 epurals; both anterior and posterior nares pore-like; suborbital skin fold discontinuous at midway; infraorbital canal shortly interrupted below eye; mandibular canal not joined with preopercular canal.

**Comparison.** *Myopsaron* is readily distinguished from the other creediines by the diagnostic characters listed above, particularly the globular fleshy extension at the tip of the upper jaw (vs. beak-like fleshy extension along most of length of upper jaw in the other creediids) and discontinuous lateral line on body (vs. continuous). *Myopsaron* is similar to *Creedia* in several meristic counts (e.g., number of fin rays, longitudinal scales, vertebrae and epurals) and coloration, but *Creedia* possesses vomerine teeth as well as a continuous lateral line and beak-like fleshy extension on the upper jaw (Fig. 5B).

**Etymology.** The new generic name *Myopsaron* is derived from the combination of the Greek words *mys*, meaning “mouse,” and *opsaron*, a term for a little fish, in reference to its unique globular-shaped fleshy extension at tip of upper jaw, resembling the nose of mouse. The gender is neuter.

***Myopsaron nelsoni* sp. nov.**

[New Japanese name: Nezu-sunaginpo]

(Figs. 1–4, 5C, 6–9, 10A and 11–20; Tables 1 and 2)

**Holotype.** NSMT-P 94886, 35.6 mm SL, male, off southern part of Chichi-jima Island, Ogasawara Islands, Japan (27°1.80'N, 142°12.22'E–27°1.87'N, 142°12.38'E), 51–68 m depth, sledge net, TR/V *Seiyo-maru*, 19 June 1995.

**Paratypes.** Total 19 specimens, 22.1–36.3 mm SL: AMS I.44840-001, 3 specimens (2 males and 1 female), 34.3–36.3 mm SL, collected with holotype; NSMT-P 94887, 8 specimens (7 males and 1 female), 33.8–36.3 mm SL, off southern Chichi-jima Island, Ogasawara Islands, Japan (27°1.74'N, 142°12.48'E–27°1.78'N, 142°12.62'E), 95–99 m depth, sledge net, TR/V *Seiyo-maru*, 19 June 1995; NSMT-P 94888, 2 specimen (1 male and 1 female: cleared, stained and dissected), 32.5–34.6 mm SL, same collecting data with holotype; NSMT-P 94895, 1 specimen (male, stained with alizarin red), 31.8 mm SL, collected with NSMT-P 94887; OMNH-P 35374–35376, 3 specimens (2 males and 1 female), 22.1–26.8 mm SL, collected with holotype; YCM-P 44207, 2 specimens (males), 33.1–33.4 mm SL, collected with holotype.

**Non-type materials.** Total 23 specimens, 16.6–22.7 mm SL: NSMT-PL 722, 4 specimens, 16.8–22.7 mm SL, collected with NSMT-P 94887; NSMT-PL 723, 17 specimens, 16.6–19.4 mm SL, collected with holotype; NSMT-PL 724, 2 specimens (cleared and stained), 16.6–18.2 mm SL, collected with holotype.

**Diagnosis.** See generic diagnosis.

**Description.** In the following description, the counts of the holotype are asterisked, and the frequency of each count is given in parentheses following the relevant count. Dorsal-fin rays 14 (3), 15\* (7) or 16 (7); anal-fin rays 16 (4), 17\* (12) or 18 (1); dorsal- plus anal-fin rays 30 (1), 31 (3), 32\* (8), 33 (4) or 34 (1); anal- minus dorsal-fin rays 0 (2), 1 (5), 2\* (8) or 3 (2); pectoral-

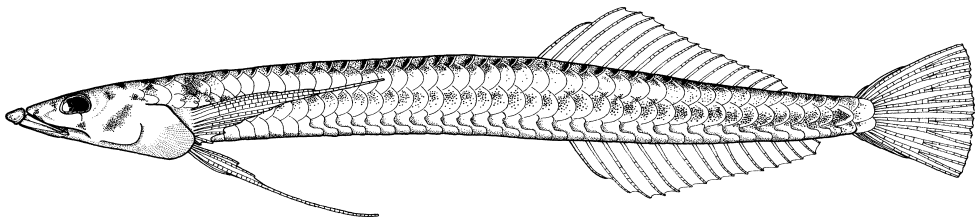


Fig. 1. *Myopsaron nelsoni* sp. nov., 1 of AMS I.44840-001, 34.3 mm SL, male, off southern Chichi-jima Island, Ogasawara Islands, Japan.



Fig. 2. Dorsal (A) and lateral (B and C) views of *Myopsaron nelsoni* sp. nov., 2 of AMS I.44840-001 in 70% ethanol-preserved condition. A–B) male, 34.3 mm SL; C) female, 36.3 mm SL.

fin rays 11 (4), 12\* (23) or 13 (5); pelvic-fin rays I, 3 (30) or I, 4 (1); branched caudal-fin rays 5+4\* (17); dorsal unbranched caudal-fin rays 2 (5) or 3\* (11), all unsegmented except for posterior most 1 (16) segmented ray; ventral unbranched caudal-fin rays 4\* (15) or 5(1), all unsegmented except for posteriormost 1\* (16) segmented ray; lateral line discontinuous, with 2 (1), 3\* (29) or 4 (1) grooved scales in anterior series located above pectoral-fin base, and 33 (12), 34\* (19) or 35\* (2) pored scales with distinct posterior lobe in posterior series running along ventral profile of body; longitudinal scales 42 (3), 43 (17), 44\* (8) or 45\* (1); predorsal scales 24 (3), 25 (8), 26\* (4), 27 (1) or 28 (1); upper transverse scales 3\* (32); lower transverse scales 1\* (30) or 2 (2); gill rakers on outer surface of first arch 0+9 (4), 0+10 (5), 0+11\* (15) or 0+12 (6); pseudobranchial filaments 3\* (27) or 4 (1).

Proportional measurements are given in Table 1. Body slender, cylindrical, somewhat compressed posteriorly. Snout pointed, gently sloping in dorsal profile. Upper jaw subequal to, and not projecting beyond, lower jaw, with a globular

fleshy extension at anterior tip (Figs. 1, 3 and 7). No teeth on premaxilla, vomer and palatine; dentary with 1–3 minute conical teeth. Maxilla extends posteriorly to beyond anterior margin of eye. Lower jaw bordered by uniserial row of short cirri, 10–14 (13 in holotype) per side. Tongue slender with pointed anterior tip, free from floor of mouth. Eye slightly protruding, as does the lens, with infolding of cornea around lens margin; eye without dorsal iris flap. Suborbital skin fold slightly covers lower margin of eye, discontinuous at midway (Figs. 3 and 7). Both anterior and posterior nares pore-like. All dorsal-, anal-, pectoral- and pelvic-fin rays segmented and unbranched. Anal fin originates at a vertical through base of first to third ray of dorsal fin. Pelvic fin inserts slightly anterior to base of pectoral fin. Fourth and first segmented rays longest in pectoral and pelvic fins, respectively. Fourth pelvic-fin segmented ray, if present, minute and rudimentary. Caudal fin near truncate. Scales on body cycloid; head naked; lateral-line scale row divided into two parts, i.e., anterior and posterior series comprising grooved scales

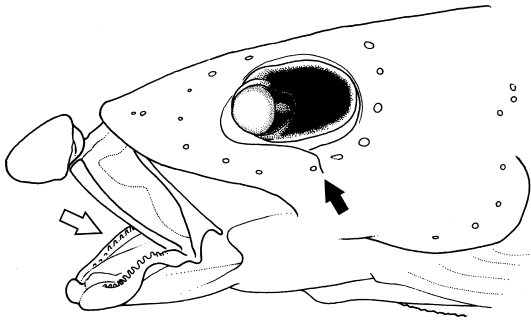


Fig. 3. Lateral view of head of *Myopsaron nelsoni* sp. nov., one of YCM-P 44207, 33.4 mm SL. Solid and open arrows indicate slit of sub-orbital skin fold and a row of short cirri on lower jaw, respectively.

and scales each with a distinct posterior lobe, respectively (Figs. 1, 4 and 5C).

