



SOLEICHTHYS DORI, A NEW SOLE (PLEURONECTIFORMES: SOLEIDAE) FROM THE RED SEA

John E. Randall¹ and Thomas A. Munroe²

¹Bishop Museum 1525 Bernice St., Honolulu, HI 96817-2704, USA.

Email: jackr@hawaii.rr.com

²National Systematics Laboratory, NMFS/NOAA, P.O. Box 37012, Smithsonian Institution, Washington, D.C. 20013-7012, USA. Email: munroet@si.edu

Accepted: August, 25 2008

Abstract: *Soleichthys dori* is described as a new species of soleid fish from 11 specimens collected in the Gulf of Aqaba and Dahlak Archipelago, Red Sea on sand bottom in 0–10.5 m. Formerly identified as *S. heterorhinos* (Bleeker), type locality Ambon, Indonesia, it is separated from this species by its more evenly dark-barred color pattern and having a snout length greater instead of less than the eye diameter. It is most similar in color to an undescribed species from the islands of Micronesia that has also been misidentified as *S. heterorhinos*, differing mainly by its lower lateral-line scale count of 98–115 and 50 or 51 vertebrae. *S. dori* was also differentiated from *S. multifasciatus* (Kaup), described from one specimen from India, and *S. nigrostriolatus* (Steindachner and Kner) from Fiji by color and meristics.

Key words: Taxonomy, Soleidae, *Soleichthys*, new species, Red Sea

Introduction

The soleid fish *Solea heterorhinos* was described by Bleeker (1856) from three specimens from Ambon, Indonesia. Bleeker (1860) reclassified it as the only species of his new genus *Soleichthys*. Earlier, Kaup (1858) described the new genus *Aesopia* for five soleid fishes, including his new *A. cornuta* and *A. multifasciata* from India. Günther (1862) restricted *Aesopia* to Kaup's *cornuta*, based on its elongate first dorsal ray, cycloid scales, and confluent median fins. He returned Bleeker's *heterorhinos* to the genus *Solea* Quensel. Evermann and Seale (1907) resurrected *Soleichthys* for *heterorhinos*, and others such as Ochiai (1963) have followed. The salient characters for the genus are the very long tubular anterior nostril, asymmetrical pectoral fins with the upper rays joined to the opercular membrane, and the caudal fin connected only

basally by a thin membrane to the dorsal and anal rays.

Muchhala and Munroe (2004) listed the species of the genus, in addition to *S. heterorhinos*, that are currently considered valid: *S. multifasciatus* (Kaup, 1858) from India; *S. microcephalus* (Günther, 1862) from New South Wales, *S. tubiferus* (Peters, 1876) from Mauritius; *S. nigrostriolatus* (Steindachner and Kner, 1870) from Fiji, and *S. siammakuti* (Wongratana, 1975) from the Gulf of Thailand. In addition, they described *S. maculosus* as a new species from northern Australia. Munroe and Menke (2004) redescribed *S. microcephalus* and named two new species from northern Australia, *S. serpenpellis* and *S. oculo-fasciatus*. The authors of both of these papers stressed the need for a comprehensive study of the genus. Some records of *Soleichthys heterorhinos* since Bleeker's description need to be confirmed or corrected.

Dor (1970: 27) published the first record of *Soleichthys heterorhinos* from the Red Sea from a specimen 30 mm SL collected by Eugenie Clark in the Gulf of Aqaba on 12 September 1960. The specimen has not been found. The first author was with Adam Ben-Tuvia and family in 1976 when they collected a sole on the Sinai coast of the Gulf of Aqaba (Figure 1). The midlateral row of conspicuous white spots was not remembered for soles identified as *S. heterorhinos* from the Pacific. Khalaf and Disi (1997: 210, lower figure) illustrated a specimen from the Jordanian coast of the Gulf of Aqaba that also shows these white spots. The suspicion that the Red Sea population might be a different species led to the present study.

Materials and Methods

Type specimens of the new species have been deposited in the Bernice P. Bishop Museum, Honolulu (BPBM); Hebrew University, Jerusalem (HUJ); Tel-Aviv University (TAU); and the National Museum of Natural History, Washington, D.C. (USNM). Other specimens of the genus *Soleichthys* pertinent to this study are from the California Academy of Sciences, San Francisco (CAS); Muséum National d'Histoire Naturelle, Paris; and the Nationaal Natuurhistorische Museum, Leiden (RMNH).

