Solenostomus halimeda, a new species of ghost pipefish (Teleostei: Gasterosteiformes) from the Indo-Pacific, with a revised key to the known species of the family Solenostomidae

James Wilder Orr[1], Ronald Alan Fritzsche[2], and John Ernest Randall[3]

1) NOAA/National Marine Fisheries Service, Alaska Fisheries Science Center, Resource Assessment and Conservation Engineering Division, 7600 Sand Point Way NE, Seattle, Washington 98115
2) Department of Fisheries, Humboldt State University, Arcata, CA 95521-8299
3) Bishop Museum, 1525 Bernice St., Honolulu, Hawaii 96817-2704

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Abstract
Solenostomus halimeda is described as a new species of the Solenostomidae, the ghost pipefishes, from specimens collected from the Maldives, western Australia, Papua New Guinea, and the Mariana Islands. The new species differs from all other solenostomids in the length of its spinous dorsal, pelvic, and caudal fins, its truncate caudal fin, lower dorsal and anal fin ray counts, and small size at sexual maturity. *Solenostomus halimeda* is most similar to *S. cyanopterus*, from which it also differs in its more slender snout, absence of a premaxillary spine in males, and presence of abdominal prickles. Unlike *S. paradoxus, S. halimeda* possesses multifid dermal papillae, nasal lamellae of males that fill only half the olfactory pit, and a reduced supraoccipital ridge. Unlike *S. armatus,* the new species has a reduced supraoccipital ridge and a more robust body, and females have a small dorsal patch of nasal lamellae and a convex pelvic fin margin. A revised key to adults of the family, and colour photographs of *Solenostomus halimeda, S.paradoxus, S. cyanopterus* and a diagram of *S. armatus* are provided.

Zusammenfassung
Solenostomus halimeda wird als neue Art der Solenostomidae (Geisterpfeifenfische) an hand von Exemplaren, die vor den Maldiven, Westaustralien, Papua-Neuginea und den Mariana Inseln gefangen wurden, beschrieben. Die neue Art unterscheidet sich von allen anderen Solenostomiden in der Länge ihrer stacheligen Rücken-, Bauch und Schwanzflosse, einer abgestumpften Schwanzflosse, einer reduzierten Anzahl von Rücken- und Afterflossenstrahlen sowie einer geringeren Größe zum Zeitpunkt der Geschlechtsreife. *Solenostomus halimeda* ähnelt am meisten *S. cyanopterus,* unterscheidet sich aber von der Art durch ein schlankeres Maul, die Abwesenheit von prämaxillaren Stacheln in Männchen und die Anwesenheit von Bauchdornen. Ungleich zu *Solenostomus paradoxus, S. halimeda* trägt vielförmige Hautwarzen; die Riechgrube in Männchen ist nur halb mit Geruchslamellen ausgefüllt und die Art hat einen reduzierten supraokzipitalen Kamm. Im Vergleich zu *S. armatus,* hat die neue Art ebenfalls einen reduzierten supraokzipitalen Kamm und dazu noch einen kräftigeren Körper; weiterhin haben die Weibchen einen kleinen dorsalen Tupfen von Geruchslamellen sowie einen konvexen Bauchflossenrand. Ein revidierter Schlüssel für Adulte Exemplare der Familie, Farbfotos von *Solenostomatus halimeda S. paradoxus, S. cyanopterus* sowie eine Zeichnung von *S. armatus* sind enthalten.

Résumé
Solenostomus halimeda est décrite comme espèce nouvelle de Solenostomidae, les poissons-aiguilles fantômes, à partir de spécimens collectés aux Maldives, en Australie de l'ouest, en Papouasie Nouvelle Guinée et dans les îles Mariannes. La nouvelle espèce diffère de tous les autres Solenostomidés par la longueur des rayons durs des nageoires dorsale, pelvienne et caudale, sa caudale tronquée, le nombre moins élevé de rayons dans la dorsale et l'anale et par la petite taille à maturité sexuelle. *Solenostomus halimeda* ressemble le plus à *S. cyanopterus,* dont il diffère par un rostre plus fin, l'absence d'épine prémaxillaire chez les mâles et la présence de piquants abdominaux. A la différence de *S. paradoxus, S. halimeda* possède des papilles dermiques divisées, des lamelles nasales chez les mâles qui n'occupent que la moitié du pore olfactif et un sillon supraoccipital réduit. A la différence de *S. armatus,* la nouvelle espèce a un sillon supraoccipital réduit et un corps plus robuste, alors que les femelles ont une petite zone dorsale de lamelles nasales et un bord convexe à la nageoire pelvienne. Le texte comprend une révision de la clé pour les adultes de la famille et des photos couleurs de *Solenostomus halimeda, S. paradoxus, S. cyanopterus* ainsi qu'un diagramme de *S. armatus.*

