

Two New Soles of the Genus *Aseraggodes* (Pleuronectiformes: Soleidae) from the Hawaiian Islands¹

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ABSTRACT: A brief review is given of the literature of the soleid genus *Aseraggodes*, restricted to the Indo-Pacific region except for one species in the Galápagos Islands. *Aseraggodes ocellatus*, described from Sri Lanka by Weed (1961), is synonymized with *Pardachirus pavoninus* (Lacepède). *Aseraggodes* is represented in the Hawaiian Islands by two shallow-water endemic species: *A. borehami* Randall, n. sp., is distinct in its combination of having 71–75 dorsal rays; 49–52 anal rays; 66–70 lateral-line scales; a moderately elongate body (depth 2.55–2.8 in SL); front of upper lip not overlapping lower lip when mouth closed; caudal peduncle present but short; moderately large size (largest of 10 specimens, 102.8 mm SL); and an ocular-side color pattern of light brown with numerous irregular white spots, some scales variously edged in dark brown. *Aseraggodes therese* Randall, n. sp., has 72–79 dorsal rays; 54–61 anal rays; 60–66 lateral-line scales; body depth 2.25 to 2.75 in SL; front of upper lip overlapping lower lip when mouth closed; no caudal peduncle; small size (largest of 27 specimens, 66 mm SL); and an ocular-side color pattern dominated by irregular dark brown blotches of variable size, the largest in three longitudinal series.

UNTIL RECENTLY, THE FLATFISHES called soles were classified in one family, the Soleidae. The Soleidae has now been divided into two families, the Soleidae and the Achiridae, the latter a New World group referred to as American soles (Chapleau and Keast 1988, Chapleau 1993). The species of Achiridae differ in having a free margin to the preopercle and the right pelvic fin joined to the anal fin. The family Cynoglossidae, the tonguefishes, has been included by a few authors within the Soleidae, a classification rejected by Nelson (1994) and others. The Soleidae consists of at least 20 genera; one of the largest is *Aseraggodes* Kaup (1858), the species of which are confined to the Indo-Pacific region except for one from the Galápagos Islands.

Aseraggodes is diagnosed as follows: eyes

on right side, separated by a narrow scaled space, the upper in advance of the lower; no pectoral fins; a straight lateral line mid-laterally on both sides, with a short anterodorsal branch on the blind side; scales small and ctenoid; no prominent pores at base of dorsal and anal fin rays; gill membranes united, free from isthmus, the lower part of head scaled over from ocular to blind side; jaws strongly curved; a band of villiform teeth in jaws only on blind side; two nostrils on each side, the anterior nostril of ocular side tubular and shorter than the eye, the posterior nostril a slit in the labial groove; dorsal fin originating anteriorly on snout, the first ray not prolonged; caudal fin not connected by membrane to dorsal and anal fins, typically with 18 rays (usually 14–16 branched); caudal peduncle, if present, very short; pelvic fins short-based, with 5 rays; abdominal vertebrae 9.

Chabanaud (1930a) reviewed the genus *Aseraggodes*, recognizing 15 species; however, *Achirus melanospilus* (Bleeker) is now classified in *Liachirus* Günther. Chabanaud

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(1930b) redescribed a sole from Queensland that Norman (1926) identified as *A. melanostictus* (Peters) and renamed it *A. normani*. Chabanaud (1931) described *A. sinusarabici* as new from the Gulf of Suez and Djibouti (an inappropriate specific name, because it suggests an Arabian Gulf locality), and he transferred *A. filiger* Weber to the new genus *Coryphillus* based on its contiguous eyes and elongate first dorsal ray. Chabanaud (1943) created the new genus *Synclidopus* for *A. macleayana* (Ramsay) and *A. normani*; he also placed *A. abnormis* Weber & de Beaufort in a new genus, *Beaufortella*. Seale (1940) described *A. herrei* from one specimen from the Galápagos Islands. Weed (1961) named *A. ocellatus* from Sri Lanka; however, this species is here synonymized with *Pardachirus pavoninus* (Lacepède). Chabanaud in Morrow (1954) described *Aseraggodes morrowi* from Kenya; however, Heemstra and Gon in Smith and Heemstra (1984) correctly referred the species to the genus *Pardachirus*. Ochiai (1963) reviewed the Soleidae and Cynoglossidae of Japan; he proposed the subfamily Aseraggodinae for the genera *Aseraggodes*, *Liachirus*, *Parachirus*, and *Pardachirus*. Schultz (1943) recorded a 35-mm sole from Hull Island, Phoenix Islands, that, he said, "may be a specimen of *Aseraggodes melanostictus* (Peters)." Woods in Schultz and collaborators (1966) added *A. whitakeri* and *A. smithi* as new from single specimens from the Marshall Islands and identified a specimen from Kwajalein Atoll as *A. melanostictus* "with uncertainty." Randall and Meléndez (1987) described *A. bahamondei* from Easter Island and Lord Howe Island; they noted that the closest relative to *A. bahamondei* is an undescribed species from New South Wales well represented by specimens in the Australian Museum. The many specimens existing in museums, including the Bishop Museum, that are identified only as *Aseraggodes* sp. attest to the need for a revision of the genus. A reappraisal is also needed of the generic classification within the subfamily, particularly with respect to the work of Chabanaud.

Gosline and Brock (1960) recorded the first soleid fish from the Hawaiian Islands. They

identified it "very provisionally" as *Aseraggodes kobensis* (Steindachner), one of two species known from Japan (Ochiai 1963). Additional fish collecting in Hawai'i has resulted in specimens of a second species of the genus, and further study has revealed that the Hawaiian material identified as *A. kobensis* represents an undescribed species. The purpose of this paper is to describe these two Hawaiian soles.

MATERIALS AND METHODS

Type specimens of the new species have been deposited in the Australian Museum, Sydney (AMS); the Natural History Museum, London (BMNH); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS); National Science Museum, Tokyo (NSMT); and the U.S. National Museum of Natural History, Washington, D.C. (USNM). Some specimens of *Aseraggodes therese* were originally part of the University of Hawai'i (UH) fish collection. Most fish specimens of this collection were transferred to the Bishop Museum collection in 1974.