Standard length (SL) is measured horizontally from snout tip to base of caudal fin (posterior end of hypural plate). Body depth is the maximum distance between bases of the dorsal and anal fins. Body width is the greatest thickness of the body measured midlaterally between ocular and blind surfaces. Head length (HL) is measured from snout tip to the posterior fleshy end of the operculum; head width from the ventralmost point of the operculum vertically to dorsal margin of the head; and snout length from snout tip to bony edge of the lower eye. Orbit diameter is the horizontal bony diameter of the lower eye. Upper-jaw length is taken as the straight-line distance from bony tip of premaxilla to bony posterior end of maxilla. Predorsal, preanal, and prepel-

vic lengths are from the snout tip to the origin of the respective fins. Lengths of fin rays of median fins are measured from the base of the longest ray to the ray tip. Pectoral-fin length is the length of the first (dorsalmost) ray on the ocular side. Pelvic-fin length is measured from the base of the first ray to the tip of the longest ray.

Counts of lateral-line scales were made on the ocular side from the caudal-fin base to the point on head where pored scales angle sharply upward (hence 3 or 4 scales anterior to vertical at posterior fleshy end of operculum). Vertebral counts include the hypural plate. The dorsal pterygiophore formula (Chapleau, 1989) consists of three numbers: number of proximal pterygiophores inserted onto dorsal edge of the erisma (first enlarged pterygiophore), number of pterygiophores attached to or directly over the cranium, and number attached to the dorsoposterior surface of the neural spine of the second vertebra.

Table 1 presents the proportional measurements of the eight largest type specimens as percentages of the standard length.

Data in parentheses refer to the paratypes if different from the holotype. Some measurements in the text are ratios with the head length (HL) and the body depth. Text-ratio measurements are rounded to the nearest .05.

Soleichthys dori, new species (Figures 1, 2; Table I)

Aesopia heterorhinos Dor, 1970: 27 (Eilat, Gulf of Aqaba).

Aesopia heterorhina Dor, 1984: 270; Goren and Dor, 1994: 71 (Red Sea).

Soleichthys heterorhinos Khalaf and Disi, 1997: 210, lower figure (Gulf of Aqaba).

Holotype: BPBM 20784, fully mature female, 99 mm, Red Sea, Gulf of Aqaba, 7 km south of Nuweiba, sand in 2–4 m, hand net, Adam Ben Tuvia and family, 3 August 1976.

Paratypes: TAU P.5112, 95 mm, Red Sea, Gulf of Aqaba, Eilat, from early collection of

Menachem Dor, approximate date 1965–1970; USNM 291080, 72 mm, Gulf of Aqaba, northwest coast, bay between Marsa Mokrah and El Himeira, 0–3 m, rotenone, V.G. Springer, D. Masri, J. Oselka, A. Levy, and H. Harpaz 15 July 1969; USNM 291079, 105.5 mm, Gulf of Aqaba, northwest coast, 0–10.5 m, V.G. Springer, G. Raz, A. Amir, H. Harpaz, and J. Oselka, 23 July 1969; USNM 291081, 2: 39.5–46 mm, Eritrea, Sciumma Island, one-half mile off southwest shore, 0–7 m, V.G. Springer, E. Clark, P. Anastos, *et al.*, 9 August 1969; USNM 291082, 106 mm, Gulf of Aqaba, northwest coast between Marset Mahash El Ala and Marset Abu Samra (32 km south of marine laboratory in Eilat), 0–3.5 m, V.G. Springer, A. Levy, L. Hughes-Games, and H. Harpaz, 2 September 1969; HUI 7725, 74 mm, Gulf of Aqaba, Nuweiba, fish collection staff, 10 April 1975; TAU P.7934, 37 mm, Gulf of Aqaba, 20 km south of Eilat, M. Goren, 25 September 1979; TAU P.11245, 2: 16–31 mm, Eritrea, Dahlak Archipelago, Bullisar Island, 5 m, rotenone, M. Goren, 18 May 1995.