Patterns of cephalic sensory canals are illustrated in Fig. 7. Oculoscapular canal with 7 pores; infraorbital canal interrupted below eye by thin skin fold, with 5 pores in anterior portion and 3 pores in posterior portion; preopercular canal with 6–7 pores; mandibular canal well separated from preopercular canal, with 2 pores.

**Osteology** (Figs. 8, 9, 10A and 11–19). Cranium elongated, its greatest width ca. 2.6 in its greatest length; interorbital area very narrow, its least width ca. 4.7 in greatest width of cranium; frontals with 2 pairs of large rounded orifices; vomer toothless, with pointed anterior margin; mesethmoid pointed anteriorly; lateral ethmoid with broad lateral projection, bearing cartilaginous articular facet for palatine anterolaterally; supraoccipital crest weakly developed; ventroanterior margin of basioccipital weakly notched. Infraorbital series completely encasing lower margin of orbit with 3 bones (including lachrymal) and small fourth infraorbital (dermosphenotic); second infraorbital tubular, much smaller than lachrymal; third infraorbital slightly smaller than lachrymal, with weakly developed posterior lobe. Premaxilla toothless; articular process for maxilla and postmaxillary process of premaxilla well developed, latter of which not indented dorsally; ascending process autogenous, interlocked with

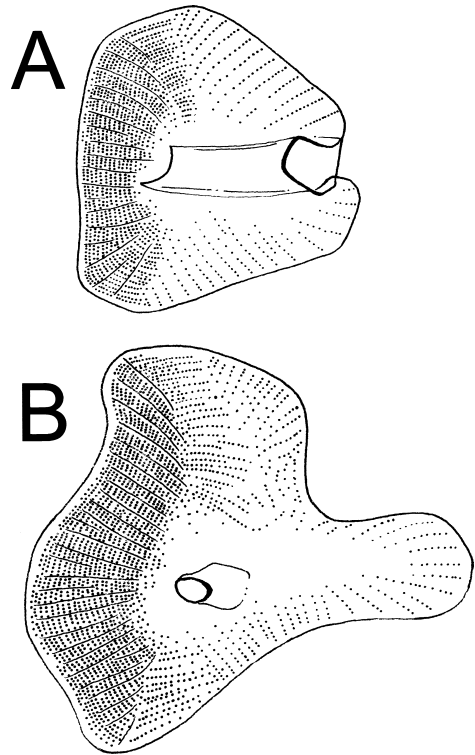


Fig. 4. Two types of lateral-line scales of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. A) grooved lateral-line scale in anterior series; B) pored lateral-line scale with distinct posterior lobe in posterior series.

main body of premaxilla anteriorly; ascending process very long, more than 2 times articular process in height; anterior end of ascending process broadened, flat and upturned, supporting cartilaginous tissue inside of globular extension of upper jaw; rostral cartilage well developed, attached to tip of ascending process; maxilla with 3 heads, anterior and posteroventral ones over articular process of premaxilla, and remaining (dorsal) one connected with vomer via ligament (maxillo-vomerine ligament) with a reel-shaped bony ossicle inside; posterior end of maxilla forked, its ventral arm longer and more slender than dorsal arm; dentary bears 1–3 minute conical teeth just posterior to mid-dorsal margin; coronoid process of dentary well developed, expanded dorsally and posteriorly, its dorsal tip



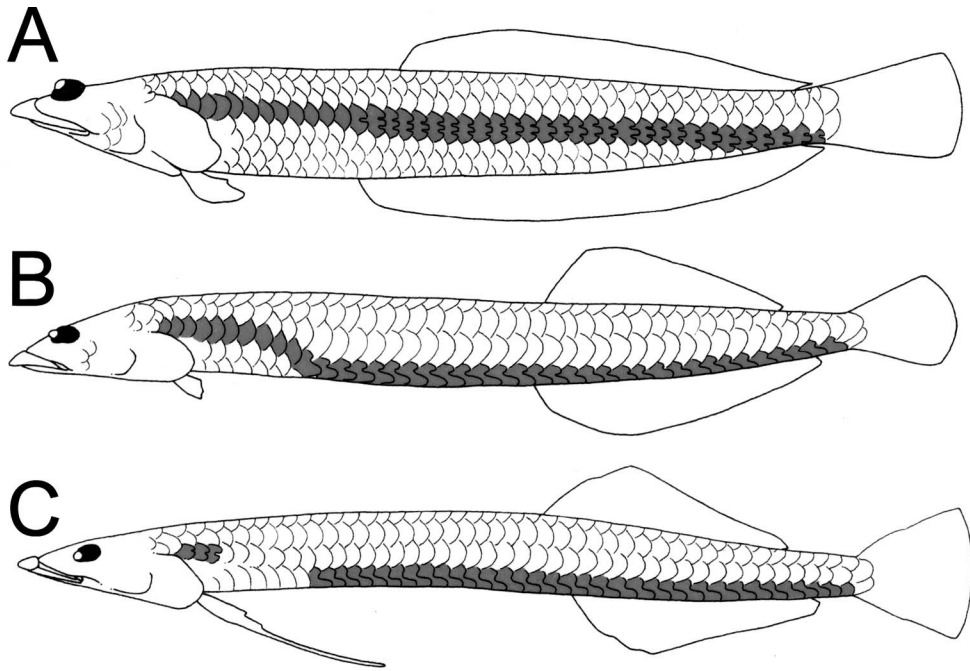


Fig. 5. Schematic illustration of three species of Creediinae, showing lateral-line scale rows (shaded area). A) *Limmichthys fasciatus*, NSMT-P 34378, 50.0 mm SL; B) *Creedia bilineata*, based on illustration of holotype by Shimada and Yoshino (1987, fig. 1) and 1 paratype examined (URM-P 6460, 24.5 mm SL); C) *Myopsaron nelsoni* sp. nov., one of AMS I.44840-001, 34.3 mm SL.

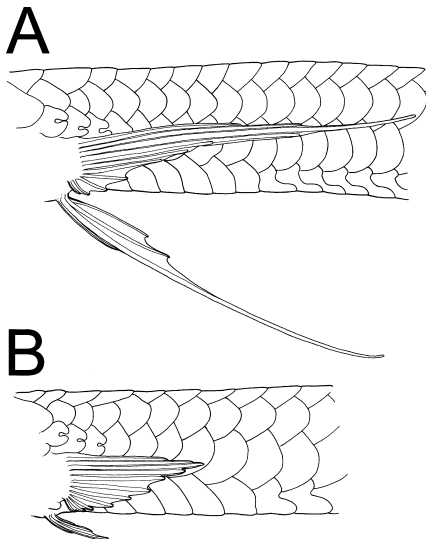


Fig. 6. Lateral views of anterior parts of bodies of *Myopsaron nelsoni* sp. nov., showing distinct sexual dimorphism in pectoral and pelvic fins. A) male, 1 of AMS I.44840-001, 34.3 mm SL; B) female, 1 of AMS I.44840-001, 36.3 mm SL.

