

Paratrachichthys heptalepis, a New Roughie (Pisces, Trachichthyidae) from the Hawaiian Islands¹

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ABSTRACT: A new species of trachichthyid fish, *Paratrachichthys heptalepis*, is described from 33 specimens that were collected by the U.S. National Marine Fisheries Service (NMFS), Honolulu Laboratory, in a series of cruises in the Hawaiian Islands. The depth range of the catches was 50–255 m. *P. heptalepis* is closely related to *P. prosthemi* Jordan and Fowler, from Japan, and *P. novaezelandicus* Kotlyar, from New Zealand.

THE GENUS *Paratrachichthys* Waite, 1899 was erected for the species *Trachichthys traili* from New Zealand. Fowler (1938) introduced the subgenus *Aulotrachichthys* to distinguish between species with striated subcutaneous areas and species without these features.

Paratrachichthys is characterized as follows: body moderately deep and compressed; head with finely denticulated ridges; preopercular spine strong, extending to or beyond opercular membrane; a single weak to moderately strong opercular spine; anterior two ribs fused forming a membranous flat plate; lateral line complete with pored scales not enlarged; anus between pelvic fin bases; 7 to 13 strong ventral scutes between anus and anal fin origin; dorsal fin with three to six spines; small teeth in bands on both jaws; a small patch of minute teeth on vomer and a narrow band on palatines. Some species with striated subcutaneous (luminescent) areas (absent in *P. traili* and *P. fernandezianus*) on side of isthmus, under pectoral base and along lower side of the body from pelvic base to caudal peduncle (Woods and Sonoda 1973). Such striated areas, although slightly different in arrangement, were found in another trachichthyid fish, *Hoplostethus metallicus* Fowler, 1938, from the Philippines.

Eight species of *Paratrachichthys* are currently recognized. *Paratrachichthys traili*

(Hutton, 1876) was originally described from Stewart Island in New Zealand; it is known from around the South Island of New Zealand (Shuntov 1971, Paulin 1979) and from southeastern Australia (Scott 1962). A second species, *P. fernandezianus* (Günther, 1887), was described from two dried specimens, thickly covered with varnish, collected at Juan Fernandez Island off the coast of Chile. Jordan and Fowler (1902), in their review of the berycoid fishes of Japan, described *P. prosthemi* from a specimen dredged by the steamer *Albatross* in Suruga Bay. A fourth species, *P. latus* Fowler, 1938, was obtained by the same vessel in a later cruise to the Philippines. *Paratrachichthys argyrophanus* Woods, 1961 was collected off the mouth of the Amazon River. Menezes (1971) described *P. atlanticus*, also collected in Brazilian waters off the coast of São Paulo and Rio Grande do Sul. A new species from the Indian Ocean, *P. sajademalensis*, was described by Kotlyar (1979) from a single specimen caught in the region of the Saya de Malha Bank, south of the Seychelles Islands. Recently Kotlyar (1980) described *P. novaezelandicus* from specimens that were collected by the *R/V Milogradovo* in New Zealand.

METHODS

Measurements were made to the nearest tenth of a millimeter. Standard length (SL) was measured from the middle point of the upper jaw (between patches of teeth) to the

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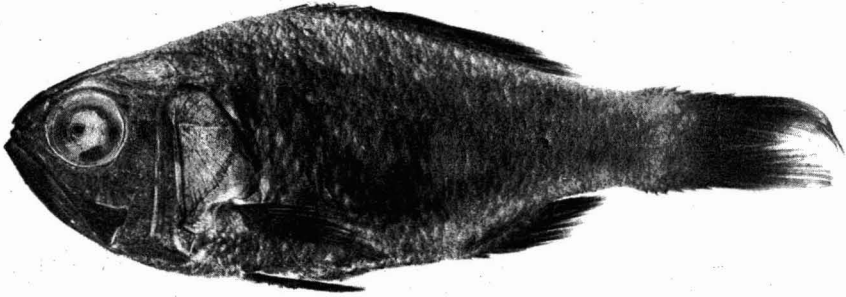