Lengths recorded for specimens are standard length (SL), measured from the front of the head at the base of the anterior dorsal rays (the dorsal fin is more anterior than the front of the snout on most species of *Aseraggodes*) to the midbase of the caudal fin (end of hypural plate); body depth is the greatest distance between the bases of the dorsal and anal fins (as determined by X ray or by transmitting a bright light through the specimen); body thickness is the maximum thickness between the ocular and blind surfaces (but not over the abdomen); head length is measured on the ocular side from the upper end of the gill opening to the front of the head (base of anterior dorsal rays); snout length is taken from the same anterior point to the front of the upper eye; eye diameter is the horizontal diameter of the upper eye (the dark eyeball, not the fleshy outer cutaneous part, which is more variable); interorbital width is the least width between the dark edges of the two eyes; upper-jaw length

TABLE 1
PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Aseraggodes borehami* EXPRESSED AS PERCENTAGES OF THE STANDARD LENGTH

	HOLOTYPE				PARATYPES					
	BPBM 7834	BPBM 36804	BMNH 1996. 1.24.1	AMS I.37164- 001	CAS 85567	BPBM 31030	BPBM 33478	USNM 339301	NSMT-P 48114	BPBM 36867
Sex	female	?	female	male	female	male	male	male	male	male
Standard length (mm)	76.0	56.6	69.9	73.4	92.3	92.5	94.5	96.8	100.2	102.8
Body depth	39.5	37.6	38.0	37.9	38.2	37.8	37.9	37.9	36.1	37.2
Body thickness	7.0	7.8	7.4	6.4	7.3	7.0	7.4	7.2	7.0	7.4
Head length	23.9	23.5	24.0	23.4	23.5	22.9	23.0	23.5	22.7	22.0
Snout length	6.2	6.2	6.6	6.5	6.1	6.4	6.0	6.9	5.9	5.8
Eye diameter	3.8	3.9	4.6	4.0	3.8	4.1	3.3	3.9	3.3	3.1
Interorbital width	2.0	1.9	1.8	2.1	2.3	2.7	2.7	2.1	2.3	2.4
Upper jaw length	7.6	7.8	8.7	8.0	7.7	7.3	8.6	7.4	8.1	7.6
Caudal peduncle depth	13.0	12.2	12.3	13.1	12.5	13.0	13.1	13.0	13.1	12.9
Caudal peduncle length	3.7	2.6	3.7	3.8	3.3	3.3	3.2	4.0	3.4	4.0
Predorsal length	5.0	5.3	5.7	5.2	5.2	5.4	5.0	5.1	4.9	5.3
Preanal length	26.2	24.3	25.9	26.2	26.5	24.8	25.2	26.0	25.1	23.3
Prepelvic length	20.8	19.7	20.1	21.2	19.8	18.4	20.6	21.3	20.6	17.8
First dorsal ray	7.9	8.8	7.5	8.2	7.5	7.0	7.4	8.1	7.8	7.0
Longest dorsal ray	14.2	14.4	14.3	16.3	14.3	15.7	17.2	17.9	17.5	17.5
First anal ray	7.9	8.9	8.6	9.3	7.9	8.3	8.7	10.4	9.8	10.5
Longest anal ray	14.5	14.4	15.0	16.5	14.5	16.2	17.3	17.7	17.7	17.6
Caudal fin length	26.2	28.6	27.8	30.6	23.4	28.3	27.5	30.6	29.4	30.5
Pelvic fin length	11.6	12.0	12.9	13.0	10.7	11.9	12.3	11.3	12.7	12.8

is measured on the ocular side from the front of the upper lip to the rear of the maxilla; caudal-peduncle depth is the least depth, and caudal-peduncle length the horizontal distance between the rear base of the anal fin and the base of the caudal fin; predorsal, preanal, and prepelvic lengths are measured from the base of the first ray of these fins to the most anterior point of the upper lip; lengths of dorsal and anal rays are measured from the extreme base of the rays to the tips without trying to straighten the rays; caudal-fin length is the length of the longest median ray; pelvic-fin length is the length of the longest ray of the fin of the ocular side. Lateral-line scales are counted on the ocular side from directly above the upper end of the gill opening to the base of the caudal fin; the counts of the number of scales above and below the lateral line are the highest obtained in a diagonal row between the lateral line and the base of the dorsal and anal fins, respectively.

Data in parentheses in the descriptions re-

fer to paratypes. Proportional measurements of type specimens are presented in Tables 1 and 5 as percentages of the standard length; the paratype data are arranged in ascending order according to length. Proportions in the text are expressed as follows: body depth, head length, and caudal-fin length are divided into the standard length, body thickness into the depth, and the remaining measurements into the head length; these ratios are rounded to the nearest 0.05. Meristic data are given in Tables 2–4.

Aseraggodes borehami Randall, n. sp.

Figures 1–3; Tables 1–4

DIAGNOSIS: A species of *Aseraggodes* with 71–75 dorsal rays; 49–52 anal rays; 66–70 lateral-line scales; body moderately elongate, the depth 2.55–2.8 in SL; snout not overlapping lower lip; color of ocular side light brown with numerous irregular white spots, some scales edged in dark brown to a variable extent; largest specimen 102.8 mm SL.

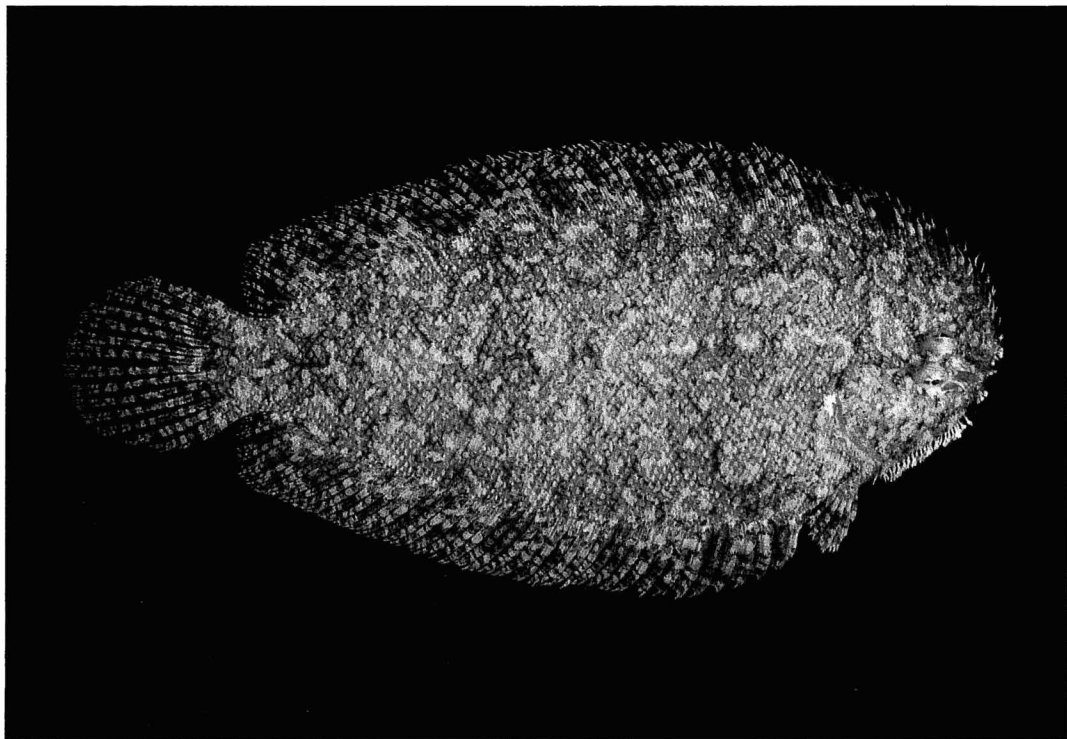


FIGURE 1. Holotype of *Aseraggodes borehami*, BPBM 7834 female, 76.0 mm SL, off Kāne'ohe Bay, O'ahu (J. Randall).