Sommario

Una nuova specie della famiglia Solenostomidae, i pesci pipa fantasma, *Solenostomus halimeda* viene descritta sulla base di esemplari raccolti lungo le coste delle Isole Maldive, dell'Australia occidentale, di Papua Nuova Guinea e delle Isole Marianne. La nuova specie si distingue da tutte le altre specie della stessa famiglia per la lunghezza delle sue pinne spinose (dorsale, pelviche e caudale), per la pinna caudale tronca, per un minor numero di raggi nelle pinne dorsale ed anale e per le dimensioni ridotte al raggiungimento della maturità sessuale. *Solenostomus halimeda* è piuttosto simile a *S. cyanopterus,* da cui però si discosta per avere un muso più longilineo, per l'assenza della spina premascellare nel maschio e per la presenza di spine addominali. Diversamente da *S. paradoxus, S. halimeda* possiede papille dermiche multifide, lamelle nasali che nei maschi occupano solo mezza fossetta olfattiva e una cresta sopraoccipitale ridotta. Rispetto invece a *S. armatus,* la nuova specie ha una cresta sopraoccipitale ridotta e un corpo più robusto, mentre le femmine possiedono un piccolo frammento dorsale di lamelle nasali e il margine convesso della pinna pelvica. Si include una nuova chiave dicotomica per gli individui adulti di questa famiglia, fotografie a colori di *Solenostomus halimeda, S. paradoxus* e *S. cyanopterus* e un disegno di *S. armatus.*

Introduction

During the course of a revision of the family Solenostomidae, Orr and Fritzsche (1993) noted four specimens as exhibiting characters different from the three recognized species, including *S. cyanopterus* to which they were tentatively referred. A description of this material as new was postponed until additional material became available. Two of the four original specimens, along with four additional, more recently collected, specimens, are herein described as a new species. Underwater observations are provided by JER. The remaining two specimens are probably distinct and await additional material.

We have also revised the key to adults of the family and provided colour photographs of all but one

Table I. Morphometric and meristic characters of described *Solenostomus* species. Morphometric data are presented as percentages of standard length (SL) or head length (HL), followed by means and standard deviations in brackets.