FIGURE 1. Holotype of *Paratrachichthys heptalepis* Gon, BPBM 28108, 55.2 mm SL, SWS of Kauai, Hawaiian Islands (photograph by J. E. Randall).

midbase of the caudal fin. The depth of the body was taken between the dorsal and ventral surfaces of the body at the pelvic fin base. Interorbital width is the narrowest bony width. The length of the preopercular spine was measured from the angle of the preopercular bone to the tip of the spine. The length of the caudal peduncle was taken between verticals at the posterior end of the anal fin base and the caudal fin base. The length of the lower jaw was taken from the middle of the lower lip to the angular bone. The lobes of the caudal fin were measured from the bases of the lowermost and uppermost principal rays of their tips.

In the description below data in parentheses refer to the paratypes. Counts were taken from all type specimens and 19 additional specimens. Gill rakers were counted on the right side of the first arch; the raker at the angle of the arch was included in the lower-limb count. Vertical rows of scales above lateral line and

pored lateral-line scales were counted on both sides of the fish. Proportional measurements were taken from all type-specimens and are presented in Table 1. Vertebral counts of the holotype and two paratypes were obtained from a radiograph taken by Arnold Y. Suzumoto in the Division of Ichthyology of the B. P. Bishop Museum.

Type specimens have been deposited at the following institutions: Australian Museum, Sydney, AMS; British Museum (Natural History), London, BM(NH); Bernice P. Bishop Museum, Honolulu, BPBM; California Academy of Sciences, San Francisco, CAS; Muséum National d'Histoire Naturelle, Paris, MNHN; U.S. National Museum of Natural History, Washington D.C., USNM; National Science Museum, Tokyo, NSMT.

Paratrachichthys heptalepis, n. sp.

Figure 1, Table 1

TABLE 1
 PROPORTIONAL MEASUREMENTS (IN % OF SL) OF TYPE SPECIMENS OF *Paratrachichthys heptalepis*