DESCRIPTION: Dorsal rays 74 (71–75); anal rays 52 (49–52); dorsal and anal rays branched (the very small posterior rays may be simple in small specimens), the last ray of each fin not connected by membrane to caudal fin; caudal rays 18, the median 16 branched; pelvic rays 5, all branched; lateral-line scales 70 (66–70), with 9 (9–11) pored scales continuing onto head; scales above lateral line 26 (25–27); scales below lateral line 29 (28–30); no gill rakers (inner edge of first gill arch with tiny papillae); vertebrae 9+28; first dorsal pterygiophore stout and long, branching anteriorly, the first branch to first dorsal ray, the shorter second branch to space between second and third rays; remaining pterygiophores slender; first 2 dorsal pterygiophores leading to space before first neural spine; next 8 (7–8) ending in space between first and second neural spines; the next two spaces between neural spines with 3 (2–3, usually 3) dorsal pterygi-

phores; the next space with 2 (2–3) dorsal pterygiophores; spaces after that with 2 dorsal pterygiophores.

Body oval, moderately elongate, the depth 2.55 (2.6–2.8) in SL; body thin, the thickness 5.65 (4.8–5.9) in body depth; head symmetrically rounded anteriorly, the head length (to most anterior point disregarding dorsal fin) 4.2 (4.15–4.55) in SL; snout length (from in front of upper eye) 3.85 (3.4–3.85) in head length; eyes small, the upper eyeball diameter 6.3 (5.25–7.1) in head; eyes separated by a narrow concave scaled space (8–10 scales in transverse series), the interorbital width 12.0 (8.5–13.3) in head; upper eye in advance of lower, a vertical at posterior edge of upper eye (edge of the dark eyeball) passing through center of lower eye (varying in paratypes from about posterior quarter to anterior quarter of lower eye); upper end of gill opening at same level as anterior end of mouth; caudal-peduncle depth 1.85 (1.75–

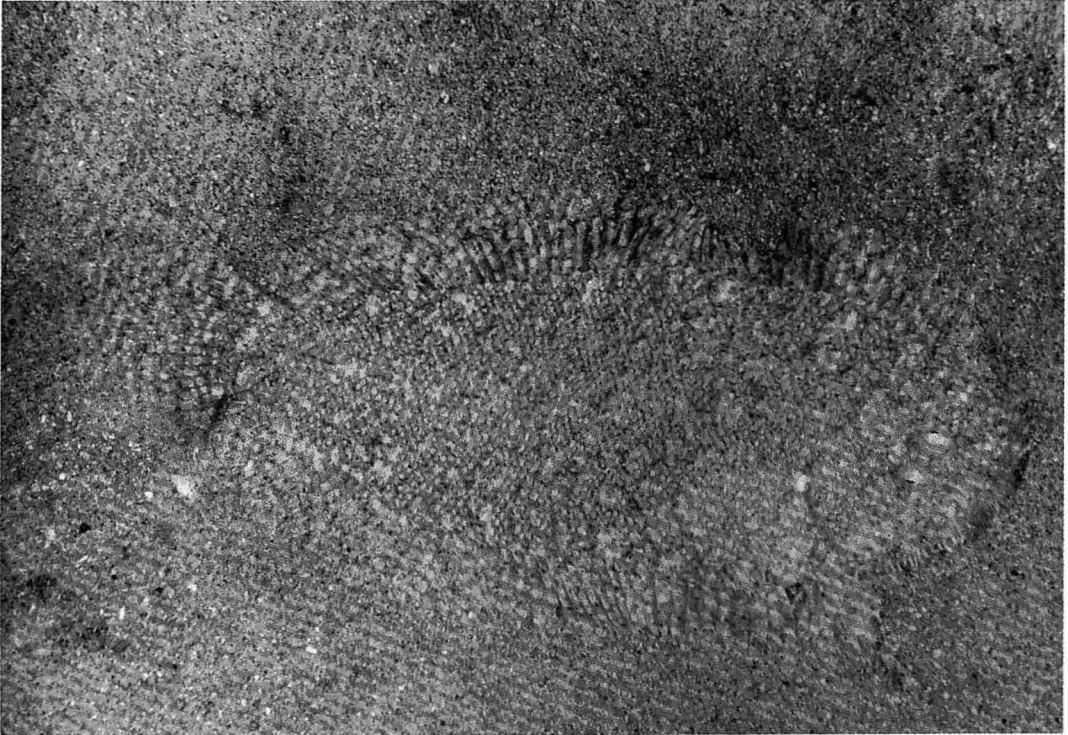


FIGURE 2. Underwater photograph of paratype of *Aseraggodes borehami*, BPBM 33478, male, 94.5 mm SL, Puakō, Hawai'i (J. Randall).

1.95) in head; caudal peduncle very short, its length 6.45 (5.5–9.0) in head.

Mouth inferior, the jaws strongly curved; upper lip not overlapping the lower; maxilla ending below anterior edge of pupil of lower eye (to below front of eye in some paratypes), the upper-jaw length 3.15 (2.75–3.2) in head; a band of slender villiform teeth (about 8 irregular rows in its greatest width) on jaws of blind side; inner surface of upper lip on blind side strongly plicate; anterior nostril of ocular side a tapering membranous tube in front of upper part of lower eye, nearly or just reaching lower eye when laid back; posterior nostril of ocular side a downward-directed slit in labial groove at front edge of lower eye; anterior nostril of blind side a slender tapering membranous tube above middle of upper jaw at edge of labial groove, its length in holotype three-fourths diameter of upper eyeball; posterior blind-side nostril a short

TABLE 2
COUNTS OF THE DORSAL FIN RAYS OF TYPE SPECIMENS OF
Aseraggodes borehami AND *A. therese*

	DORSAL RAYS								
	71	72	73	74	75	76	77	78	79
<i>A. borehami</i>	2	2	3	1	2				
<i>A. therese</i>		1	3	5	5	7	4	1	1

membranous tube dorsoposterior to anterior nostril, the internarial distance in holotype equal to upper eyeball diameter.