curved dorsoposteriorly; large, elongate ovoid foramen at near mid-dorsal margin of dentary; articular not or slightly overlapping dentary; palatine toothless, forked posteriorly, its dorsal and ventral arms contact endopterygoid and ectopterygoid, respectively; endopterygoid largely free except for anterior contact with palatine, supporting ventral portion of eye socket; posterior tip of endopterygoid only slightly upturned, but well apart from skull; ectopterygoid very elongate, rod-like, with slightly broadened (but not fan-shaped) posterior end attaching to quadrate and metapterygoid; preopercle, interopercle and subopercle splintered; distinct, large open space circumscribed by margins of symplectic, hyomandibular, preopercle and quadrate (and symplectic well apart from preopercle). Ossified gill rakers developed on both sides of all gill arches; gill rakers on outer surface of first gill arch very low, small multispine laminae; remaining gill rakers raised as short stubs, fringed

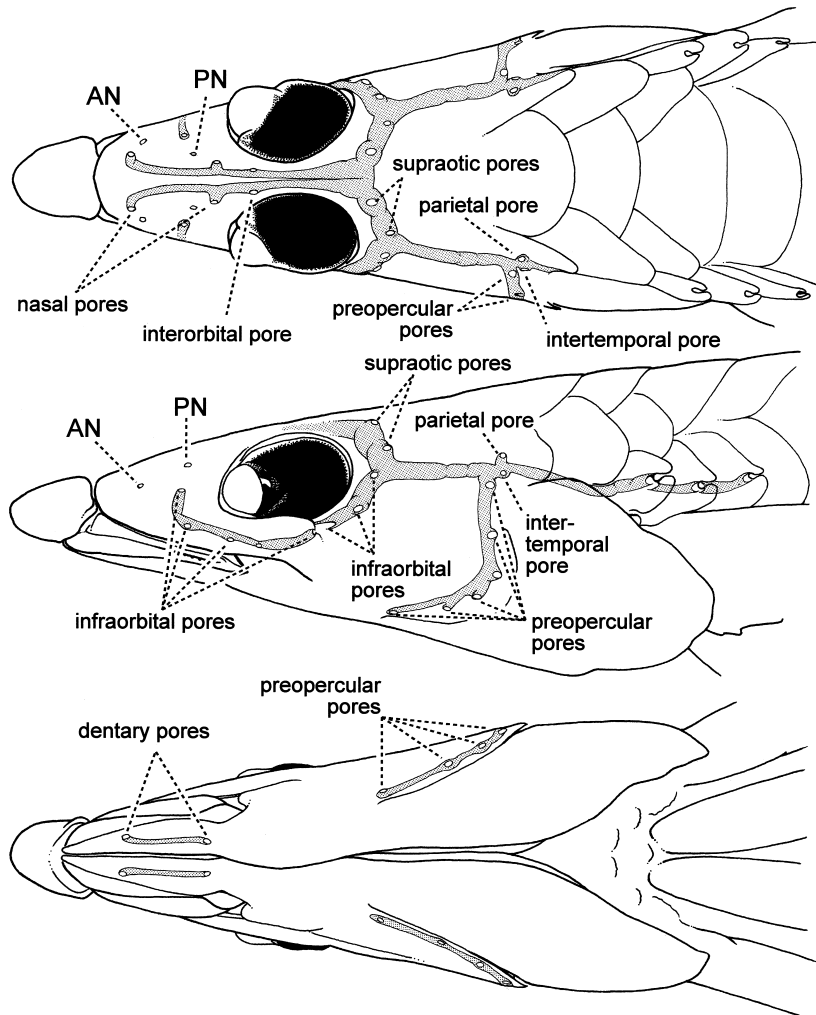


Fig. 7. Dorsal (top), lateral (middle) and ventral views (bottom) of head of *Myopsaron nelsoni* sp. nov. (one of AMS I.44840-001, male, 35.0 mm SL), showing cephalic sensory canals (shaded area). AN and PN, anterior and posterior nares, respectively.

by minute spines dorsally; basihyal long, rod-like; basibranchial 4 cartilaginous, elongate, subequal to basibranchials 1 and 2 in length; epi-branchials 1–4 simple, not forked medially; pharyngobranchial 1 absent; pharyngobranchials 2 and 3 connected via U-shaped cartilage anteriorly; pharyngobranchial 4 absent, fourth upper pharyngeal tooth plate present. Urohyal not forked anteriorly; anterior tip of urohyal lies under anterior end of basibranchial 2; anterior five branchiostegal rays articulate with anterior ceratohyal, and the remaining two with posterior

ceratohyal. Vertebrae 43–45, including 24–26 precaudal and 18–21 caudal (precaudal minus caudal vertebrae 3–8, 7 in holotype); all neural and haemal spines long, slender, not expanded anteroposteriorly, excluding those of preural vertebra 2; neural spine of preural centrum 2 very short, lying beneath anterior epural; haemal spine of preural centrum 2 slightly expanded anteroposteriorly; ribs absent; epineurals on all precaudal and anterior 3 caudal vertebrae; first dorsal-fin pterygiophore inserts between 22nd and 23rd (1 specimen), 23rd and 24th (11 specimens), or

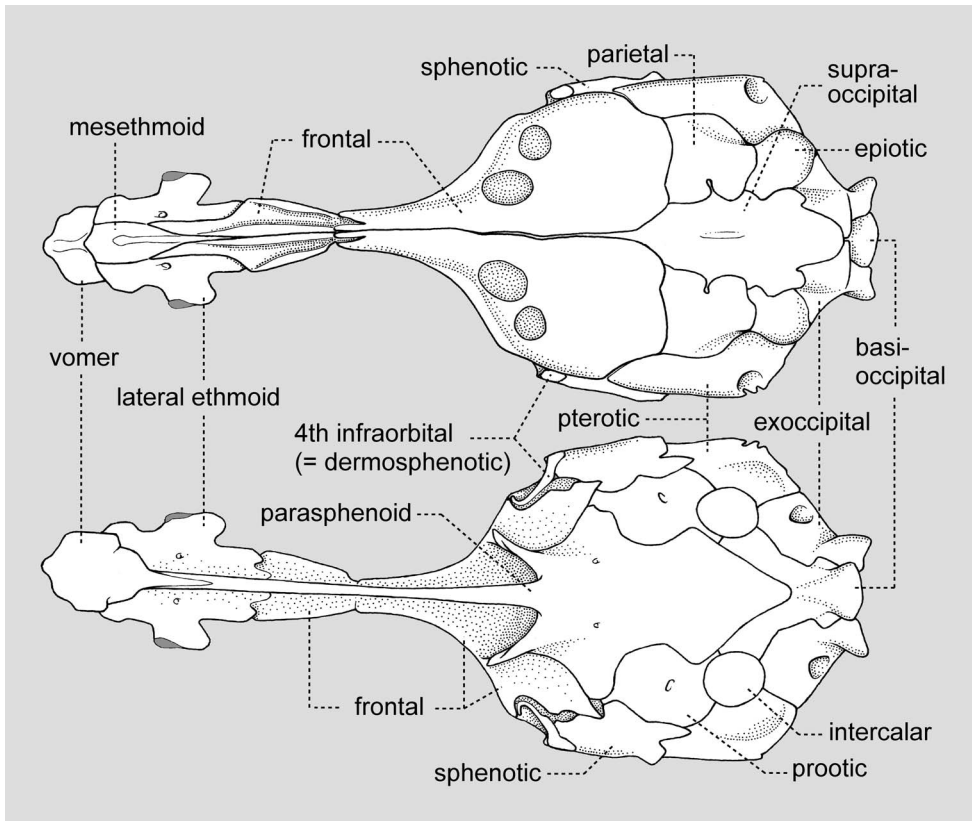


Fig. 8. Dorsal (top) and ventral (bottom) views of neurocranium (skull) of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Shading areas indicate cartilaginous parts.