	HOLOTYPE						PARATYPES								
	BPBM 28108	BPBM 24736	BPBM 24736	BPBM 24736	BPBM 24736	BPBM 24736	MNHN 1982-1007	BM(NH) 1982.7.6.1	BPBM 24736	NSMT P21486	AMS I. 22836-001	CAS 50733	USNM 235296	BPBM 24736	
Standard length (mm)	55.2	49.4	49.6	50.3	50.8	52.3	52.4	52.7	54.3	54.5	54.8	70.8	71.8	71.8	
Depth of body	37.9	38.0	36.1	37.2	37.6	37.7	38.5	38.7	37.9	37.2	38.5	36.3	36.5	38.3	
Head length	37.7	38.9	36.7	37.4	37.4	37.3	38.5	35.9	37.6	37.8	37.2	35.9	36.5	36.1	
Snout length	6.3	5.7	6.8	6.9	5.5	7.3	6.5	5.9	6.8	6.0	6.7	5.6	5.8	5.1	
Diameter of orbit	12.1	12.3	11.5	12.1	12.2	11.5	12.2	11.8	12.5	12.3	12.2	11.4	10.7	11.1	
Interorbital width	10.9	10.5	10.3	11.1	10.6	10.3	11.1	10.0	10.7	10.6	10.9	9.7	10.0	10.3	
Length of preopercular spine	8.1	8.1	7.7	6.9	8.1	7.3	8.4	7.2	7.5	7.5	8.2	7.1	7.0	6.1	
Least depth of caudal peduncle	14.5	13.8	13.9	13.9	13.0	13.8	13.5	13.3	14.2	13.2	13.5	13.6	13.8	13.8	
Length of caudal peduncle	21.7	20.2	19.7	21.3	18.5	20.8	22.3	21.2	21.7	20.0	21.2	20.9	19.9	21.7	
Length of upper jaw	21.5	22.3	21.8	23.3	21.6	22.6	22.7	21.4	22.6	22.4	22.4	21.9	21.3	22.0	
Length of lower jaw	23.4	24.3	24.0	24.0	23.8	24.1	24.4	22.4	23.9	24.0	23.9	23.7	22.1	24.1	
Snout to origin of dorsal fin	41.3	42.5	42.7	42.7	43.1	41.7	42.7	41.4	42.5	42.6	42.3	40.1	39.2	41.9	
Snout to origin of anal fin	70.6	68.6	69.3	73.3	69.7	69.8	69.6	70.0	71.4	69.7	67.3	70.9	70.6	70.5	
Snout to origin of pelvic fins	40.8	40.9	39.9	46.1	41.1	42.2	42.0	39.3	40.7	39.6	41.4	39.0	42.6	40.9	
Length of base of dorsal fin	39.3	38.2	39.9	37.2	41.7	39.6	40.4	38.7	39.4	38.7	40.7	41.0	42.3	40.8	
Length of first dorsal spine	5.6	6.5	5.6	5.4	6.3	broken	7.2	6.6	7.4	7.0	7.3	6.3	6.3	4.6	
Length of longest dorsal spine	10.1	10.1	10.3	12.5	11.4	9.7	12.6	9.8	12.7	12.3	10.6	9.9	9.6	9.3	
Length of longest dorsal ray	21.5	19.8	19.3	19.9	20.3	21.2	23.8	20.1	22.5	20.0	21.5	23.2	16.7	19.2	
Length of base of anal fin	15.6	16.2	14.9	15.5	16.3	16.8	17.0	14.8	16.2	15.2	16.0	15.2	16.1	15.4	
Length of first anal spine	2.3	2.0	2.4	2.2	2.5	2.5	3.2	2.6	2.6	2.7	2.9	2.0	1.8	2.2	
Length of third anal spine	8.0	8.3	5.8*	8.9	9.4	9.0	9.9	8.7	9.6	9.2	9.1	6.5*	10.0	8.3	
Length of longest anal ray	13.8	15.0	15.1	15.1	15.3	15.3	17.2	13.3	15.3	16.5	15.0	13.8	12.4	14.9	
Length of upper lobe of caudal fin	27.5	32.8	29.6	31.6	33.7	27.5	32.1	28.1	28.9	30.6	31.4	28.5	25.6	29.2	
Length of lower lobe of caudal fin	29.3	31.0	30.0	30.4	32.9	27.5	33.6	28.3	30.4	31.2	32.3	28.1	26.5	29.0	
Length of pectoral fin	21.7	21.6	22.2	22.1	23.0	22.7	24.2	22.0	22.3	23.8	22.8	22.6	20.9	23.1	
Length of pelvic spine	13.0	12.5	13.7	12.3	14.0	13.4	16.0	14.0	12.9	13.2	13.7	12.3	12.0	12.9	
Length of pelvic fin	20.6	21.9	20.4	21.1	21.4	19.9	22.9	20.3	21.0	20.7	21.5	19.9	19.1	19.8	

* Measurement of second anal spine of specimens with only two anal spines.

Paratrachichthys sp. Clarke, 1972. Pac. Sci., vol. 26, no. 3, p. 310 (Hawaiian Islands).

Paratrachichthys sp. Struhsaker, 1973. Ph.D. Thesis, University of Hawaii (Hawaiian Islands).

HOLOTYPE: BPBM 28108, 55.2 mm SL, female, Hawaiian Islands, SWS of Kauai, 20°16' N: 160°02' W, 50–100 m, midwater trawl, *Townsend Cromwell*, cruise 59, station 41, 24 July 1972.

PARATYPES: BPBM 24736, 7:49.4–71.8 mm SL; AMS I. 22836-001, 54.8 mm SL; BM(NH) 1982.7.6.1, 52.7 mm SL; CAS 50733, 70.8 mm SL; MNHN 1982-1007, 52.4 mm SL; USNM 235296, 71.8 mm SL; NSMT P21486, 54.5 mm SL.