A straight lateral line midlaterally on both sides of body; blind-side lateral line with a less-distinct dorsoanterior branch on head along base of dorsal fin, extending a variable distance onto body (in one paratype to below the 50th dorsal ray). Scales ctenoid on both

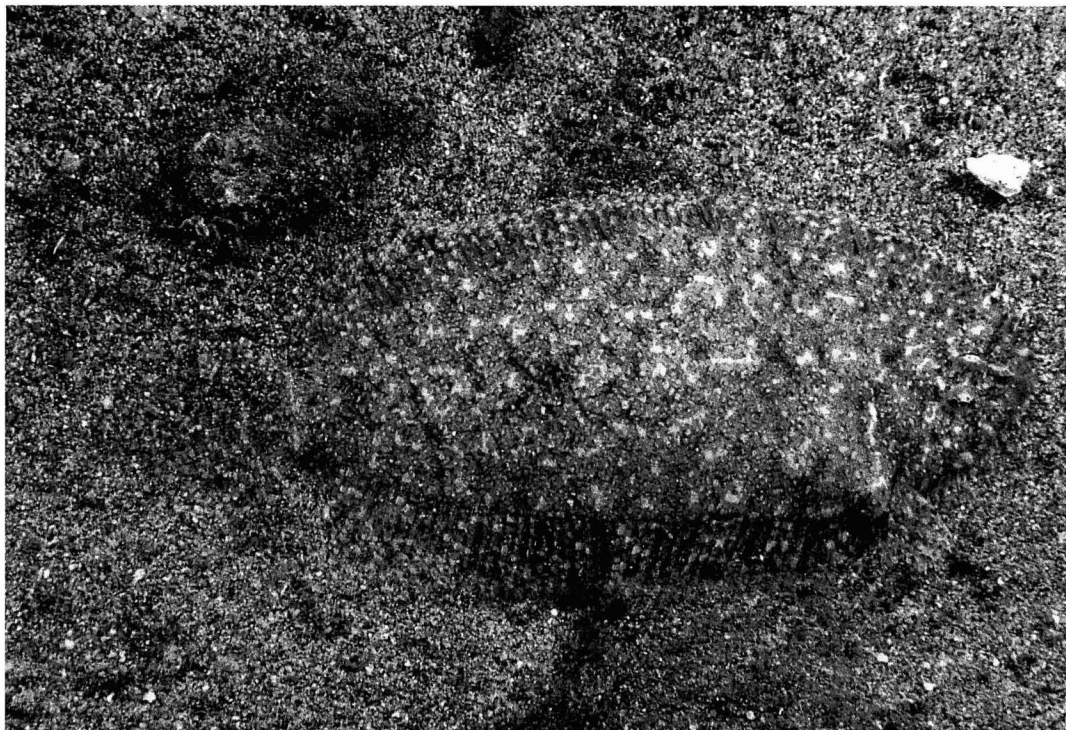


FIGURE 3. Underwater photograph of *Aseraggodes borehami*, West Maui (J. Randall).

sides of body except lateral-line scales, which are embedded and lack cteni; scales on body about 1.5 times longer than wide with numerous fine longitudinal ridges, the rounded exposed part with 11–17 prominent cteni, the middle ones longest (highest count of cteni on paratypes, 21); scales becoming progressively smaller anteriorly on head, those toward front of snout and basally on anterior part of dorsal fin losing cteni and becoming partially embedded; scales replaced by small fleshy papillae still more anteriorly on dorsal fin at front of head; papillae better developed anteriorly and around mouth on blind side; dorsal rays along upper part of head with a column of progressively smaller scales on each ray and adjacent membrane on both sides (more than half distance to ray tips on anterior rays, gradually shorter on more posterior rays until no scales present on the third ray posterior to head); anal rays and dorsal rays posterior to those with scales with a membranous ridge basally on each side, this con-

tinuing, though progressively shorter posteriorly, to end of anal fin, but disappearing from last few rays of dorsal fin; lower edge of head with a fringe of fleshy papillae, variously developed on different specimens.

Origin of dorsal fin (base of first ray) directly in front of lower edge of upper eye, but a fleshy papillate ridge continues anterior to first dorsal ray to front of upper lip; first dorsal ray short, 3.0 (2.7–3.3) in head; longest dorsal rays (37th to 43rd on holotype equal), 1.7 (1.3–1.7) in head; origin of anal fin a short distance behind head, on a vertical at base of 24th dorsal ray; first anal ray also short, 3.0 (2.25–3.0) in head; longest anal rays (25th to 27th on holotype equal), 1.7 (1.3–1.65) in head; caudal fin rounded, 3.8 (3.25–4.35) in SL; bases of pelvic fins contiguous anteriorly, diverging slightly posteriorly, about the lower third of the last ray of each joined by membrane to ventral part of abdomen; base of last ray of pelvic fins slightly anterior to anus; pelvic fin of ocular

TABLE 3
 COUNTS OF THE ANAL FIN RAYS OF TYPE SPECIMENS OF *Aseraggodes borehami* AND *A. therese*

	ANAL RAYS												
	49	50	51	52	53	54	55	56	57	58	59	60	61
<i>A. borehami</i>	1	2	1	6									
<i>A. therese</i>						3	2	6	8	5	2		1

side a little longer than fin of blind side, the second and third rays longest, 2.05 (1.7–2.2) in head, reaching to or slightly beyond base of third anal ray; pelvic fin of ocular side slightly in advance of fin of blind side; anus median, directly in front of origin of anal fin; genital papilla on ocular side of first anal ray.

Color of holotype in alcohol: entirely pale (true also of some of the older paratypes, but paratypes more recently collected have retained their color pattern essentially like that in life except that the light brown ground color is now pale).

Color of ocular side of holotype when fresh: light brown with irregular white spots, some round, some as circles, many as short arcs; edges of some scales dark brown or partly dark brown; concentrations of such dark-edged scales forming indistinct dark blotches, the most conspicuous along lateral line, especially one slightly posterior to middle of body and one between posterior part of dorsal and anal fins, and along bases of dorsal and anal fins; scattered over body are dark edges where four scales meet, thus forming dark brown X's; fin rays mottled and spotted with white and dark brown, the membranes clear; blind side whitish with scattered dark brown dots, most concentrated along outer part of body.

REMARKS: This sole is named in honor of Roland S. Boreham in recognition of his support for my ichthyological research.

When first collected in 1960, specimens now identified as *A. borehami* were tentatively identified as *Aseraggodes whitakeri* Woods in Schultz and collaborators (1966), described from a single specimen 38 mm SL from Rongelap Atoll, Marshall Islands. The identification was based principally on Woods'

recording 72 dorsal rays, 51 anal rays, and 72 lateral-line scales. However, when more specimens of *A. borehami* were collected, and the holotype of *A. whitakeri* was examined, it was realized that there are differences in meristic data. Woods' count of the dorsal rays was corrected from 72 to 77. The dorsal-ray and lateral-line scale counts of the holotype of *A. whitakeri* were then outside the known range of those of *A. borehami*. More important, the upper lip of *A. whitakeri* completely overlaps the lower lip. Also it is a fully mature female at only 38 mm SL, so obviously this is a much smaller species than *A. borehami* (a 56.6-mm specimen is immature).