24th and 25th (5 specimens, including holotype) neural spines; 1 (16 specimens, including holotype) or 2 (1 specimen) anal-fin pterygiophores anterior to first haemal spine; middle radials of dorsal- and anal-fin pterygiophores not present as separate ossifications; distal radial of dorsal- and anal-fin pterygiophores cartilaginous posteriorly; ultimate dorsal- and anal-fin pterygiophores lack distal radial; hypurals and parhypural fused to urostyle, forming urostylar complex; 2 epurals, anterior one J-shaped. Cleithrum with 3 heads dorsally, inner one of which directed posteriorly; postcleithra absent; pelvis with dorsomedially-expanded suprapelvic keel, forming an inverted-bowl shape; anterolateral flange of pelvis (=subpelvic keel) not or slightly expanded anteriorly; iliac spur of pelvis minute, arising near pelvic spine articulation and directed ventromedially;

postpelvic process undeveloped.

*Color when fresh.* No information available.

*Color in alcohol* (Fig. 2). Ground color of body pale yellow. Two dark brown stripes on upper half of body; dorsal one along dorsal profile from nape to caudal fin base, ventral one on lateral midline from a little behind base of pectoral fin to caudal-fin base; posterior margin of each scale pocket covered by these stripes slightly darkened. A short dark brown bar just above pectoral-fin base, forming bridge between dorsal and mid-lateral stripes on body. Several variously-shaped brown or dark brown markings on dorsal surface from snout to nape. A pupil-sized dark brown spot on mid-lateral snout. Cheek with 2 dark brown markings, comprising a small (smaller than pupil) dark brown spot below eye and a short diagonal dark brown bar at mid-pos-



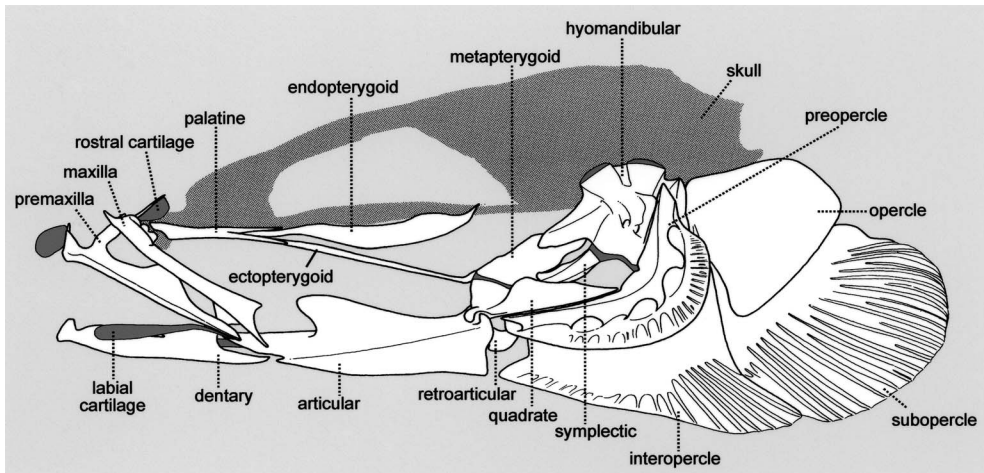


Fig. 9. Lateral view of jaws, suspensorium and opercular bones of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Shading areas indicate cartilaginous parts, except for silhouette of skull.

Table 1. Measurements of *Myopsaron nelsoni* gen. et sp. nov. Data for paratypes are shown in means, with ranges in parentheses

	Holotype	Paratypes	
	NSMT-P 94886	Males ( $n=13$ )	Females ( $n=3$ )
Standard length (mm)	35.6	31.8–36.3	32.5–36.3
In % of standard length			
Head length	22.1	22.7 (21.7–23.7)	23.3 (23.0–23.7)
Snout length	6.2	6.7 ( 6.2–7.2)	6.9 ( 6.6–7.4)
Eye diameter	4.2	4.3 ( 4.0–4.6)	4.5 ( 4.2–4.8)
Interorbital width	1.4	1.5 ( 1.3–1.8)	1.4 ( 1.3–1.4)
Body depth	9.1	8.9 ( 8.3–9.5)	9.2 ( 9.0–9.5)
Predorsal length	64.3	63.3 (60.7–65.4)	64.7 (63.8–65.2)
Prepelvic length	20.2	21.5 (20.1–23.0)	21.3 (20.3–22.2)
Preanal length	66.4	65.3 (63.3–67.7)	66.6 (65.2–68.5)
Preanus length	62.8	62.7 (60.9–65.5)	63.8 (62.3–65.2)
Caudal-peduncle depth	4.5	4.5 ( 4.1–4.9)	4.4 ( 4.2–4.6)
Length of dorsal-fin base	29.5	28.6 (26.9–30.8)	27.3 (25.8–29.1)
Length of anal-fin base	33.0	32.1 (30.4–33.9)	30.0 (29.1–30.6)
Length of 1st ray of dorsal fin	9.6	9.2 ( 7.1–11.0)	9.4 ( 9.1–9.9)
Length of 2nd ray of dorsal fin	10.4	10.6 ( 9.7–11.9)	9.9 ( 9.0–10.3)
Length of longest ray of pectoral fin	23.0	22.4 (19.8–24.7)	9.1 ( 9.0–9.2)
Length of pelvic-fin spine	5.8	5.6 ( 4.9–6.2)	2.3 ( 2.2–2.3)
Length of 1st ray of pelvic fin	25.8	25.0 (21.7–27.9)	4.4 ( 4.1–5.0)
Length of 2nd ray of pelvic fin	10.8	9.4 ( 8.4–10.3)	3.1 ( 3.1–3.3)
Length of 3rd ray of pelvic fin	6.2	6.1 ( 5.1–7.4)	2.2 ( 2.0–2.5)
Length of 1st ray of anal fin	5.6	5.3 ( 4.1–7.5)	5.0 ( 5.0–5.2)
Length of 2nd ray of anal fin	8.2	7.6 ( 6.5–8.7)	6.9 ( 6.7–7.4)

terior part. A dark brown blotch just behind anterior tips of lower jaws. Dorsal, anal, pectoral and pelvic fins subtranslucent with pale rays. Caudal fin with a dark brown transverse bar a little behind its base; sometimes an additional indistinct

brown transverse bar at middle of caudal fin.

*Sexual dimorphism.* Pectoral and pelvic fins are greatly elongate, long and filamentous in male, whereas short and non-filamentous in female (Fig. 6; Table 1). Although similar sexual

dimorphism in these fins has been reported in 2 *Creedia* species (i.e., *C. haswelli* and *C. partim-squamigera*) by Nelson (1983), the degree of fin elongation in male *Myopsaron nelsoni* is much greater than in *Creedia*. Within the type series of *M. nelsoni*, the smallest male specimen with elongate fins is 22.1 mm SL (OMNH-P 35374). The other known sexual dimorphism known in creediine fishes, i.e. serrations on the posterior lobe of the lateral-line scales (known only in males of *Creedia haswelli*), is not present in *Myopsaron nelsoni*.

**Early development.** One of the smallest specimens (16.6 mm SL) appears to be least developed within the specimens examined, as follows: eyes not typical creediine-like, i.e., lens not protruding beyond, and partially covered by, cornea; no spines along preopercular margin, but posteroventral corner of preopercle near angular (rather than rounded); all fin rays developed, ex-

cept pectoral- and pelvic-fin rays; scales undeveloped on body, except posterior lateral-line scales; head, body and fins not pigmented, except eyeball black. In another 16.6 mm SL specimen, the lens protrudes beyond the cornea; the free rear margin of the preopercle is rounded; all fin rays are developed; both anterior and posterior lateral-line scales are developed (but the other scales remain undeveloped). The smallest pigmented specimen is 16.9 mm SL; in this specimen, a narrow area around the dorsal profile of the body is weakly pigmented by minute melanophores. Along with increasing pigmentation and body size, the scaled area is radically broadened from the posterior part of the body in addition to the lateral-line scales (Fig. 20).