Diagnosis: Dorsal rays 87–95; anal rays 77–83; ocular-side pectoral rays 8–10; lateral-line scales 98–115; vertebrae 50 or 51; body depth 3.05–3.3 in SL; head length 4.45–5.65 in SL (head decreasing in relative length with growth); tubular anterior nostril nearly or just reaching posterior margin of lower eye when laid back; ocular-side pectoral fin three times longer than fin of blind side, the elongate upper ray 2.0–2.65 in HL; basal three-fourths of ocular-side pectoral fin scaly, except two elongate upper rays, scaly only on basal fourth; color of ocular side in preservative pale yellowish with about 16 slightly wavy, double, dark brown bars across body, more irregular posteriorly, continuing variably into dorsal and anal fins to merge with a darker brown outer band in fins; distalmost tips of all fins pale; head with six narrow dark brown bars, the sixth usually a double bar continuing across chest; caudal fin with a dark bar or double bar at base, the outer third of fin dark

brown; blind side of body pale yellowish; inner surface of blind-side pelvic fin dark brown; blind side of dorsal and anal fins dark brown anteriorly, the dark pigment reduced to distal two-thirds of fins posteriorly; distal fourth of blind-side of caudal fin dark brown; inside of mouth black; a series of three or four white spots on lateral line in pale interspaces in life (usually not evident in preserved specimens). Dark brown markings in preserved specimens black in life.

Description: Dorsal rays 87 (87–95); anal rays 78 (77–83); caudal rays 19 (17–19); ocular-side pectoral rays 9 (8–10); blind-side pectoral rays 9 (7–9); pelvic rays of both sides 5, all branched; lateral-line scales 105 (98–115); vertebrae 51 (50 or 51); dorsal pterygiophore formula 2–1–2 (2–0–2, 2–1–2, or 2–1–1).

Body depth 3.1 (3.05–3.3) in SL; body width 5.3 (4.3–5.5) in body depth; head length 5.4 (4.45–5.65) in SL, decreasing with growth; head depth 4.8 (4.4–4.75) in SL; snout length 3.85 (3.65–4.6) in HL; eyes dorsal, oval, elevated, and contiguous throughout their midlengths; orbit diameter 5.8 (4.4–6.65) in HL; no caudal peduncle; depth of caudal-fin base 3.5 (3.25–4.25) in HL.

Mouth terminal to slightly ventral, anterior to lower eye, its posterior half curving ventrally; maxilla ending below anterior part of lower eye; upper-jaw length 3.6 (3.05–3.6) in HL; teeth in jaws only on blind side, in dense villiform band, broader posteriorly, with maximum of about nine transverse rows; lower lip fleshy, with prominent triangular flap extending toward angle of upper jaw; tubular ocular-side anterior nostril nearly or just reaching posterior margin of lower eye when laid back, its length 2.4 (2.3–3.1) in HL; ocular-side posterior nostril a short, flat, ventrally-directed tube adjacent to ventroposterior base of anterior nostril; blind-side anterior nostril a very short, broad tube above upper lip about two-fifths jaw length from front of jaw (nostril difficult to detect among fleshy dermal cirri); posterior nostril of blind side a short

pointed tube on vertical about one eye diameter above posterior end of jaws.

Gill opening of ocular side beginning below fleshy flap covering pectoral-fin base, continuous with that of blind side, free from isthmus, with cirri on margin of lower fourth of ocular side and most of margin of blind side.

Scales ctenoid, except those of lateral line, with as many as 12 cteni on ocular side, progressively smaller and with fewer cteni laterally on base of fins and on head, becoming short, fleshy, pointed papillae anteriorly on head; fleshy interorbital space with a narrow longitudinal band of two to three small scales; scales on blind side thinner and more adherent, altering to fleshy cirri anteriorly on head; ocular-side lateral line in midline from near tip of caudal fin, passing 10 scale rows above pectoral-fin base, and continuing three to four scales anteriorly, where angling sharply upward another 10 scale rows, then curving anteriorly and passing about an eye diameter dorsal to upper eye; blind-side lateral line from near tip of caudal fin, along middle of body, and altering posteriorly on head to series of short rows of about 4 papillae that are longer anteriorly, changing more anteriorly to small circles of papillae on about anterior third of head; a dense mass of circles of papillae forming reticular pattern that continues broadly along ventral side of head; two semicircular rows of papillae on anterior half of blind side of head, crossing lateral line, the anterior row enclosing posterior nostril; a similar curving row of progressively small papillae submarginally on blind side of operculum; broad band of small scales on about basal fourth of median fins of both sides (better developed on ocular side), scales continuing onto membranous ridge of each ray in a single row, their size diminishing distally; scales continuing on fin rays about one-half way to margin (about one-third to margin on blind side); anterior dorsal rays of blind side with a few cirri along edge of ridges; membranous ridges posteriorly in dorsal and anal fins less developed; a row