One other species with meristic data close to that of *A. borehami* is *A. melanostictus* (Peters, 1877), described from one specimen 90 mm long (presumably total length) taken in 40 fathoms off the island of Bougainville. Peters' counts: dorsal rays 73, anal rays 54, and lateral-line scales 70. Only the anal-ray count falls outside the range given here for *A. borehami* (by a count of 2, but if many specimens of *A. borehami* were available, it is likely that some will have 54 anal rays). Chabanaud (1930a,b) examined the holotype of *A. melanostictus* in Berlin and provided additional information. There is obvious difference in the color of *A. borehami* from the descriptions of *A. melanostictus* given by both Peters and Chabanaud. *Aseraggodes melanostictus* was described by Peters as gray-brown with scattered dark spots in indistinct transverse rows; the median fins dark with a clear border. Furthermore, Chabanaud gave the eye size as 11% of the head length (in *A. borehami* it varies from 14 to 19%).

The holotype of *A. borehami* is a fully ripe female. The ovary lies in a narrow, tapering

TABLE 4
 COUNTS OF THE LATERAL-LINE SCALES OF TYPE
 SPECIMENS OF *Aseraggodes borehami* AND *A. therese*

	LATERAL-LINE SCALES										
	60	61	62	63	64	65	66	67	68	69	70
<i>A. borehami</i>							1	2	3	2	2
<i>A. therese</i>	1	2	2	4	8	5	1				

posterior extension of the body cavity from a vertical at the base of the sixth anal ray to a vertical at the base of the 27th anal ray.

The five largest of the 10 type specimens of *A. borehami* are males. Adult males, in general, have longer fins than females (Table 1).

All specimens were collected from sand or sand and rubble substrata in the depth range of 6–29 m. Most were from caves or at the entrances to caves. They are usually found buried just beneath the surface of the sand. Their presence is revealed only when one's hand touches the sand above or near them. They then dart away 20 cm or so and quickly rebury in the sand. Only if they are repeatedly frightened in this manner will they remain, at least briefly, on the surface, at which time a photograph is possible.

The stomach and intestines of the eight largest type specimens were examined for food material. Two were completely empty. The stomach of one contained a shrimp. The intestines of three contained crab remains (one specimen also had an unidentified worm, and another an alpheid shrimp). The seventh fish had a small pelecypod and crustacean remains in its intestine. The intestine of the last fish, 94.5 mm SL, contained three small, partly crushed gastropods and a hermit crab in a fully intact shell measuring 6 by 3 mm (which caused a substantial bulging of the intestine). Very little sand was present in the digestive tracts.

TYPE MATERIAL: Holotype: BPBM 7834, female, 76.0 mm, Hawaiian Islands, O'ahu, off channel entrance at NE end of Kāne'ōhe Bay, cave with sand and coral rubble bottom, 29 m, J. E. Randall, E. H. Chave, and W. Hashimoto, 10 October 1969.

Paratypes: CAS 85567, 92.3 mm, Hawaiian Islands, O'ahu, off Pōka'i Bay, sand, 24.5 m, rotenone, J. E. Randall, E. H. Chave, and S. N. Swerdloff, 29 July 1969; AMS I.37164-001, 73.4 mm, same data as holotype; BPBM 31030, 92.5 mm, O'ahu, Mākaha, coral reef, cave with sand bottom, 10.5 m, hand nets, J. L. Earle, 17 August 1986; BMNH 1996.1.24.1, 69.9 mm, USNM 339301, 96.8 mm, NSMT-P 48114, 100.2 mm, same data as BPBM 31030; BPBM 33478, 94.5 mm, Hawai'i, Kona coast, Puakō, small sand patch in coral reef, 6 m, hand nets, J. E. Randall and J. L. Earle, 18 November 1987; BPBM 36804, 56.6 mm, Maui, off Pu'u Ōla'i, sand in small cave, 10 m, spear, J. E. Randall, 1 September 1995; BPBM 36867, 102.8 mm, O'ahu, Mākaha, sand bottom under ledge, 15 m, rotenone, J. L. Earle, 10 November 1995.

Aseraggodes therese Randall, n. sp.

Figures 4–6; Tables 2–5

Aseraggodes kobensis (non Steindachner)

Gosline and Brock, 1960: 151, 323.

DIAGNOSIS: A species of *Aseraggodes* with 72–79 dorsal rays; 54–61 anal rays; 60–66 lateral-line scales; body depth 2.25–2.75 in SL; front of snout overlapping lower lip when mouth closed; no caudal peduncle; ocular side pale with irregular dark brown blotches of various sizes in three longitudinal series, the largest blotches on the lateral line; largest specimen, 66 mm SL.

DESCRIPTION: Dorsal rays 72 (72–79), dorsal rays of holotype branched except first 13 (none branched in 19.7-mm paratype, all branched in 66-mm paratype); anal rays 54 (54–61), all rays branched in holotype (none branched in 19.7-mm paratype); last ray of dorsal and anal fins adjacent to upper and lower caudal rays, respectively, but not connected by membrane to caudal fin; caudal rays 18, all but lowermost branched in holotype (median 12 branched in 19.7-mm paratype, all but lowermost branched in 66-mm paratype); pelvic rays 5, all branched (just beginning to branch on 19.7-mm paratype); lateral-line scales 62 (60–66), with 8 (4–9) pored scales continuing onto head;