	S. halimeda	***S. cyanopterus***	***S. armatus***	***S. paradoxus***
N	5	52	6	47
Standard length (mm)	34.3-46.9	30.6-109	46.5-97.7	32.1-107
Morphometrics (%SL)				
Head length	45.3-52.5 (48.9+/-3.0)	39.8-50.5 (45.4 +/- 1.3)	40.3-49 (43.2+/-3.3)	37.2-53.5 (44.8+/-3.5)
Snout length	30.1-36.7 (33.5+/-2.3)	21.4-34.3 (31.2+/-2.0)	26.1-35.1 (30.6+/-3.7)	25.8-38.6 (31.5+/-2.8)
Pretrunk length	11.7-15.3 (13.2+/-1.0)	6.3-16.1 (11.7+/-1.9)	7.7-12.1 (9.8+/-1.9)	4.5-19.0 (12.1+/-2.6)
Trunk length	35.9-41.9 (37.9+/-2.4)	36.7-52 (42.7+/-2.2)	42.3-49.9 (47.0+/-2.6)	37.5-50.5 (43.2+/-2.8)
Ventral ridge (VR) 1/Vr2	72.0-94.0 (84.4+/-9.1)	55.6-110.0 (92.7+/-10.2)	56.3-100.0 (80.3+/-14.6)	47.8-140.0 (78.9+/-16.9)
Body depth	17.0-29.9 (21.5+/-1.2)	13.8-48.4 (21.3+/-4.8)	15.7-22.8 (19.1+/-2.3)	13.1-25.1 (19.2+/-2.6)
Caudal peduncle length	5.4-10.9 (8.2+/-2.3)	1.4-17.3 (7.3+/-3.6)	10.4-17.6 (14.0+/-2.3)	4.4-20.2 (12.5+/-3.3)
Caudal peduncle depth	3.5-4.4 (3.9+/-0.4)	3.2-10.4 (6.0+/-1.7)	2.9-3.7 (3.2+/-0.31)	2.3-8.0 (3.8+/-0.8)
Caudal peduncle depth/length	33.3-65.2 (49.9+/-12.4)	25.0-427.0 (119.9+/-92.8)	19.5-30.6 (23.5+/-4.1)	13.3-103 (34.2+/-17.5)
Spinous dorsal fin length	13.4-19.0 (15.5+/-2.4)	18.5-31.2 (22.9+/-5.1)	23.7-30.7 (26.2+/-3.0)	14.8-33.5 (23.7+/-5.6)
Pelvic fin length	14.2-24.3 (19.4+/-3.9)	16.9-38.9 (27.2+/-7.8)	22.8-36.5 (27.8+/-5.2)	18.5-30.9 (24.6+/-3.4)
Caudal fin length	16.0-22.6 (20.2+/-2.6)	30.3-44.9 (35.5+/-6.0)	33.3-45.6 (40.4+/-4.2)	15.9-35.1 (23.9+/-5.7)
Morphometrics (%HL)				
Maxilla length	9.7-11.4 (10.6+/-1.2)	9.4-14.8 (11.9+/-1.3)	9.4-11.1 (10.2+/-0.76)	9.4-13.7 (11.2+/-1.1)
Mandible length	15.1-15.7 (15.4+/-0.4)	13.3-19.3 (16.3+/-1.6)	13.1-15.7 (14.7+/-1.1)	10.3-18.7 (15.6+/-1.5)
Greatest snout depth	9.9-12.6 (11.7+/-1.1)	9.0-23.2 (15.6+/-3.4)	9.1-10.9 (9.9+/-0.61)	7.4-16 (11.0+/-1.4)
Least snout depth	9.3-11.1 (9.9+/-0.7)	7.4-22.7 (13.7+/-3.3)	7.8-9.6 (8.9+/-0.68)	7.1-13.6 (9.3+/-1.3)
Orbit length	9.8-12.6 (11.3+/-1.2)	7.1-14.9 (10.7+/-1.5)	8.6-10.5 (9.7+/-0.80)	8.3-14.4 (11.2+/-1.5)
Epioccipital width	8.9-10.1 (9.6+/-0.5)	6.1-15.6 (7.9+/-0.09)	6.3-8.6 (7.2+/-0.75)	6.3-14.2 (10.2+/-1.4)
Meristics				
Total body plates	27-29	27-35	27-35	31-35
Total trunk plates	11-13	10-14	12-15	11-14
Complete trunk rings	4-5	4-8	4-10	4-8
Total tail plates	16-18	12-17	15-18	14-18
Complete tail rings	8-11	5-9	6-11	5-11
Caudal peduncle plates	8-11	5-10	6-11	7-12
Dorsal fin rays	16-18	18-22	20-22	17-21
Anal fin rays	17-19	17-21	20-22	18-22
Pectoral fin rays	22-25	25-28	23-25	23-25

species. The addition of new species brings to four the number of recognized species in the family Solenostomidae (Orr and Fritzsche, 1993, 1997).

Materials and methods

Counts and measurements follow Orr and Fritzsche (1993). The ventral ridge is formed by the ventralmost pretrunk plates; the ventral ridge ratio is calculated from the distance between the central spines of the three plates anterior to the pelvic fin base, with the distance between plates 1 and 2 divided by the distance between plates 2 and 3. Unless indicated otherwise, standard length (SL) is used throughout. Institutional abbreviations follow Leviton *et al*. (1985) and Leviton and Gibbs (1988), as modified by Poss and Collette (1995).

To aid in the discrimination and classification of species, standard principal components analysis (PCA; S-Plus, Statistical Sciences, 1999) was conducted on all morphometric and meristic characters for a set of specimens with all characters. Raw morphometric data were log transformed and the covariance matrix was subjected to PCA, as was the correlation matrix of raw meristics. Differences between species were illustrated by plotting scores of principal components (PC) 1 of the meristic analyses against PC 2 of the morphometric analyses.

Solenostomus halimeda n. sp.

Halimeda ghost pipefish
(Figs. 1-6)

Solenostomus cf. *cyanopterus* (part): Orr and Fritzsche 1993: 177.
Solenostomus sp. A: Myers 1999: 86, fig. 1.
Solenostomus sp. 1 (part): Kuiter 2000: 211, figs. A, E.

Material examined

Holotype: WAM P.27666.030, 46.9 mm, female with eggs, western Australia, Mermaid Reef, Central Lagoon, Rowley Shoals, 26 July 1982, 17°06'S, 119°37'E, G. R. Allen.
Allotype: WAM P.27666.052, 41.0 mm, male, western Australia, Mermaid Reef, Central Lagoon, Rowley Shoals, 26 July 1982, 17°06'S, 119°37'E, G. R. Allen.
Paratypes: BPBM 38841, 50.1 mm, female, Marshall Islands, Kwajalein Atoll, specimen died in aquarium, 10 January 2000, J. Johnson. BPBM 36263, 34.3 mm, female with eggs, Papua New Guinea, NE coast, bay W of Basilisk Pt., 10°15'48"S, 150°42'6"E, "silty sand at log with much plant debris," 13 December 1993, J. E. Randall. UG 5800, 37.2 mm, male, Mariana Islands, Double Reef, 7.6 m depth, 5 October 1968, R. S. Jeres and H. Kami. SMF 26660, 42.5 mm, female, Maldive Islands, South Miladhunmadulu Atoll, Noonu, 23 m depth, collection date unknown, N. Probst.