of small scales basally on anterior rays of ocular-side dorsal and anal fins, but not on first four or five rays of blind side.

Dorsal and anal rays of adults branched at tips for about anterior fourth of fins, double-branched in broad middle part of fin, reverting to single branch posteriorly, and unbranched on posteriormost few rays; caudal-fin rays branched except upper and lower two rays; pectoral rays unbranched; pelvic rays branched at tips.

Origin of dorsal fin above anterior edge of orbit, the predorsal length 3.05 (2.6–3.4) in HL; longest dorsal ray 8.4 (7.05–7.9) in SL; anal-fin origin on transverse line with base of eleventh or twelfth dorsal ray; preanal length 5.75 (5.6–6.2) in SL; caudal fin linked by membrane at extreme base to dorsal and anal fins; caudal fin rounded, its length 7.2 (5.95–7.05) in SL; pectoral fins joined by opercular membrane distally to second and third rays; rays of ocular-side pectoral fin progressively longer dorsally; pectoral-fin length 2.35 (2.0–2.65) in HL; blind-side pectoral fin about one-third length of ocular-side fin; pelvic fins short, the middle ray longest, 2.65 (2.3–3.1) in HL.

Color of holotype when fresh as in Figure 1. Color in alcohol entirely faded to pale yellowish.

Color of ocular side of nonfaded paratypes in alcohol pale yellowish with about 16 slightly wavy, double, dark brown bars across body, becoming irregular posteriorly; first double dark bar of body enclosing base of pectoral fin and tip of opercular membrane; head with six, narrow, transverse, dark brown bars, the sixth as a double bar continuing across chest; dark bars on body extending narrowly, obliquely, and sometimes broken, into dorsal and anal fins, merging with darker brown outer band that broadens posteriorly; all fin-ray tips pale; caudal fin with brown bar or double bar at base, the outer third of fin dark brown; middle dark bar or partial bar sometimes present in pale basal half of caudal fin; pectoral fins pale; pelvic fins dark brown

on both sides; tubular anterior nostril pale; blind side of body (Figure 2 of 105.5-mm paratype) pale yellowish; blind-side pelvic fin dark brown; blind side of dorsal and anal fins dark brown anteriorly, the pigmented part reduced to distal two-thirds of fins posteriorly (dark oblique banding of fins of ocular side visible on blind side only with transmitted light from ocular side); distal fourth of blind-side caudal fin dark brown; ocular side in life with series of three or four white spots on lateral line in pale interspaces (usually not evi-

dent in preserved specimens); inside of mouth posterior to lips black; inside of gill chamber on both sides pale (tiny melanophores visible under microscope, but not dense enough to register, even as gray). Dark brown markings of preserved specimens probably black in life.

Etymology: This species is named in honor of the late Menahem Dor, in recognition of his major contribution to our knowledge of the fish fauna of the Red Sea, and who recorded the first Red Sea specimen of this species.



Figure 1. Holotype of *Soleichthys dori*, BPBM 20784, 99 mm SL, Gulf of Aqaba, Red Sea.