DIAGNOSIS: Dorsal fin V, 12 to 14; anal fin III (rarely II), 8 or 9 (usually 8); pectoral-fin rays 11 to 13; vertical rows of scales 47 to 52; pored lateral-line scales 26 to 29; gill rakers 6 to 8 + 13 to 15. Anus between pelvic fin bases; seven or eight large ventral scutes between anus and anal fin origin. Principal caudal rays 19, uppermost and lowermost unbranched; five to six upper and lower procurrent caudal spines; two short downward-projecting rostral spines. Striated areas on isthmus, under pectoral bases, and along ventral sides of the body from pelvic bases to just past anal fin base. Eye 3.0 to 3.4 in head length. Teeth on both jaws small, conical, and close set in bands. Two to 4 minute teeth anteriorly on angle of vomer, and a band of teeth on palatines. Post-temporal bone with a low ridge; opercular spine short, not extending beyond opercular membrane; preopercular spine strong, extending beyond opercular membrane; soft rays of all fins with asperities.

DESCRIPTION: Dorsal fin V, 13 (12 to 14); anal fin III (2 of 33 with II), 8 (2 of 33 with 9); pectoral rays 12 (2 of 33 with 11 and 1 with 13); pelvic rays I, 6; upper and lower procurrent caudal spines six (five or six); branched caudal rays 17; vertical rows of scales 48 (47 to 52); pored lateral-line scales 27 (26 to 29); ventral scutes seven (seven or eight); gill rakers 7 + 14 (6 to 8 + 13 to 15); branchiostegal rays 8; vertebrae 13 + 13 (holotype and two paratypes) (Table 1).

Body moderately deep and compressed, the maximum depth at pelvic-fin insertion 2.6 (2.6 to 2.8) in SL; head length 2.6 (2.6 to 2.8) in SL; dorsal ridges on head finely serrate, ending anteriorly in two short, ventrally pointing rostral spines; the head has large mucus cavities covered with translucent membrane (in alcohol), dorsal profile of head straight to slightly convex; snout is short and rounded 5.9 (5.1 to 7.0) in head length; nostrils in front of eye, above center of orbit; posterior nostril large, oval, and separated from the small, rounded anterior nostril by a space equal to 1.0 to 1.5 the latter's diameter; eye 3.1 (3.0 to 3.4) in head length; the interorbital space is slightly convex, its bony width 3.5 (3.3 to 3.7) in head.

Maxilla exposed reaching vertical at rear posterior margin of orbit; upper jaw 1.7 (1.6 to 1.7); lower jaw 1.6 (1.5 to 1.6) in head; anterior end of lower jaw fitting into a median gap between the teeth of upper jaw. Teeth in both jaws short, conical, broad based, their tips slightly curved inward arranged in a broad patch narrowing posteriorly to a long band, premaxillary bones exposed, outer surface covered with teeth; vomer V-shaped, its apex pointing forward; 2 to 4 minute teeth on apex of vomer, a narrow band of teeth on apex of vomer, and a narrow band of teeth on palatines.

Gill membranes free from isthmus; gill rakers long, armed with small irregular teeth on internal margin; longest gill raker of first arch about 0.5 orbit; longest gill filament 0.25 of orbit diameter. Post temporal with a low, serrated ridge; operculum with low narrow ridges, radiating from a point on a horizontal line with center of orbit; opercular spine prominent, not extending beyond opercular membrane; rear margin of preoperculum with small spinules; preopercular spine strong, triangular in shape, with a prominent serrated ridge reaching beyond opercular membrane; posterior projection of cleithrum a flat rounded plate with two, low smooth ridges ventrally (in larger specimens there are more ridges and the posterior margin is serrated); suborbital bones form a broad, ridged flange, about 0.7 of orbit at its widest point (covers most of the cheek); area of cheek not covered by flange with small ctenoid scales.