Diagnosis

A species of *Solenostomus* with the following combination of characters: dorsal, pelvic, and caudal fins short; caudal fin truncate or slightly rounded; fin membranes entire; olfactory rosette sexually dimorphic, females with a small dorsal patch of nasal lamellae, males with a larger patch filling about half of the nasal cavity; premaxillary spine absent in males and females; dorsal, anal, and pectoral fin counts low; dermal papillae multifid; colour in life pale green with lighter mottling, spinous dorsal fin membrane between two anteriormost spines typically with large black blotches, body with scattered dark spots; size at maturity small, females with eggs 34.3-46.9 mm.

Fig. 1. *Solenostomus halimeda* n. sp., female, N. Sulawesi, Indonesia, photographed underwater. Photo by D. Tackett.

Fig. 2. *Solenostomus halimeda* n. sp., female (top) and male (bottom) photographed underwater at 5 m depth in Milne Bay, New Guinea. Photo by B. and D. Halstead.

Description

Based on the holotype, allotype, and four paratypes, 34.3-50.1 mm. Values in parentheses are those of the holotype. Largest specimen examined is a female of 50.1 mm (BPBM 38841).

Dorsal fin spines V, rays 16-18 (17); anal fin rays 17-19 (17); pectoral fin rays 22-25 (22, 23); pelvic fin spine I, rays 6; caudal fin rays 16. Vertebrae 32 (19 + 13).

Body depth 17.0-29.9 (20.3) % SL; head length 45.3-52.5 (50.3) % SL; snout length 30.1-36.7 (34.3) % SL; greatest snout depth 9.9-12.6 (11.9) % HL; least snout depth 9.3-11.1. (9.3) % HL; premaxillary spine absent in males and females; mesethmoid and frontal ridges with up to ten isolated spines; olfactory rosette sexually dimorphic, females with a small dorsal patch of 3-5 lamellae, males with a larger patch filling about half of the olfactory pit, with 15 lamellae; orbit length 9.8-12.6 (9.8) % HL; plate spines high, midlateral plates with reduced or absent anterior spine; epioccipital ridges parallel, width 8.9-10.1 (8.9) % HL, posterior tips not flared; supraoccipital ridge low to moderately high, rounded or with small, dorsally oriented spine; preopercular spines 10-16, typically isolated; pretrunk length 11.7-15.3 (12.6) % SL; ventral ridge ratio < 1.0, 0.72-0.94 (0.86); trunk length 35.9-41.9 (37.1) % SL; caudal peduncle short, 5.4-10.9 (6.4) % SL, and narrow, 3.5-4.4 (3.7) % SL, caudal peduncle depth 33.3-65.2 (56.7) % caudal peduncle length; abdominal spinules few to numerous (in females the dorsal margin of the brood pouch obscures many spinules); spinous dorsal fin extending to soft dorsal fin origin, length 13.4-19.0 (19.0) % SL; pelvic fin extending to anal fin origin, length 14.2-24.3 (24.3) % SL, posterior margin convex in females; caudal fin truncate or slightly rounded, length 16.0-22.6 (20.0) % SL; fin membranes entire, all fin lengths increasing proportionately with standard length. Cutaneous papillae present, with multiple filaments extending from stout base, small and scattered. Papillae always present at midpoint of snout.

Remaining description as for family and genus (Orr and Fritzsche, 1993).

Colour in life: Body pale green with darker speckling and white mottling; dermal papillae red; dark blue or black blotches often present on each interspinal

Table II. Character loadings for principal component analysis of morphometric and meristic characters of some adult *Solenostomus* species.