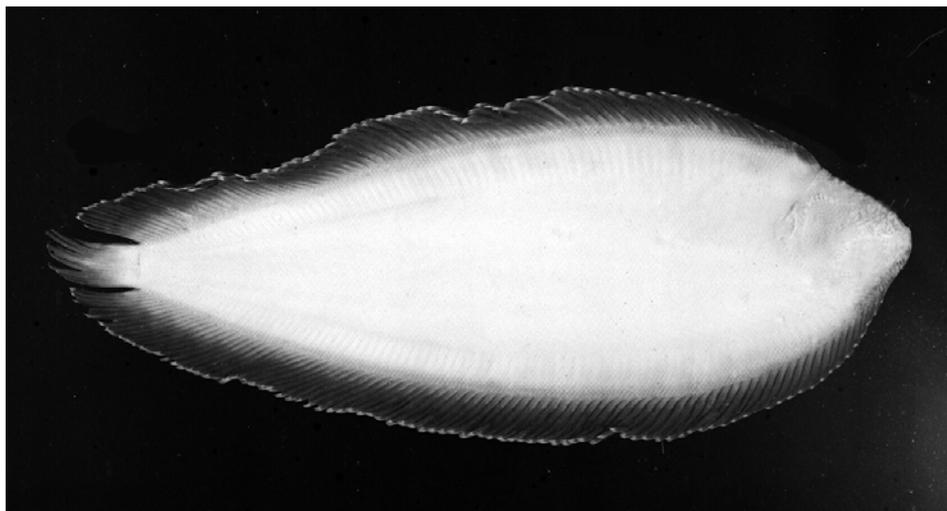


Figure 2. Blind side of paratype of *Soleichthys dori*, USNM 291079, 105.5 mm SL, Gulf of Aqaba.

Table 1. Proportional measurements of type specimens of *Soleichthys dori* as percentages of the standard length

	Holotype				Paratypes			
	BPBM 20784	USNM 281081	USNM 291081	USNM 291080	HUJ 7725	TAU P.5112	USNM 291079	USNM 291082
Standard length (mm)	99	39.5	46	72	74	95	105.5	106
Body depth	32.4	30.7	31.3	30.5	31.4	30.6	32.5	32.6
Body width	6.1	7.1	6.5	6.0	6.1	6.4	7.5	6.3
Head length	18.5	22.5	21.7	18.0	18.6	18.0	17.7	17.9
Head depth	20.9	22.5	22.4	22.2	21.4	21.1	22.7	22.0
Snout length	4.8	5.5	4.7	4.8	4.6	4.8	4.7	4.9
Eye diameter	3.2	5.1	4.2	3.4	4.0	3.7	3.2	3.3
Anterior nostril length	7.8	8.4	7.0	7.8	8.2	6.3	7.1	7.0
Upper-jaw length	5.1	7.3	6.8	5.6	5.7	5.3	5.2	5.0
Depth of caudal-fin base	5.3	5.3	5.6	5.5	5.7	5.3	5.4	5.3
Predorsal length	6.1	6.6	6.3	7.0	6.0	6.5	6.8	6.6
Preanal length	17.4	17.9	16.8	16.7	16.4	16.2	17.0	16.9
Prepelvic length	13.7	13.0	13.8	13.5	13.5	13.3	13.7	13.3
Longest dorsal ray	11.9	12.7	12.8	14.2	13.1	12.4	12.3	12.3
Longest anal ray	12.3	13.2	13.3	14.7	13.7	12.9	13.0	13.1
Caudal-fin length	13.9	16.6	16.7	16.8	15.2	14.6	14.4	14.2
Pectoral-fin length	7.9	aberrant	9.1	9.0	9.2	7.2	6.9	6.8
Pelvic-fin length	7.0	7.3	7.8	7.8	7.2	6.8	6.7	6.6