Reader and Neira (1998) listed “Small posterior preopercular spines from 3–5 mm, disappearing from 9 mm” as one of the main characters of creediine (as creediid) larvae. All examined specimens of *Myopsaron nelsoni* (16.6–36.3 mm SL) lack preopercular spines, but the spines might have already disappeared in this size range.

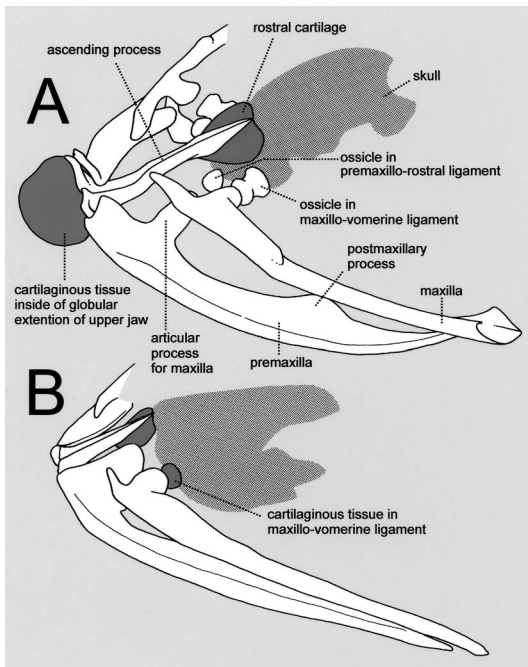


Fig. 10. Dorsoanterolateral views of upper jaws of 2 species of Creediinae. A) *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, 32.5 mm SL; B) *Linnichthys fasciatus*, MTUF-P 25670, 35.0 mm SL. Shading areas indicate cartilaginous parts, except for silhouettes of skulls.

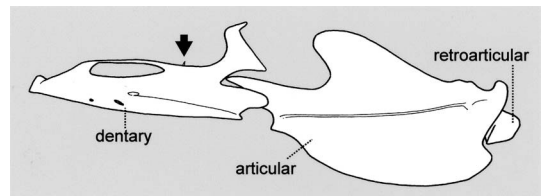


Fig. 11. Lateral view of lower-jaw bones of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 34.6 mm SL. Arrow indicates minute tooth on dentary.

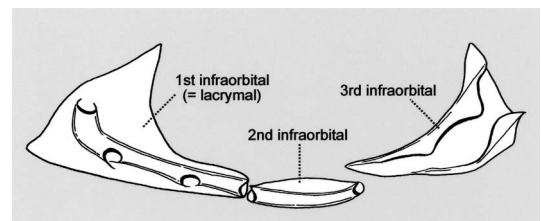


Fig. 12. Lateral view of infraorbital bones of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Note that the fourth infraorbital (or dermosphenotic) is not shown.

**Distribution and habitat.** All specimens of *Myopsaron nelsoni* were collected by sledge nets from flat sandy bottoms at depths of 51–99 m off the southern part of Chichi-jima Island, Ogasawara Islands.

**Remarks.** Some unusual extra ossicles and cartilaginous tissues are developed in the oral region of *Myopsaron nelsoni* (Figs. 9 and 10A). These include: globular cartilaginous tissue with a shallow hollow ventrally, supported by the anterior end of ascending processes of the premaxillae; a reel-shaped bony ossicle in the maxillovomerine ligament; a small globular bony ossicle in the premaxillo-rostral ligament; and a labial cartilage (=cartilaginous labial ligament). Of

these, similar ossicles were illustrated by Shimada and Yoshino (1987, fig. 2) in *Creedia bifasciata*. Present research reveals that *Limnichthys*, the only other creediine genus examined for its osteology, has a cartilaginous tissue within maxillovomerine ligament (Fig. 10B); this is, nevertheless, not hypertrophied and rather similar to the maxillovomerine meniscus found in most acanthomorphs (Johnson and Brothers, 1993). No traces of the other extra ossicles and/or cartilaginous tissues were seen in *Limnichthys*. Nelson (1985) and Rosa (1995) did not refer to any of these extra ossicles and/or cartilaginous tissues in their osteological surveys of the creediine fishes.

The extra ossicles and/or hypertrophied cartilaginous tissues around the oral region are not common but are known from several actinopterygians, e.g., gasterosteiform family Pegasidae, atheriniform family Phallostethidae, and perciform families Epigonidae, Ammodytidae and Schindleriidae, with various degrees of development (Gosline, 1963; Ida, 1973; Pietsch, 1984; Johnson and Brothers, 1993; Ida *et al.*, 1994). Presence of similar features in unrelated fishes suggests that they represent examples of convergence correlated with jaw protrusion (Pietsch, 1984).

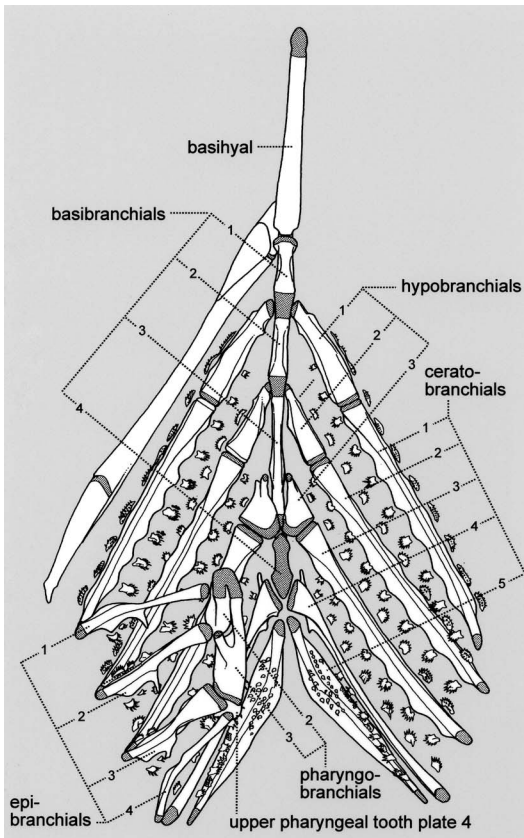


Fig. 13. Dorsal view of branchial arches of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Note that the dorsal elements of right side is removed, and shown in Fig. 13. Shading areas indicate cartilaginous parts.

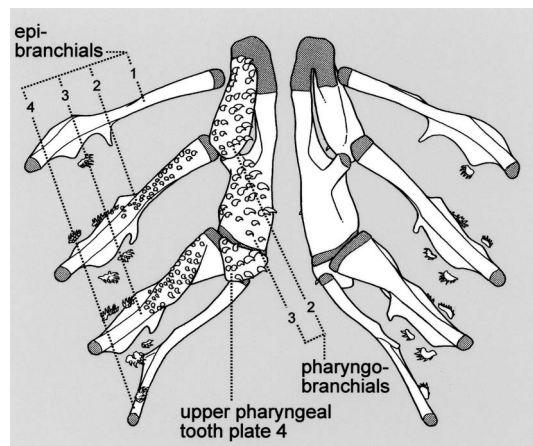


Fig. 14. Ventral (left) and dorsal (right) views of dorsal elements of left-side branchial arches of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Shading areas indicate cartilaginous parts.