Plot of principal component	PC1	PC2
Morphometrics		
Standard length	0.2194	-0.0986
Head length	0.1901	-0.0523
Trunk length	0.2619	-0.1621
Pretrunk length	0.1823	-0.0606
Snout length	0.1922	-0.0727
Least snout depth	0.2543	0.2686
Greatest snout depth	0.2690	0.3709
Body depth	0.2560	-0.0149
Epioccipital width	0.1314	-0.1329
Orbit length	0.1679	-0.0069
Caudal peduncle length	0.2319	-0.5557
Caudal peduncle depth	0.3114	0.5998
Spinous dorsal fin length	0.3340	-0.2127
Pelvic fin length	0.3773	-0.1031
Caudal fin length	0.3524	0.0153
Meristics		
Caudal peduncle plates	-0.0373	-0.8360
Dorsal fin rays	0.6515	-0.0519
Anal fin rays	0.6255	-0.3055
Pectoral fin rays	0.4277	0.4529

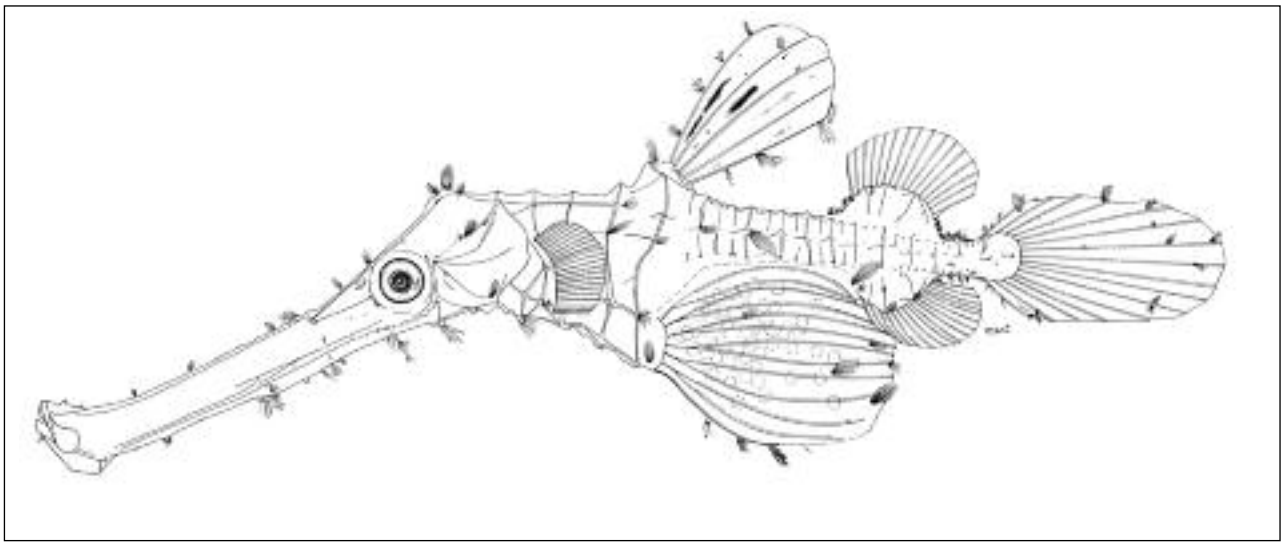

Fig. 3. *Solenostomus halimeda* n. sp., holotype, WAM P.27666030, 46.9 mm, female, Western Australia, Mermaid Reef, Central Lagoon, Rowley Shoals, 26 July 1982, 17°06'S, 119°37'E, G. R. Allen. Illustration by R. Cartwright.

Fig. 4. *Solenostomus halimeda* n. sp., male, Marshall Islands, Kwajalein Atoll, 8-10 m depth, photographed underwater. Photo by J. Johnson.

membrane between dorsal fin spines one and three (Figs. 2, 4, and 6).

Colour in alcohol: Body pale yellow, with scattered, dark speckling; a large black blotch present on each interspinal membrane between dorsal fin spines one and three; posterior portion of caudal fin with dark mottling (Fig. 3).

Distribution

Solenostomus halimeda has been collected in the Indian and western Pacific Oceans, from the Maldives to Western Australia, Papua New Guinea, Sulawesi, the Mariana Islands, and the Marshall Islands. It has been collected at a maximum depth of 23 m.

Etymology

The specific epithet *halimeda,* a genus of marine algae, is to be treated as a noun in apposition. The name alludes to the species' resemblance to algae of the genus *Halimeda,* especially in its greenish coloration and the rounded shapes of the spinous dorsal, pelvic, and caudal fins.

Comparisons

Solenostomus halimeda differs from all other solenostomids in having short dorsal, pelvic, and caudal fins and a truncate caudal fin, and being smaller at sexual maturity. It appears most similar to *S. cyanopterus* (see Fig. 7), with which it shares a more

Fig. 5. *Solenostomus halimeda* n. sp., male, Atauro Island, Indonesia, photographed underwater. Photo by M. Severns.