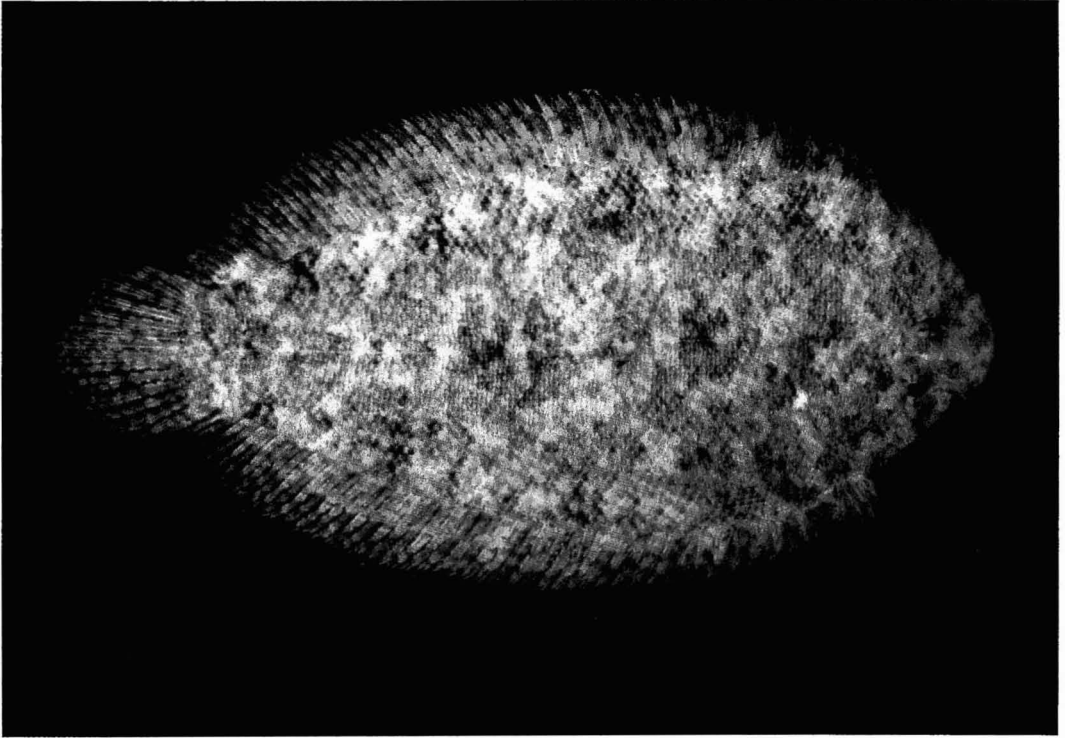


FIGURE 4. Holotype of *Aseraggodes therese*, BPBM 34845, male, 40.3 mm SL, Midway Atoll, Northwestern Hawaiian Islands (J. Randall).

scales above lateral line 27 (26–28); scales below lateral line 28 (27–31); no gill rakers (inner edge of first gill arch with a series of close-set, tiny papillae); vertebrae 9 + 27 (26–28); first dorsal pterygiophore stout and long, the remaining pterygiophores slender; first 2 dorsal pterygiophores leading to space before first neural spine; next 5 (4–6) ending in space between first and second neural spines; the next three spaces between neural spines with 3 (2–4, usually 3) pterygiophores each; after that, 2 per space.

Body oval, the depth 2.3 (2.25–2.75) in SL; body thin, the thickness 5.65 (5.3–6.05) in body depth; head symmetrically rounded anteriorly, the head length (to most anterior point, disregarding dorsal fin) 3.9 (3.85–4.2) in SL; snout length (from before upper eye) 4.8 (4.6–5.2) in head; eyes small, the upper eyeball diameter 5.3 (5.1–5.95) in head; eyes separated by a narrow, concave scaled space

(about 10 scales in transverse series), the interorbital width 10.2 (8.1–10.1) in head; upper eye in advance of lower, a vertical at posterior edge of upper eye (edge of dark eyeball) passing through anterior third of lower eye (varying in paratypes from about posterior third to anterior quarter of lower eye); upper end of gill opening at same level as anterior end of mouth; no caudal peduncle; depth at caudal-fin base 1.7 (1.7–2.0) in head.

Mouth inferior, the jaws strongly curved; front of upper lip overlapping front of lower lip when mouth closed; maxilla nearly reaching to below center of lower eye (varying from below anterior fourth of eye to below posterior third of eye in paratypes), the upper-jaw length 3.15 (2.9–3.3) in head; a band of slender villiform teeth (about 6–7 irregular rows at its greatest width) on jaws of blind side; inner surface of upper lip not plicate;

TABLE 5

PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Aseraggodes therese* EXPRESSED AS PERCENTAGES OF THE STANDARD LENGTH

	HOLOTYPE				PARATYPES					
	BPBM 34845	BPBM 31311	BPBM 31314	BPBM 31311	BPBM 7832	BPBM 36794	BPBM 30650	BPBM 31314	BPBM 36794	BPBM 31312
Sex	male	female	male	female	female	male	male	male	male	male
Standard length (mm)	40.3	19.7	32.9	42.6	43.5	51.4	55.1	57.4	57.5	61.6
Body depth	43.1	36.5	38.8	42.6	43.4	44.1	40.0	44.0	43.2	43.9
Body thickness	7.6	6.6	6.5	7.5	7.1	7.8	6.6	6.9	8.1	7.1
Head length	25.5	26.1	25.9	24.6	24.2	25.4	23.8	24.0	24.5	24.3
Snout length	5.3	5.4	5.3	5.1	5.0	4.9	5.0	4.7	5.3	5.3
Eye diameter	4.8	5.1	4.9	4.7	4.6	4.7	4.0	4.8	4.3	4.9
Interorbital width	2.5	3.0	3.2	2.6	2.7	2.9	3.0	2.8	2.7	2.4
Upper jaw length	8.1	8.1	8.5	7.6	7.5	8.2	7.5	7.3	8.4	8.1
Depth at caudal-fin base	14.8	12.9	13.0	14.0	13.5	14.1	13.7	13.2	13.7	14.2
Predorsal length	5.4	6.0	6.1	5.3	4.6	5.3	5.4	5.1	5.2	4.6
Preanal length	23.1	25.4	24.6	22.8	25.0	24.0	26.0	23.9	23.4	24.5
Prepelvic length	17.5	17.0	18.2	18.8	19.8	18.3	20.3	18.5	18.5	20.6
First dorsal ray	7.6	7.8	7.6	broken	7.6	7.5	7.4	7.1	6.9	6.4
Longest dorsal ray	15.8	15.8	16.0	14.0	15.6	15.4	14.0	14.3	13.7	14.8
First anal ray	7.2	8.1	8.0	7.5	7.6	7.2	7.3	7.0	7.2	7.0
Longest anal ray	15.4	15.7	15.4	14.5	15.6	15.1	14.1	13.9	13.5	14.0
Caudal fin length	23.0	24.0	24.3	21.1	23.0	23.4	19.4	20.9	20.7	19.2
Pelvic fin length	10.1	10.2	10.9	10.5	10.6	11.3	10.0	10.5	10.3	10.1

anterior nostril of ocular side a tapering membranous tube in front of upper part of lower eye, just reaching lower eye when laid back (slightly overlapping edge of eyeball in some paratypes); posterior nostril of ocular side a downward-directed slit in labial groove at front edge of lower eye; anterior nostril of blind side a slender tapering membranous tube above middle of upper jaw at edge of labial groove, its length in holotype equal to about half diameter of upper eyeball; posterior nostril also a membranous tube, but shorter with a broader base, dorsoposterior to anterior nostril, the internarial distance about equal to upper eyeball diameter.