Amongst the fishes with these hypertrophied elements, the ammodytids are peculiar in having autogenous ascending processes of the premaxillae (Ida, 1973; Pietsch and Zabetian, 1990; Ida *et al.*, 1994) as do the trichonotids. The ammodytids also share another uncommon feature, a large anterolateral foramen in the dentary, with *Myopsaron nelsoni* and *Creedia bilineata* (Ida,

1973; Shimada and Yoshino, 1987; Ida *et al.*, 1994; present study). Pietsch and Zabetian (1990) indicated that the foramen found in the ammodytids is “apparently unique among teleosts.” Ammodytids are also known as sand-diving fishes, and the salient resemblances in a series of uncommon features between ammodytids and creediines quicken our interest particularly in functional morphology. Note that the dentary foramen is apparently undeveloped in *Schizochirus*, *Limnichthys* and the type species of *Creedia*, viz. *C. haswelli*, regarding illustrations or photographs of lower jaw of creediines shown by Nelson (1985), Rosa (1995) and Smith and Johnson (2007); the condition in the other creedi-

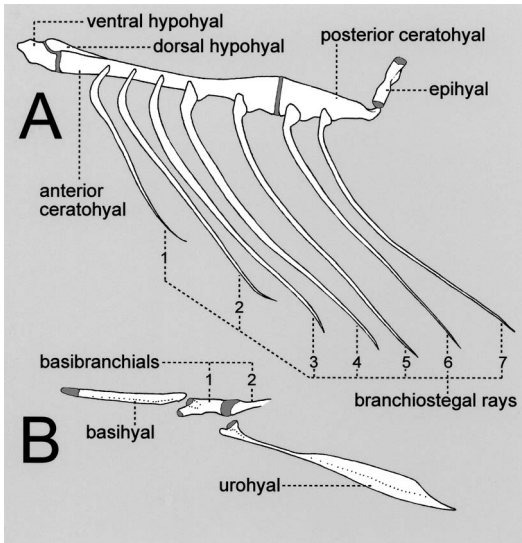


Fig. 15. Lateral views of hyoid arches of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, female, 32.5 mm SL. Shading areas indicate cartilaginous parts.

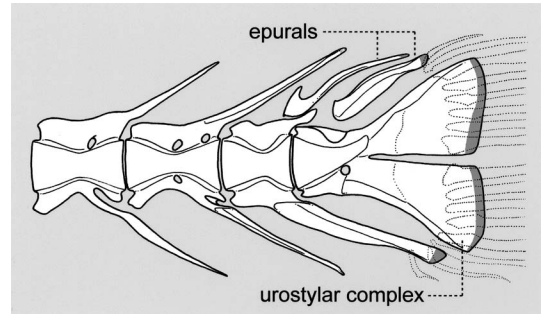


Fig. 17. Lateral view of caudal-fin skeleton of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, male, 34.6 mm SL. Shading areas indicate cartilaginous parts.

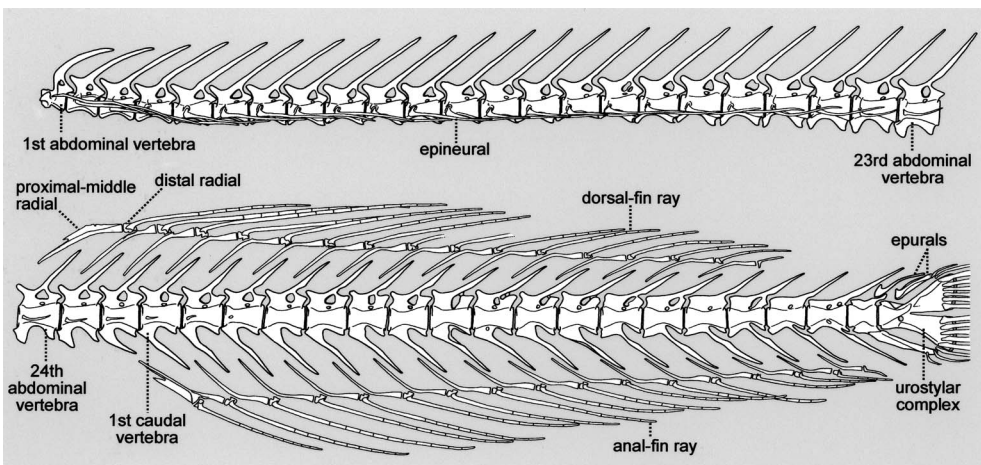
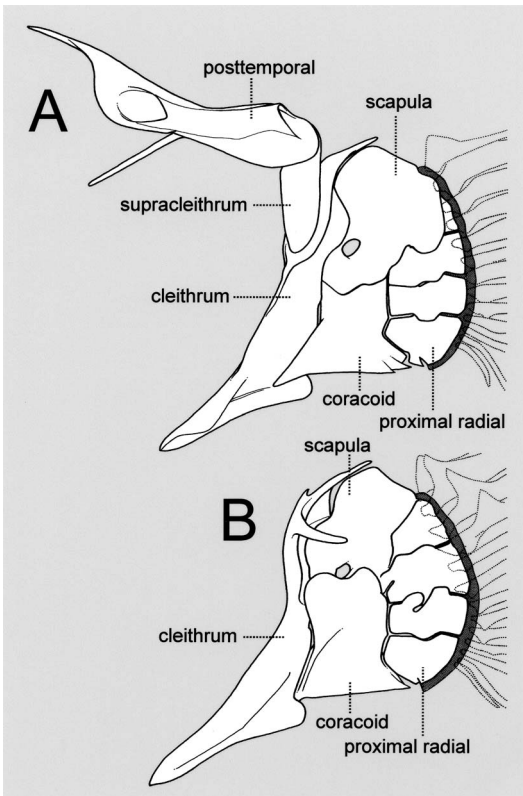


Fig. 16. Lateral views of axial skeleton and vertical fins of *Myopsaron nelsoni* sp. nov., 1 of NSMT-P 94888, male, 34.6 mm SL.



ines remains unexplored.

**Etymology.** The new species is named for J. S. Nelson, in reference to his great contribution to our knowledge about taxonomy and systematics of the creediine fishes.

### Discussion

Nelson (1985) recognized monophyly in the creediine (as creediid) clade on the basis of 21 characters. *Myopsaron nelsoni* agrees well with almost all diagnostic features of the Creediinae discussed by Nelson (1985), except as follows: globular shaped fleshy extension at tip of upper jaw, discontinuous lateral line on body, higher number of precaudal than caudal vertebrae, and edentate premaxilla. These 4 characters are found only in *M. nelsoni* within the family, and are regarded as autapomorphic for the species. The other feature differing from what Nelson showed is the position of “jaw articulation” (= articular-quadrata articulation). As described by Nelson (1985; 1986), the jaw articulation is positioned at the point posterior to vertical from the posterior margin of orbit in all creediine genera except *Myopsaron*. However, the point of jaw articulation in *Myopsaron* is placed slightly forward to a vertical from the posterior margin of the orbit (Fig. 9); it is more similar to that of the trichonotine genus *Trichonotus* (see Nelson, 1986, fig. 1) than to that of other creediines. The position of jaw articulation varies among the creediines (see Nelson, 1985, figs. 2 and 3), and, considering the other osteological characteristics (see below), the condition in jaw articulation of *Myopsaron* is hypothesized as the one extreme, apparently plesiomorphic, example within the Creediinae.