**Figure 3.** *Soleichthys heterorhinos*, BPBM 20891, 87 mm SL, Bali, Indonesia.

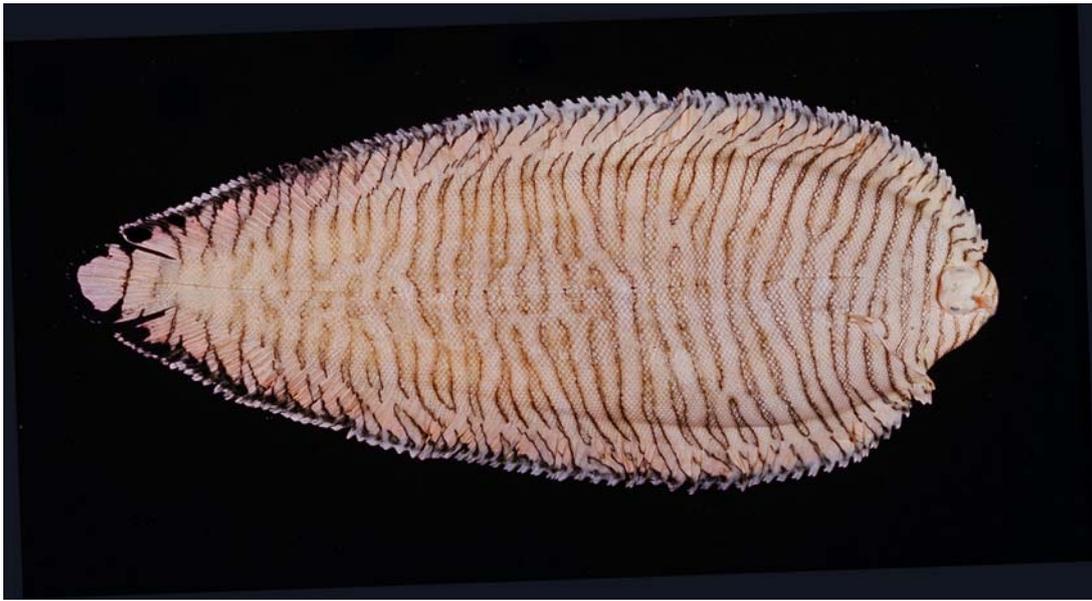


Figure 4. *Soleichthys* sp., BPBM 8029, 82.5 mm SL, Enewetak, Marshall Islands.

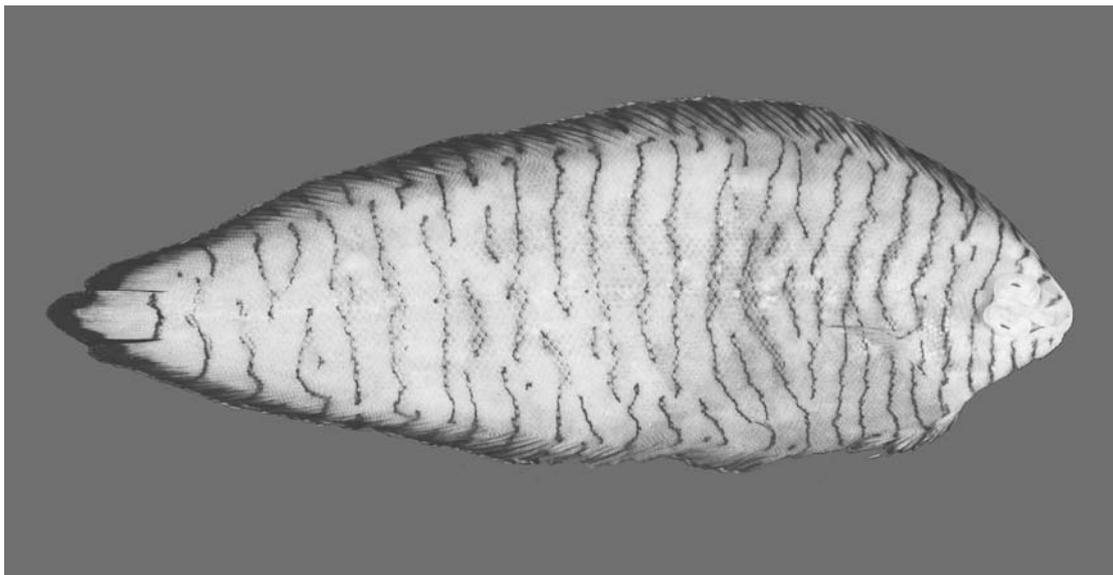


Figure 5. *Soleichthys nigrostriolatus*, CAS 226863, 68 mm, Fiji.

Remarks: Our specimens of *Soleichthys dori* have been collected from sandy bottom at depths of 0-10.5 m in the Gulf of Aqaba at the northern end of the Red Sea and the Dahlak Archipelago near the southern end. Khalaf and Disi (1997: 210) reported it as *Soleichthys heterorhinos* from shallow protected sandy areas of lagoons and seaward reefs in the Gulf of Aqaba to depths of 15 m. It remains buried

beneath the sand with only its eyes and tubular nostril exposed, and it is more active at night.