Body covered with rough ctenoid scales, except for a small area under pectoral fin which approximately equals the area of the fully spread pectoral fin; the scales of this area with ctenii reduced in number and size; number of ctenii decreasing from tip of pectoral anteriorly, the scales becoming cycloid from about midpectoral to base of fin; scales covering pectoral and pelvic bases mostly cycloid, thin, and transparent; predorsal scales with a low median ridge but not enlarged; a sheath of scales along base of dorsal and anal fins; large ventral scutes between vent and anal origin; lateral line complete, the pored scales not enlarged. Origin of dorsal fin on a vertical at pelvic fin insertion; first dorsal spine 6.7 (5.1 to 7.8); longest dorsal spine (fourth or fifth) 3.7 (3.0 to 4.3); longest dorsal ray (second to fourth) 1.7 (1.5 to 2.2) all in head length; anal fin origin under base of eighth or ninth dorsal ray; third anal spine 4.7 (3.6 to 4.7) and longest anal ray 2.7 (2.2 to 2.9) in head length; pectoral fin rounded 4.6 (4.1 to 4.8) in standard length, the seventh ray longest, its tip reaching a vertical at tip of pelvic fin or slightly behind it; origin of pelvic fin under ventral-most pectoral ray, its second and third rays longest; caudal fin forked, upper lobe 3.6 (3.0 to 3.9), lower lobe 3.4 (3.0 to 3.8) in SL; soft-rays of all fins with asperities. Striated subcutaneous areas on side of isthmus, under pectoral base, and along ventral side of body from pelvic base to just past anal fin base.

COLOR (in alcohol): Body reddish-brown; isthmus and abdomen dark; snout, jaws, and chin light yellow; a black mark on anterior third of chin between mandibles; black ring around anus; branchiostegal rays dark, with yellow membrane; silvery reflecting areas on side of isthmus, under base of pectoral fin, and along ventral part of body in a narrow line from pelvic base to just past anal fin base; all fins pale yellow.

REMARKS

Paratrachichthys heptalepis is most closely related to *P. prosthemi* from Japan and *P. novaezelandicus* from New Zealand. I have examined the holotype of *P. prosthemi*

(USNM 50575). *Paratrachichthys heptalepis* differs in the number of ventral scutes (seven or eight compared to nine in *P. prosthemi*) and has mesially curved ridges in the occipital pit that are absent in *P. prosthemi*. The opercular spine of *P. heptalepis* is short, not extending beyond the opercular membrane; it is longer, extending beyond that membrane in *P. prosthemi*. The preopercular spine of *P. heptalepis* is long, reaching beyond the opercular membrane; it is a shorter spine, not reaching beyond that membrane in *P. prosthemi*. The posttemporal "spine" is a low ridge in *P. heptalepis*, but a prominent sharp spine in *P. prosthemi*. The suborbital flange of *P. heptalepis* is larger, about 0.7 of the orbit compared to less than 0.5 of orbit diameter in *P. prosthemi*. The posterior projection of *P. heptalepis* is thin, rounded, with more ridges, and often with serrated margin. In *P. prosthemi* it is somewhat thicker, pointed and with smooth edge. The striated area along the ventral side of the body of *P. heptalepis* reaches posteriorly just short of the tip of the last anal ray (when depressed against caudal peduncle), but in *P. prosthemi* it reaches to or just past the tip of the last anal ray (when depressed against caudal peduncle), to the point of least depth of the caudal peduncle (Figure 2).

Paratrachichthys heptalepis differs from *P. novaezelandicus* (Kotlyar, 1980) in having a larger eye (orbit diameter 3.0 to 3.4 compared to 3.3 to 3.7 in head in *P. novaezelandicus*), wider interorbital space (3.3 to 3.7 compared to 4.0 to 4.6 in head length), and a longer (4.5 to 5.4 versus 5.3 to 8.0 in SL) and deeper (6.9 to 7.7 versus 7.7 to 9.0 in SL) caudal peduncle. Other differences are in the count of ventral scutes (seven or eight compared to eight or nine in *P. novaezelandicus*) and number of gill rakers (6 to 8 + 13 to 15 compared to 7 + 12 in *P. novaezelandicus*).