Another work defining the Creediinae was that of Rosa (1995, as Creediidae). In the text of her paper, she noted that the family is separated from the other trachinoids (*sensu* Pietsch, 1989) by the following 3 “new” characters, suggesting its monophyly: 1) dentary bone not completely toothed (i.e., no teeth on symphysis and posterior portion of dentary); 2) anterior tip of urohyal



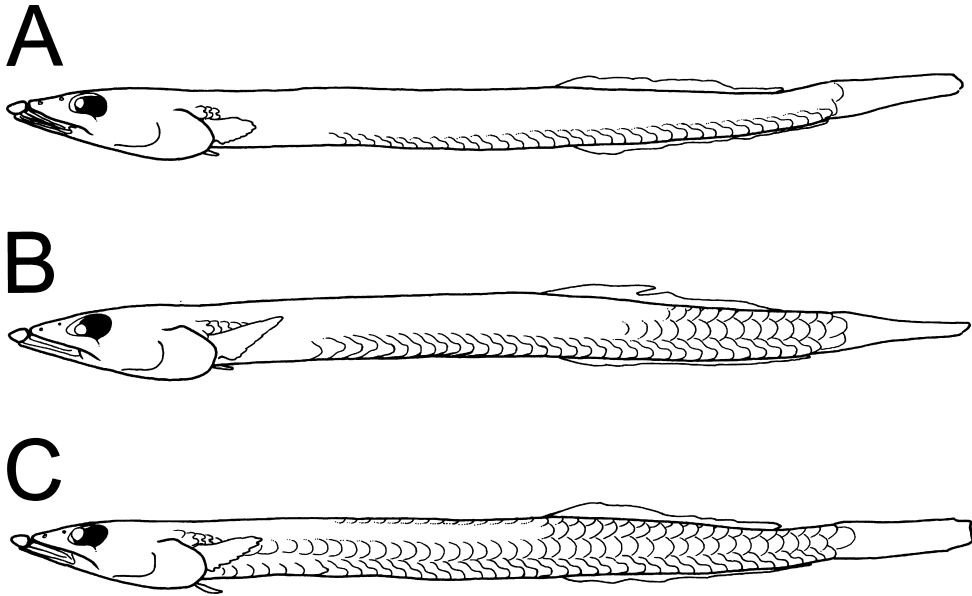


Fig. 20. Schematic illustrations of juveniles of *Myopsaron nelsoni* sp. nov., 3 specimens of NSMT-PL 723, showing development of scaled areas. A) 17.0 mm SL; B) 17.5 mm SL; C) 19.2 mm SL.

lying on second or third basibranchial; 3) posterior tip of mesopterygoid reaching posterior margin of skull [*sic.*] (probably error of “orbit”). On the other hand, in the abstract of the same paper, she listed 4 characters as “new characters of taxonomic significance for the group”, including above listed 1) and 2) and the other 2 characters, i.e., 4) lower arm of posttemporal not reaching skull, and 5) posterior tip of ectopterygoid reaching posterior margin of orbit; any accounts of the last 2 features were not apparent in the text. *Myopsaron* possesses at least all of Rosa’s (1995) features, exclusive of 3) and 5).

Interrelationships of the creediine genera were explored by Nelson (1985), based on “similarities and differences” of 15 characters. He recognized 3 unresolved basal lineages within the subfamily; first and second lineages comprise *Schizochirus* and *Creedia*, respectively, while the third contains the remaining 5 genera (*Apodocreedia*, *Chalixodytes*, *Crystallodytes*, *Limnichthys* and *Tewara*). Nelson (1985) assumed that *Schizochirus* is the most primitive creediine genus, having, e.g., deeper body (comparing with the other creediines), branched rays

of pectoral, pelvic and anal fins, wide inter-pelvic distance, and appearance of lateral-line scales resembling some hemerocoetines. This assumption is followed here. Multiple rows of suborbital- and preopercular-canal pores, resembling that of hemerocoetines, also suggest that *Schizochirus* is the most primitive derivative within the family. *Myopsaron*, *Creedia* and the other creediine genera have the specialized condition in these features, viz. body elongate, all pectoral, pelvic and anal-fin rays unbranched, inter-pelvic distance narrower, lateral-line scales non-hemerocoetine-like, and suborbital- and preopercular-canal pores forming uniserial rows in each (Table 2).

All 8 creediine genera are compared in Table 2. *Myopsaron* is most similar to *Creedia* in sharing the following diagnostic, apparently derived, features within the family: 1) 12–16 dorsal-fin rays; 2) relatively long, tube-like second infraorbital; 3) ventrally directed bony flange at anterior margin of postocular broadened portion of frontals (see Rosa, 1995: 48, fig. 1). These 2 genera also share in having the suborbital skin fold discontinuous midway (and anterior skin fold covering ventral margin of eye), not found in the

Table 2. Comparisons of the creediine genera. Data is cited from Nelson (1978, 1983, 1985), Nelson and Randall (1985), Shimada and Yoshino (1987), Rosa (1995) and Yoshino *et al.* (1999), in addition to examination of the present study.

	Myopsaron gen. nov.		Schizochirus		Creedia		Limnichthys		Tewara		Apolocreedia		Crystallobytes		Charixodytes		
	1	1	1	1	4	4	5	5	1	1	1	1	2	2	2	2	
Number of species																	
Counts																	
Dorsal-fin rays	14-16	18-20	12-16	18-20	12-16	12-16	21-33	21-33	34-36	34-36	35-40	35-40	30-43	30-43	36-40	36-40	
Anal-fin rays	16-18	28-29	17-28	28-29	17-28	17-28	25-34	25-34	37-40	37-40	32-36	32-36	34-41	34-41	36-40	36-40	
Pectoral-fin rays	11-13	16-17	10-15	16-17	10-15	10-15	10-16	10-16	13-14	13-14	13-14	13-14	10-14	10-14	12-13	12-13	
Pelvic-fin segmented rays	3-4	5	3-4	5	3-4	3-4	4-5	4-5	5	5	5	5	5	5	4	4	
Branched caudal-fin rays	9	9	8-9	9	8-9	8-9	8	8	8	8	8	8	8	8	8	8	
Lateral-line scales	3+33-35	36-41	40-47	36-41	40-47	40-47	37-45	37-45	50-53	50-53	55-58	55-58	50-58	50-58	56-59	56-59	
Precaudal vertebrae	24-26	12	14-16	12	14-16	14-16	14-16	14-16	14	14	23	23	24-25	24-25	23-24	23-24	
Total vertebrae	43-45	36-41	41-47	36-41	41-47	41-47	37-45	37-45	50-53	50-53	55-58	55-58	50-58 <sup>*1</sup>	50-58	56-59	56-59	
Epirals	2	2	2	2	2	2	1-2	1-2	1	1	1	1	1	1	1	1	
Branchiostegal rays <sup>*2</sup>	5+2	5+2	5+2	5+2	5+2	5+2	5+2	5+2	5+2	5+2	6+1	6+1	6+1	6+1	6+1	6+1	
Fleshy extension of upper jaw	globular	beak-like (but less developed)	beak-like	beak-like (but less developed)	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	beak-like	
Anterior nostril	not tubular	not tubular	not tubular	not tubular	not tubular	not tubular	tubular	tubular	tubular	tubular	tubular	tubular	tubular	tubular	tubular	tubular	
Branched anal-fin rays	absent	present	absent	present	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	
Branched pectoral- and pelvic-fin rays	absent	present	present or absent	present	present or absent	well developed to reduced	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	
Scales on body	well developed	well developed	well developed to reduced	well developed	well developed to reduced	reduced	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	well developed	
Lateral-line arrangement <sup>*3</sup>	Type C	Type A	Type B	Type A	Type B	Type B	Type A	Type A	Type A	Type A	Type B	Type B	Type A	Type A	Type A	Type A	
Pores of suborbital and preopercular canals	uniseriate	multiple	uniseriate	multiple	uniseriate	uniseriate	uniseriate	uniseriate	?	?	?	?	uniseriate	uniseriate	uniseriate	uniseriate	
Preopercular and mandibular canals	discontinuous	continuous	continuous	continuous	continuous	continuous	continuous	continuous	?	?	?	?	continuous	continuous	continuous	continuous	
Slit-like extension on ventral margin of eye	present	absent	present	absent	present	present	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	
Dorsal saddles on body	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	
Teeth on vomer	absent	present	present	present	present	present	present	present	present	present	present or absent	present	present	present	present	present	
Teeth on premaxilla	absent	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	
Teeth on palatine	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	absent	
Orifices on frontals	2 pairs	2 pairs and single median	2 pairs and single median	2 pairs and single median	2 pairs and single median	2 pairs and single median	1 pair and single median	1 pair and single median	1 pair and single median	1 pair and single median	2 pairs and single median	2 pairs and single median	1 pair and single median	1 pair and single median	1 pair and single median	1 pair and single median	
Posterior lobe of 3rd infraorbital	undeveloped	undeveloped	slightly expanded	undeveloped	slightly expanded	slightly expanded	expanded	expanded	expanded	expanded	expanded	expanded	expanded	expanded	expanded	expanded	
Posterior tip of maxilla	forked	forked	forked	forked	forked	forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	
Postmaxillary process of premaxilla	developed	developed	developed	developed	developed	developed	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	undeveloped	
Posterior end of endopterygoid	slightly upturned	slightly upturned	slightly to well upturned	slightly upturned	slightly to well upturned	slightly to well upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	greatly upturned	
Anterior tip of urohyal (in dorsal view)	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	not forked	
Neural spine of 2nd preural centra	short stub	short stub	short stub	short stub	short stub	short stub	elongate	elongate	elongate	elongate	elongate	elongate	elongate	elongate	elongate	elongate	