We have examined the three syntypes of *Soleichthys heterorhinos* (Bleeker) from Ambon, Indonesia (RMNH 6758, 76–126 mm SL) and conclude that the Red Sea species is not the same. Figure 3 is a photograph of a specimen of *S. heterorhinos* (BPBM 20891, 86 mm SL) collected by the first author in less

than 1 m in Bali. The difference in color pattern from *S. dori* is evident. Also, *S. heterorhinos* has a short snout, always greater than the orbit diameter (ratio of orbit diameter to snout length, 1.35-2.2), compared to the reverse for *S. dori* (ratio 0.65-0.95).

Kaup (1858: 97) described *Aesopia multifasciata* from one specimen from India (MNHN 1998-1306, 119 mm SL; Desoutter et al., 2001: 318), now classified in *Soleichthys*. The holotype was examined by the second author, who corrected the meristic data as follows: dorsal rays 95; anal rays 80, and lateral-line scales 123. It differs from *S. dori* in its higher scale count (98-115 for *S. dori*), the scales on fins of the blind side beginning on the posterior third of the fins (anteriorly on *S. dori*), and the inside of the mouth not black (though finely dotted with melanophores in *S. dori*).

We have been unable to locate other specimens of this species in fish collections, including the large collection of the South African Institute of Aquatic Biodiversity (P.C. Heemstra, pers. comm.). The only record we have found of *S. heterorhinos* from the western Indian Ocean is that of Jones and Kumaran (1980: 651, fig. 554), who reported two specimens, 55 and 120 mm, from Lakshadweep (Laccadive Islands). Their publication does not identify the institution where their specimens were deposited. Their counts of 92-94 dorsal rays, 81-83 anal rays, and 120-123 lateral-line scales, and their illustration suggest that their specimens are *S. multifasciatus*.

We have specimens of a probable undescribed species of *Soleichthys* from the islands of Micronesia that is closest in color pattern to *S. dori*. Five specimens from Rongelap Atoll in the Marshall Islands were identified as *Aesopia heterorhinos* by Woods in Schultz et al. (1966: 69, pl. 132, fig. A). Figure 3 is a specimen collected by the first author in 1977 from the lagoon of Enewetak Atoll, Marshall Islands (BPBM 8029, 82.5 mm SL). This species differs notably from *S. dori* in having a

higher lateral-line scale count of 114-125, and usually 52 or 53 instead of 50 or 51 vertebrae.

Myers (1999: 280, pl. 180, fig. E) gave the distribution of *S. heterorhinos* from the Red Sea to Samoa, including the Mariana and Marshall Islands in Micronesia. His illustration of fig. E, however, is not the Micronesian species. The photograph was taken by the first author at night in Sulawesi, and was loaned to Myers. The same photograph was mistakenly identified by Randall (2005: 617, bottom fig.) as *S. heterorhinos*. The Sulawesi fish was not collected; it resembles *S. nigrostriolatus* (Steindachner and Kner), type locality, Fiji. We have examined a specimen of *S. nigrostriolatus* (CAS 226863, 68 mm SL) collected in Fiji by D.W. Greenfield et al. in 2002, shown here in our photograph of the preserved specimen (Figure 5). It has 91 dorsal rays, 80 anal rays, and 99 lateral-line scales. The counts given by Steindachner and Kner in their description of *S. nigrostriolatus*: dorsal rays 90-92, anal rays 78-82, and lateral-line scales "circa 110".

Acknowledgments

We thank David Catania of the California Academy of Sciences, Daniel Golani of the Hebrew University, Menachen Goren of Tel-Aviv University, and Patrice Pruvost and Martine Desoutter-Meniger of the Muséum National d'Histoire Naturelle, Paris for loan of specimens. We are also grateful to Loreen R. O'Hara of the Bishop Museum and La'Shaun Willis of the National Systematics Laboratory for x-rays.