Tett and Kelly (1973) described Trachichthyidae as a group of fish in which luminescence originates bacterially in an internal anal gland and emanates through a translucent ventral body wall. Kuwabara (1955), Haneda (1957), and Haneda and Johnson (1962) described the luminescent system of *Paratrachichthys prosthemi* in which the luminous gland is of the "internal type," situated near

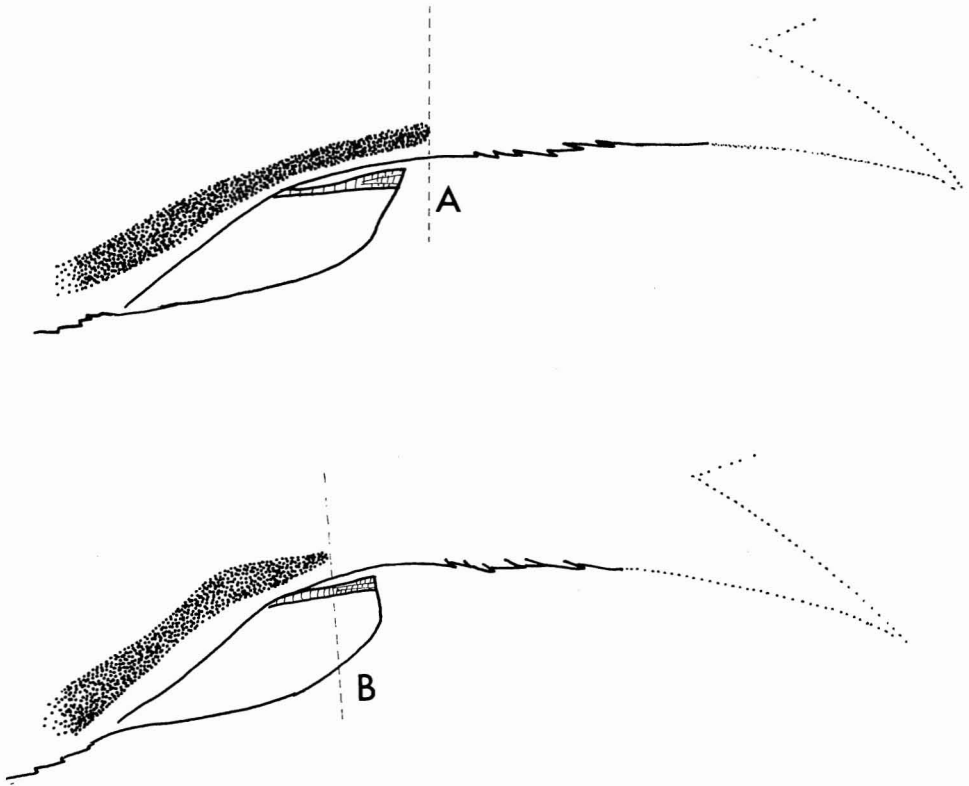


FIGURE 2. The posterior end of the striated area along the ventral side of the body in *Paratrachichthys prosthemi* (A) and in *P. heptalepis* (B).

the anus, and contains symbiotic bacteria. When excited in the dark, specimens of *P. prosthemi* emitted bright light along the isthmus and posteriorly along each ventral side of the body. The same type of luminescent system apparently exists in *P. heptalepis*.

Paratrachichthys heptalepis is known only from the Hawaiian Islands. All 33 specimens I have examined were collected around the major islands; the depth range of the catches was 50–255 m; the smallest specimen, 26 mm in SL, was fully developed morphologically and resembled the largest one.

DERIVATION OF NAME: *heptalepis*, meaning seven scales, describes the large ventral scutes.

ADDENDUM

A collection of 52 specimens of *Paratra-*

chichthys heptalepis was donated to the Bernice P. Bishop Museum by Paul J. Struhsaker shortly after completion of this manuscript. The specimens were collected in Hawaiian waters by the NMFS vessel *Townsend Cromwell* off Haleiwa (cruise 36, stations 15 and 20; cruise 40, stations 114, 115, 121, and 122) and Penguin Bank (cruise 35, station 35; and cruise 40, stations 3, 11, 21, and 33). Depth range was 88–185 m. Twenty specimens were sexed, all were found to be females; those taken in spring (April and May) had large ripe gonads or were at postspawning stage: the ripe egg was about 1.5 mm in diameter, white and semitransparent (in alcohol); other smaller eggs were opaque orange. The contents of ten stomachs were examined; apart from two amphipods found in one stomach, penaeid shrimps were the only food item.

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