A straight lateral line midlaterally on both sides of body; in addition, on blind side, a less-distinct dorsoanterior branch on head along base of dorsal fin, extending a variable distance onto body (in holotype to below base of 32nd dorsal ray). Scales ctenoid on both sides of body except lateral-line scales, which are embedded and lack cteni; scales on body about 1.5 times longer than wide

with numerous fine longitudinal ridges, the rounded exposed part with 7–9 very long cteni on the edge (to as many as 13 cteni on larger paratypes); scales becoming progressively smaller anteriorly on head, those toward front of snout and basally on anterior part of dorsal fin losing cteni and becoming partially embedded; scales replaced by small fleshy papillae still more anteriorly on dorsal fin at front of head; papillae better developed anteriorly on blind side of head and around mouth (larger paratypes with fleshy cirri as well as papillae); fleshy cirri on opercle at edge of gill opening on both sides and along lower edge of head (better developed on some specimens than others, especially larger ones); dorsal rays along upper part of head with a column of progressively smaller scales on each ray and adjacent membrane on both sides, the scales extending more than half distance to ray tips on anterior rays, gradually less on more posterior rays until no scales are present on rays posterior to head (on some paratypes low columns of scales

present on a few rays posterior to head; also some on anterior anal rays); anal rays and dorsal rays posterior to those with scales with a membranous ridge basally on each side extending about three-fourths length of rays, this ridge shorter on more posterior rays and disappearing from last few rays.

Origin of dorsal fin (base of first ray) directly in front of lower edge of upper eye; dorsal fin continuing as a fleshy papillate ridge anterior to first dorsal ray to front of upper lip; first dorsal ray short, 3.35 (3.2–3.8) in head; longest dorsal rays (47th to 49th of holotype equal), 1.6 (1.55–1.8) in head; origin of anal fin at a vertical about an eye diameter in front of upper end of gill opening and in line with base of 18th dorsal ray; first anal ray short, 3.55 (3.2–3.6) in head; longest anal rays (33rd to 37th of holotype equal), 1.65 (1.55–1.8) in head; caudal fin rounded, 4.35 (4.1–5.2) in SL; bases of pelvic fins contiguous anteriorly, diverging slightly posteriorly; base of last ray of each pelvic fin at origin of anal fin, not joined by membrane to anal fin or ventral part of abdomen; pelvic fins short, about equal in length, the third or fourth rays longest, 2.5 (2.25–2.4) in head, reaching to base of third anal ray; pelvic fin of ocular side slightly in advance of fin of blind side; anus median, directly in front of origin of anal fin; genital papilla on ocular side of first anal ray.

Color of holotype in alcohol: ocular side pale yellowish brown finely mottled with blackish, with three longitudinal series of large irregular dark blotches (not solid blotches, but concentrations of dark mottling), one along each side (about six blotches with lesser blotches between) and one on lateral line; three dark blotches on lateral line largest (two close together in middle of body and one on a vertical through ninth anal ray); fins pale (under a microscope a fine stippling of small melanophores apparent, principally on rays), with a series of dark blotches at base (12 in dorsal fin, 9 in anal fin), consisting mainly of concentrations of dark pigment on two adjacent rays, and a concentration of dark pigment along outer edge of dorsal and anal fins; blind side pale (a fine stip-

pling of small melanophores visible under a microscope).

Two underwater photographs are included to show the variation in color. Figure 5 was taken of a fish over sand bottom, and Figure 6 of one on a reef.

REMARKS: This species is named *Aseraggodes therese* in honor of Therese Hayes, one of the collectors of the holotype. The specific name is treated as a noun in apposition.

Of the described species of *Aseraggodes*, *A. whitakeri* Woods seems closest to *A. therese*. As mentioned in the Remarks for *A. borehami*, *A. whitakeri* is a small species. It differs in having 52 anal rays (correction of Woods' count of 51) compared with 54–61 for *A. therese*, a distinct caudal peduncle, and the upper lip much more strongly overlapping the lower.

Aseraggodes therese is very close to the specimen Woods in Schultz and collaborators (1966) misidentified as *A. melanostictus* (Peters) from Kwajalein Atoll, Marshall Islands. The meristic data correspond, although the lateral-line scale count of 67 (correction of Woods' count of 63) is one over the range of 60–66 for *A. therese*. The color pattern is essentially the same (the dark blotches on the body in Woods' fig. 150 are not accurately placed; for example, the three blotches along the dorsal side should be in a more anterior position), and the body and fin proportions agree well. The most obvious differences are the failure of the upper lip of Woods' specimen to overlap the lower at the front and the more pointed shape of the caudal fin (described by Woods as "rather pointed, lanceolate," but better termed as rhomboid). I collected a second specimen from Kwajalein of the same species as Woods' "*melanostictus*" (BPBM 18445, 46.5 mm). It has 75 dorsal rays, 56 anal rays, and 62 lateral-line scales; the mouth structure is like that of Woods' specimen, and the caudal fin is rhomboid.

Aseraggodes therese is a shallow-water species. Those for which the depth of capture is reported were taken from the range of 1.5–26 m. As is the case with *A. borehami*, they

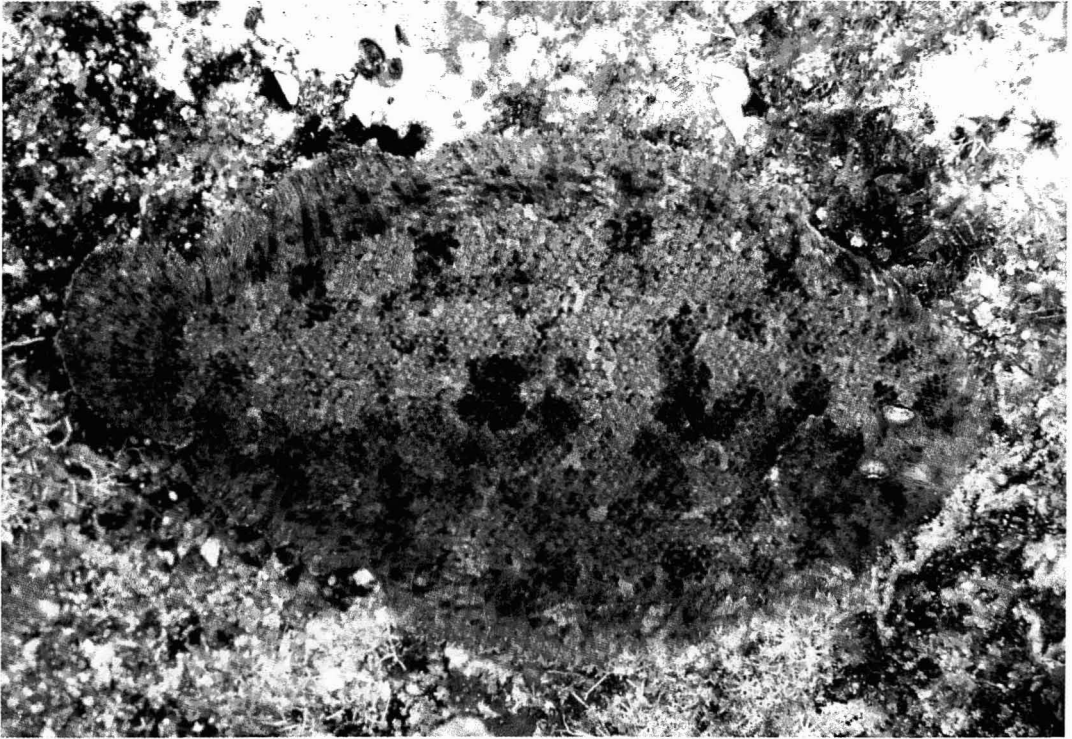


FIGURE 5. Underwater photograph of *Aseraggodes therese*, night, Pūpūkea, O'ahu (J. Hoover).

are often found buried in sand in caves. I have observed and photographed *A. therese* at night in the open on coral reef substrata (the photograph by John P. Hoover [Figure 5] was also taken at night), but not by day, suggesting that they are nocturnal (as is known for other soles of the genus and those of the related genus *Pardachirus*).