References

- Bleeker, P. (1856). Beschrijvingen van nieuwe en weinig bekende vischsoorten van Amboina, verzameld op eene reis door den Molukschen Archipel gedaan in het gevolg van den Gouverneur Generaal Duymaer van Twist, in September en Oktober 1855. Acta Soc. Sci. Indo-Neerl. 1: 1-76.
- Bleeker, P. (1860). Dertiende bijdrage tot de

- kennis der vischfauna van Celebes (Visschen van Bonthain, Badjoa, Sindjai, Lagoesi en Pompenoea). *Acta Soc. Sci. Indo-Neerl.* **8** (7): 1–60.
- Chapleau, F. (1989). Étude de la portion supracrânienne de la nageoire dorsale chez les Soleidae (Téléostéens, Pleuronectiformes). *Cybium* **13**(3): 271–279.
- Desoutter, M., Chapleau, F., Munroe, T.A., Chanet, B. & Beaunier, M. (2001). Catalog critique des types de poissons du Muséum National d'Histoire Naturelle. *Cybium* **25** (4): 299–368.
- Dor, M. (1970). Nouveaux poissons pour la faune de la Mer Rouge. *Bull. Sea Fish. Res. Stn. Israel*, no. 44: 7–28.
- Dor, M. (1984). Checklist of the Fishes of the Red Sea. The Israel Academy of Sciences and Humanities, Jerusalem. xxii + 437 pp.
- Evermann, B.W. & A. Seale. (1907). Fishes of the Philippine Islands. *Bull. Bur. Fish.* **26**: 49–110.
- Goren, M. & Dor, M. (1994). An Updated Checklist of the Fishes of the Red Sea. The Israel Academy of Sciences and Humanities, Jerusalem, and the Interuniversity Institute of Marine Science, Eilat. xii + 120 pp.
- Günther, A. (1862). Catalogue of the Fishes in the British Museum, vol. 4. British Museum, London. xxi + 534 pp.
- Jones, S. & Kumaran, M. (1980). Fishes of the Laccadive Archipelago. The Nature Conservation and Aquatic Sciences Service, Trivandrum. xii + 760 pp.
- Kaup, J. (1858). Uebersicht der Soleinae, der vierten Subfamilie der Pleuronectidae. *Arch. Naturgesch* 24: 94–104.
- Khalaf, M. & Disi, A.M. (1997). Fishes of the Gulf of Aqaba. Marine Science Station, Aqaba, Jordan. 252 pp.
- Muchhala, N. & Munroe, T.A. (2004). A new species of *Soleichthys* (Soleidae: Pleuronectiformes) from tropical seas off northern Australia. *Ichth. Res.* **51**: 57–62.
- Munroe, T.A. & Menke, S.B. (2004). Two new soleid flatfishes (Pleuronectiformes: Soleidae: *Soleichthys*) from Australian waters, with a re-description of *Soleichthys microcephalus* (Günther). *Rec. Austral. Mus.* **56**: 247–258.
- Myers, R.F. (1999). *Micronesian Reef Fishes*, ed. 3. Coral Graphics, Guam. vi + 330 pp.
- Ochiai, A. (1963). *Fauna Japonica: Soleina (Pisces)*. Biographical Society of Japan, Tokyo. 114 pp.
- Randall, J.E. (2005). *Reef and Shore Fishes of the South Pacific*. University of Hawaii Press, Honolulu. xii + 707 pp.
- Schultz, L.P., Woods, L.P. & Lachner, E.A. (1966). Fishes of the Marshall and Marianas Islands. Vol. 3. Families Kraemeriidae through Antennariidae. *Bull. U.S. Natl. Mus.* 202: vii + 176 pp.

In accordance with Article 8.6 of the International Code of Zoological Nomenclature, copies of the PDF file of this work have been deposited in the following publicly accessible libraries: 1. National Museum of Natural History, Smithsonian Institution, Washington D.C. USA; 2. Natural History Museum, London, UK; 3. California Academy of Sciences, San Francisco, California, USA; 4. Department of Ichthyology, Muséum National d'Histoire Naturelle, 75005 Paris, France; 5. Senckenberg Museum, Frankfurt/Main, Germany; 6. National Museum of Natural History, Leiden, The Netherlands. 7. The Gitter-Smolartz Library of Life Sciences and Medicine, Tel Aviv University, Israel; 8. The National and university Library, Jerusalem, Israel; 9. Library of Congress, Washington, D.C. USA; 10. South African Institute for Aquatic Biodiversity, Grahamstown, South Africa; 11. The National Science Museum, Tokyo, Japan; 12. The Swedish Museum of Natural History, Stockholm, Sweden.