Fig. 6. *Solenostomus halimeda* n. sp., paratype , BPBM 38841, 50.1 mm, male, Marshall Islands, Kwajalein Atoll, collected at 8-10 m depth, photographed in aquarium. Photo by S. Johnson.

robust body, multifid dermal papillae, and nasal lamellae morphology. In addition, males of *S. cyanopterus* possess a spine at the dorsal tip of the premaxilla, which is absent in males of *S. halimeda.*

Both *S. paradoxus* and *S. armatus* are more slender species with longer and narrower caudal peduncles. Nasal lamellae differ among these species and *S. halimeda.* Males of *S. paradoxus* have an olfactory pit completely filled with nasal lamellae, unlike the partially filled pit of males of *S. halimeda..* Females of *S. armatus* have a large patch of lamellae relative to *S. halimeda* and all other *Solenostomus* females. Both *S. paradoxus* and *S. armatus* also have prominent supraoccipital ridges as opposed to the low to moderate ridge of *S. halimeda.*

Characters of snout and caudal peduncle shape and spinous dorsal fin length loaded most heavily among morphometric characters in the principal component analysis (Table II; Fig. 7). Snout and caudal peduncle shape served to separate *S. cyanopterus,* with its typically deep snout and caudal peduncle, from all other species. Counts of caudal peduncle rings, and pectoral and anal fin rays, loaded most heavily among meristic characters, reflecting the relatively low counts of *S. halimeda* and high pectoral fin ray counts of *S. cyanopterus.* Meristic data from *S. halimeda* extend the lower ranges for the Solenostomidae (Table II; Orr and Fritzsche, 1993). Dorsal fin ray count range is increased to 16-22 rays, and pectoral fin ray range to 22-28.

Key to adults to four species of the family Solenostomidae

1a. Numerous small and scattered stellate ossifications always present just dorsal to pelvic fins, typically present posterior to second trunk ring (only one or two dorsal to pelvic fin in two females greater than 75 mm); caudal fin membranes deeply incised; fourth and fifth dorsal and anal fin plates present; nasal lamellae of males prominent, completely filling nasal cavity; dermal papillae typically profuse, bifid and finger-like..... .....*S. paradoxus* (Pallas, 1770) (Figs. 8-10)

1b. Small stellate ossifications absent or present; caudal fin membranes entire or slightly incised; fourth dorsal and anal fin plates present or absent, fifth plates absent; nasal lamellae of males fill half of nasal cavity; dermal papillae always multifid and bushy or absent.....2

2a. Nasal lamellae of females weak, forming a small dorsal patch in nasal cavity; premaxillary spines present or absent; posterior margin of brood pouch convex; caudal peduncle length typically about equal to caudal peduncle depth; dorsalmost supraoccipital spine absent or, if present, directed anterodorsally 3

2b. Nasal lamellae of females prominent, forming a circular pattern in posterior half of nasal cavity; premaxillary spines absent; posterior margin of brood pouch concave; caudal peduncle length three to four times caudal peduncle depth; greatest snout depth about equal to orbit width; dorsalmost supraoccipital spine directed posterodorsally .....*S. armatus* Weber, 1913 (Fig. 11)

3a. Premaxillary spines present in males; greatest snout depth typically greater than orbit width; spinous dorsal fin reaching beyond soft dorsal fin origin; caudal fin elliptical to lanceolate; fourth dorsal and anal fin plates absent; soft dorsal and anal fin rays typically higher, dorsal fin rays 18-22, anal fin rays 17-22; smallest mature female known 51 mm ....*S. cyanopterus* Bleeker, 1854 (Figs. 12-13)

3b. Premaxillary spines absent; snout depth equal to orbit width; spinous dorsal fin short, not reaching origin of soft dorsal fin; caudal fin truncate or slightly rounded; fourth dorsal and anal fin plates present; soft dorsal and anal fin ray counts typically lower, dorsal fin rays 16-18, anal fin rays 17-19; mature females known 34.3-46.9 mm ....*S. halimeda* n. sp. (Figs. 1-6)

Remarks

The excellent colour photographs of solenostomids recently published by Kuiter (2000) include *S. halimeda* n. sp. (Sp. 1), the first photograph correctly identified as *S. armatus* (p. 210), and new illustrations of *S. paradoxus* and *S. cyanopterus*. On p. 209, Kuiter has six figures identified as *S. paegnius* Jordan and Thompson. Orr and Fritzsche (1993) examined the holotype of *S. paegnius* and determined that it is *S. cyanopterus*; hence all of Kuiter's figures of *S. paegnius* should be referred to *S. cyanopterus.*