The seven largest paratypes of *A. therese* are males. The largest female measures 55 mm SL. A female 43 mm SL is fully ripe, with the ovary extending posteriorly to above the base of the 25th anal ray.

The stomach and intestines of 10 specimens, 40.3–66.0 mm SL, were examined for food material. One fish was empty. The others contained mainly small crustaceans (shrimps, crabs, isopods, ostracods, and amphipods, including caprellids); three had also eaten polychaetes, and a few contained Foraminifera. No mollusk remains were found except

for one gastropod operculum (there was no trace of the rest of the animal, so the operculum may have been accidentally ingested). There was surprisingly little sand in the digestive tracts.

TYPE MATERIAL: Holotype: BPBM 34845, male, 40.3 mm, Hawaiian Islands, Midway Atoll, Sand Island, SE side, 200 m SW of bulk garbage pier, cave in reef, 8 m, rotenone, J. E. Randall, J. L. Earle, T. Hayes, and R. L. Pyle, 16 September 1991.

Paratypes: BPBM 31311, 2: 19.7–42.6 mm, Hawaiian Islands, O'ahu, Hanauma Bay, rotenone, W. A. Gosline et al., 6 October 1951 (formerly UH 1270); BPBM 31312, 61.6 mm, O'ahu, off Diamond Head, A. L. Tester, W. A. Gosline et al., rotenone, 30 December 1951 (formerly UH 2448); BMNH 1996.1.24.2, 39.5 mm, Hawai'i, Kona coast, 1 mile N of Kailua, rotenone, W. A. Gosline,

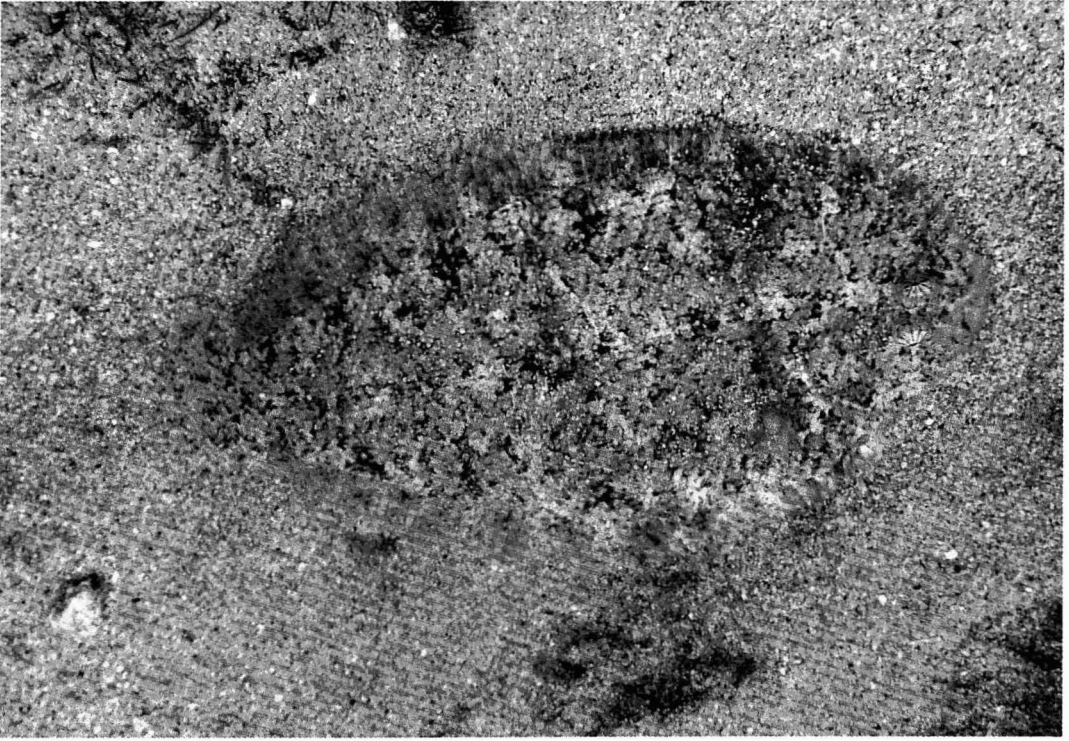


FIGURE 6. Underwater photograph of *Aseraggodes therese*, off Pu'u Ōla'i, Maui (J. Randall).

V. E. Brock et al., 19 June 1953; BPBM 30650, 55.1 mm, O'ahu, Makapu'u Point, rotenone, W. A. Gosline and G. Arita, 21 February 1963; AMS I.37165-001, 50.3 mm, O'ahu, off Ala Moana Beach, W. A. Gosline et al., March 1963; BPBM 31314, 2: 32.9–57.4 mm, O'ahu, Kāne'ohe Bay, W. A. Gosline et al., 10 April 1963 (formerly UH 3009); BPBM 7832, 4: 43.5–56.5 mm, O'ahu, Moku Manu, cave, 26 m, rotenone, J. E. Randall and W. J. Baldwin, 6 October 1969; CAS 85568, 3: 44.2–55.2 mm, O'ahu, off Lahilahi Point, sand in cave, 12 m, quinaldine, J. E. Randall and P. M. Allen, 11 July 1970; NSMT-P 48115, 31.6 mm, Hawai'i, large tide pool in 1960 lava flow just N of Kapoho Bay, rotenone, P.M. Allen and S. Ralston, 24 May 1973; USNM 339302, 66.0 mm, Hawai'i, Hawai'i Volcanoes National Park, Halapē, Frederick W. Ball, July 1975; BPBM 36794, 7: 18.4–58.5 mm, O'ahu, off Kāne'ohe Bay, outer end of

Sampan Channel, sand, spur and groove bottom, 13.5–14.5 m, rotenone, D. W. Greenfield and G. Cockrell, 17 October 1991.

ADDITIONAL MATERIAL EXAMINED (NON-TYPE): BPBM 31313, 2: 31–43 mm, Hawaiian Islands, O'ahu, off Waikīkī, W. A. Gosline, V. E. Brock, J. E. Randall et al., rotenone, 31 December 1952 (formerly UH 1700; condition poor).

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