\*<sup>1</sup> Data is cited from Rosa (1995); Nelson (1985) gave a range of 49-55 in vertebral count of *Tewara crammellae*.

\*<sup>2</sup> Counts of branchiostegal rays are provided in the form of those attached to ceratohyal + epiphyal.

\*<sup>3</sup> Types of lateral line are illustrated in Fig. 5.

other creediines. Nevertheless, the phylogenetic implication of this character is uncertain, because a similar condition is found in the trichonotines (comprising *Trichonotus* only) and the other sand-diving fish family Ammodytidae. All of these fish groups with a discontinuous suborbital skin fold are bottom-oriented elongate sand-divers, suggesting that the condition has been independently derived with their sand-diving habit.

*Creedia* and *Myopsaron* also share the following features, not found in other creediines except *Schizochirus*: usually 9 branched caudal-fin rays [except for intraspecific variation reported by Nelson (1978) in *C. haswelli*]; posterior end of maxilla forked; weakly to well developed post-maxillary process of premaxilla; free rear margin of preopercle with splintering; posteroventral laminated projection of lacrymal undeveloped; relatively long and slender urohyal; short neural spine of second preural centrum (PU2) under epural(s). All of these features appear to be primitive within the Creediinae, since they are also found in the other 2 trichonotid subfamilies, i.e., Trichonotinae and Hemerocoetinae (Nelson, 1986; Fujita, 1990; present study). Lack of specialized condition in these features suggests that, as well as *Schizochirus*, *Creedia* and *Myopsaron* do not belong to the lineage including the other 5 genera.

A sister group relationship of *Myopsaron* with *Creedia* is open to question. Although these 2 genera share some putative apomorphies as noted above, *Myopsaron* appears to be a plesiomorphic condition in the position of its jaw articulation and a barely-developed posterior lobe of third infraorbital, which resembles the condition in most primitive derivate *Schizochirus*. Further study, including molecular analysis, is needed to resolve certain relationships of the creediine genera.

**Comparative materials.** *Chalixodytes chameleontoculis*: AMS I. 28101-010, 1 specimen, 41.9 mm SL, west of Riviere, Riviere des Anguilles, south coast at Senneville, Mauritius, 0.2–1.5 m depth, 1989 (collected by J. Paxton, O. Griffiths and M. Welshman); AMS I. 41428-008, 5 specimens, 19.4–25.9 mm SL, Souillac, South-

ern Mauritius, Mauritius, Jan. 2002 (collected by O. Griffiths). *Chalixodytes tautensis*: AMS I. 37908-010, 1 specimen, 41.1 mm SL, southeastern side of Efate Island, Vanuatu, 0–1 m depth, 6 May 1997. *Creedia bilineata*: URM-P 6460, 1 specimen (paratype of *C. bifasciatus*), 24.5 mm SL, Hatoma-jima Island, Yaeyama Group of Ryukyu Islands, Japan, 9 Nov. 1979 (collected by K. Shimada); URM-P 6463, 1 specimen (paratype of *C. bifasciatus*: cleared, stained and dissected), Kabira Bay, Ishigaki-jima Island, Yaeyama Group of Ryukyu Islands, Japan, 15 Oct. 1985 (collected by K. Shimada); URM-P 11750, 1 specimen, 36.6 mm SL. *Creedia haswelli*: AMS B 9210-9213, 4 specimen (syntypes of *Hemerocoetes haswelli*), 44.3–50.7 mm SL. *Creedia partimsquamigera*: AMS I. 21420-001, 1 specimen (holotype of *Creedia partimsquamigera*), 53.8 mm SL, off Coogee Beach, Sydney, New South Wales, Australia, 26 Jan. 1980 (collected by R. Kuitert); AMS I. 21420-005, 2 specimens (paratypes of *Creedia partimsquamigera*), 57.5–66.1 mm SL, off Coogee Beach, Sydney, New South Wales, Australia, 26 Jan. 1980 (collected by R. Kuitert); AMS I. 22868-001, 2 specimens (paratypes of *Creedia partimsquamigera*), 38.3–55.9 mm SL, Sept. 1981 (collected by R. Kuitert). *Crystalloodytes pauciradiatus*: AMS I. 24606-001, 2 specimens (paratypes of *Crystalloodytes pauciradiatus*), 30.3–31.3 mm SL, south end of Hanga Roa, off northern coast of Easter Island, 10 Feb. 1969 (collected by G. Allen and J. Randall). *Limnichthys fasciatus*, 14 specimens (syntypes of *Limnichthys fasciatus*), 21.3–36.1 mm SL, Lord Howe Island, Feb. 1903 (collected by Waite and McCulloch); MTUF-P 25670, 1 specimen (cleared and stained), Kominato, Chiba Prefecture, Japan, 29 Aug. 1984; NSMT-P 34378, 1 specimen, 50.0 mm SL, Koajiro, Miura City, Kanagawa Prefecture, Japan, 26 Apr. 1991 (collected by M. Aizawa). *Limnichthys polyradiatus*: AMS I. 19646-001, 1 specimen (paratype of *Limnichthys polyradiatus*), 44.5 mm SL, near Leigh, New Zealand, 18 Aug. 1971 (collected by G. R. V. Anderson); AMS I.19647-001, 2 speci-

mens (paratypes of *Lymnichthys polyradiatus*), 38.2–41.9 mm SL, Pink Beach, near Goat Island, New Zealand, 1 Feb. 1972 (collected by G. R. V. Anderson). *Schizochirus insolens*: AMS IA. 7062, 1 specimen, 34.9 mm SL, Ballina, New South Wales, Australia (collected by M. Ward); AMS IB 514, 1 specimen, ca. 52.2 mm SL (head damaged), Mooloolabah, Queensland, Australia, May 1940 (collected by T. Iredale); AMS I. 34384-010, 1 specimen, 21.5 mm SL, 2.5 km western of Island Head, 0–6 m depth, 25 Oct. 1993 (collected by D. Bray and S. Reader).

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