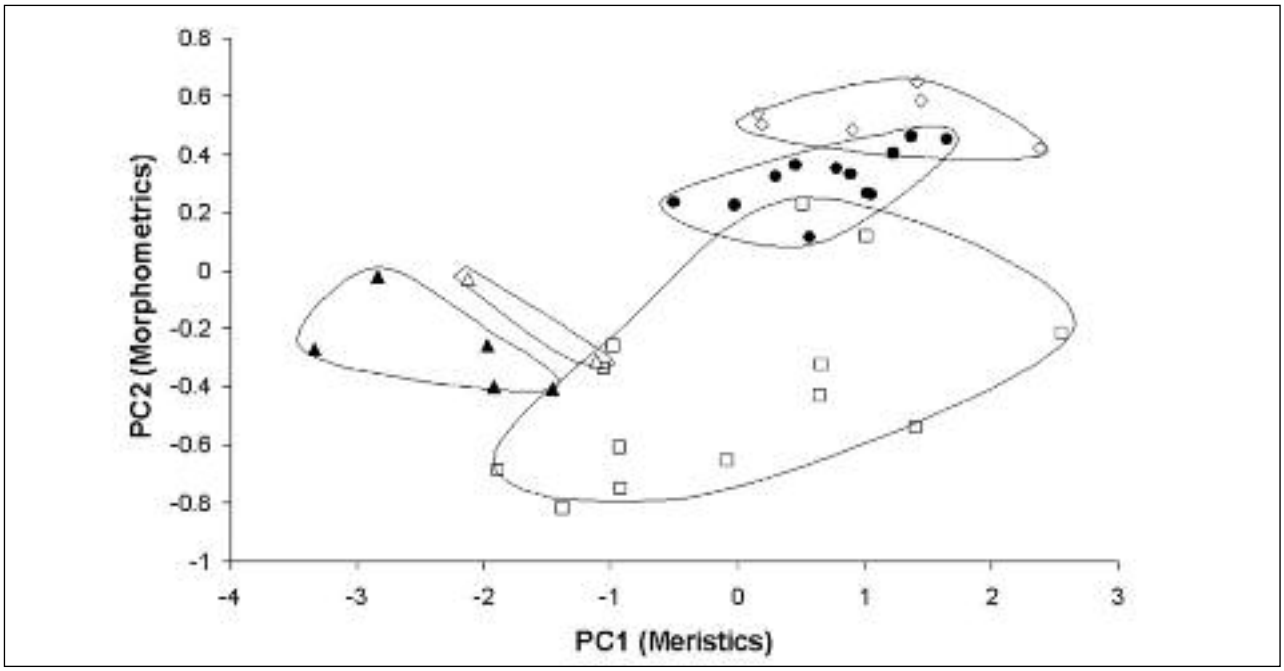

Fig. 7. Plot of principal component (PC) scores for morphometric (PC2) and meristic (PC1) characters for *Solenostomus* species: *S. halimeda* n. sp. (solid triangle), *Solenostomus* cf. *cyanopterus* (open triangle), *S. cyanopterus* (square), *S. paradoxus* (circle), *S. armatus* (diamond).

Fig. 8. *Solenostomus paradoxus,* female, ca. 100 mm, D'Entrecasteaux Island, Papua New Guinea, photographed underwater. Photo by J. E. Randall.

Fig. 9. *Solenostomus paradoxus,* female, Alor Island, Indonesia, photographed underwater. Photo by J. E. Randall.

Fig. 10. *Solenostomus paradoxus,* female, ca. 80 mm, Banda Islands, Indonesia, 18 m depth, photographed underwater. Photo by J. E. Randall.

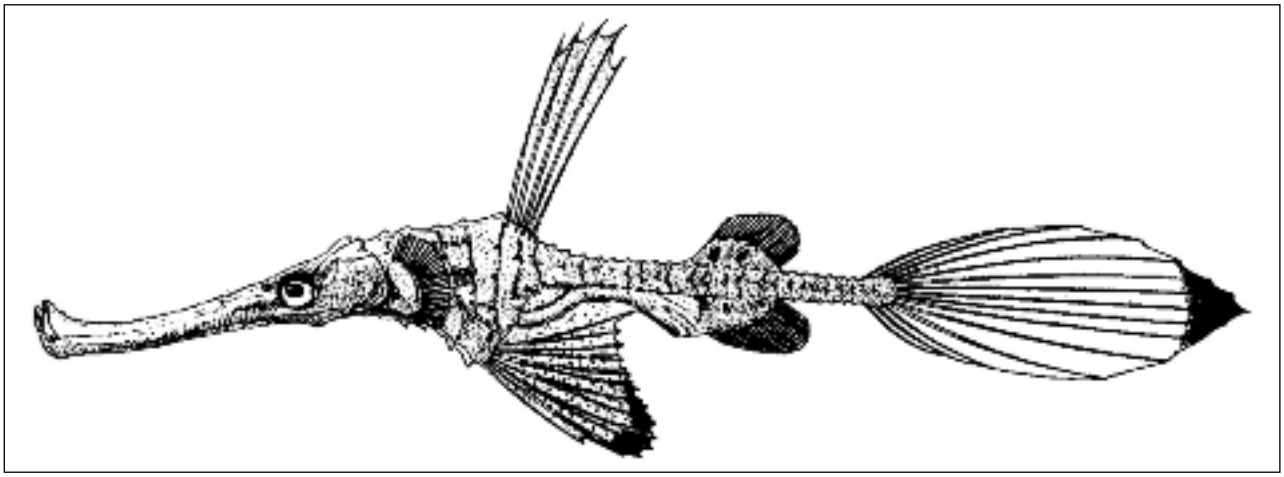

Fig. 11. *Solenostomus armatus,* female, lectotype, ZMA 112.629, 56.7 mm. After Weber, 1913.

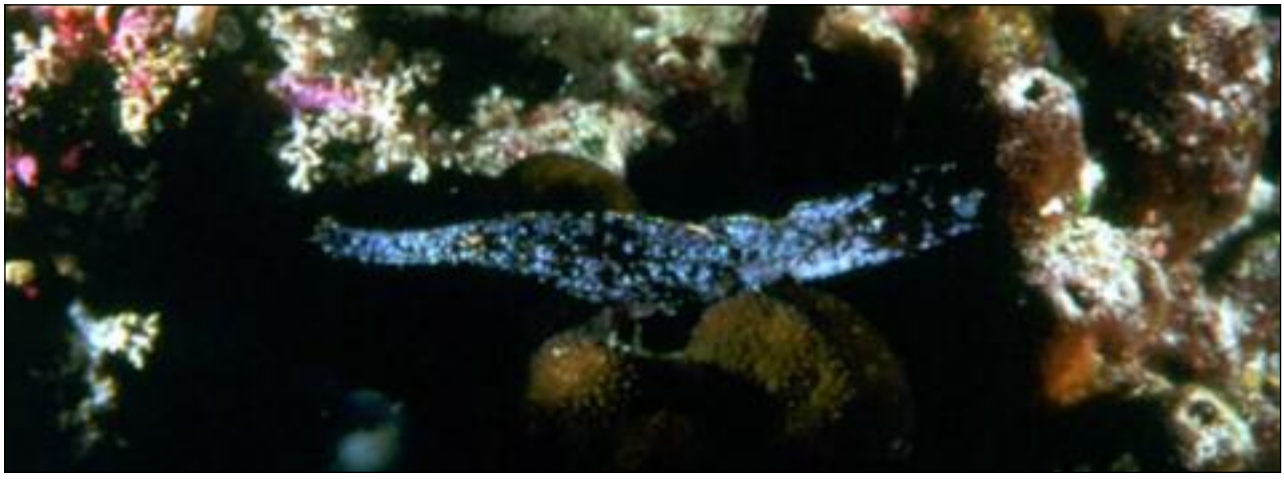

Fig. 12. *Solenostomus cyanopterus,* female, ca. 65 mm, Mai Island, Indonesia, photographed underwater. Photo by J. E. Randall.

Fig. 13. *Solenostomus cyanopterus,* female, ca. 40 mm, northeast Sulawesi, Indonesia, photographed underwater. Photo by J. E. Randall.

Solenostomus leptosoma Tanaka is known only from the original description and illustration of the holotype, which has not been located (Orr and Fritzsche, 1993). While the original description lacks the detail required to diagnose this species from other solenostomids, it does indicate a slender snout, an elliptical caudal fin, and the absence of dermal papillae, characters which differ from the individuals in each of Kuiter's photographs. The photos provided by Kuiter (2000) should not therefore be referred to *S. leptosomus* and they may illustrate at least one undescribed species. Similarly, Kuiter's *Solenostomus* sp. 1 represents at least three species: *S. halimeda* n. sp. (p. 211, figs. A and E) and two apparently undescribed species (figs. B and D).

Orr and Fritzsche (1993) identified three female *S. armatus* as *S. cyanopterus* (BSKU 4376, BSKU 7023, and BSKU 9768). All three individuals had been collected at fish markets in the vicinity of Kochi, Japan, and were more or less desiccated. During comparisions for the description of this new species, differences in fin lengths were recognized as significant and with other available characters allowed us to correct what we now consider to be misidentifications.

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