

A pictorial review and key to the shrimp gobies of the genus *Amblyeleotris* of the Red Sea, with description of a new species

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ABSTRACT. Fishes of the gobiid genus *Amblyeleotris* live in symbiotic relationship with snapping shrimps of the genus *Alpheus*. Five species of this genus have been previously recorded from the Red Sea. We here describe a sixth species, *Amblyeleotris neglecta* sp. nov., at present known only to occur in the Red Sea. This new species can be distinguished by the following suite of characters: dorsal fin rays VI + I, 12–14; anal fin rays I, 13–15; pectoral fin rays 18–19; presence of pelvic frenum, fifth pelvic fin ray slightly shorter than fourth, longitudinal scale series 77–85; median predorsal scales 16–17; one dark bar on nape, four on body; pale interspaces with an irregular dark brown line; branchiostegal membranes dark brown; caudal fin with a dark brown arc at base. A key to the species of *Amblyeleotris* occurring in the Red Sea is included.

KEYWORDS: *Amblyeleotris*, new species, Red Sea

INTRODUCTION

There are 13 genera of gobiid fishes occurring in symbiotic association with shrimps from the genus *Alpheus*. Of these, the genus *Amblyeleotris* Bleeker 1874, is the most speciose with a current total of 36 species; 35 species noted in a review by Chen et al. (2006) and one species later described by Senou and Aonuma (2007). The shrimp constructs and maintains a burrow in sedimentary substratum that is used by the goby as a refuge. The goby serves as a sentinel, warning the shrimp of the approach of a predator by occluding the burrow entrance, and/or by rapid fluttering of the caudal fin (Karplus, 1987). When leaving the burrow entrance, the shrimp generally maintains contact with the goby with one antenna. It is hypothesized that alarm signals are conveyed via these contact points (Yanagisawa, 1976).

Early records from the Red Sea included two species of the genus *Amblyeleotris*, *A. sungami* (Klausewitz, 1969) and *A. steinitzi* (Klausewitz, 1969) (Dor 1984; Goren and Dor 1994). Randall (1994a) increased this number to five by the inclusion of the following three species to the ichthyofauna of the area; *A. diagonalis* Polunin and Lubbock, 1979 (page 245, fig. 4), *A. wheeleri* (Polunin and Lubbock, 1977) (page 88, figs. 16–17) and *A. triguttata* Randall, 1994 (pages 321, pls. 5–9). We describe here a new species of *Amblyeleotris* collected off Eilat in the Gulf of Aqaba, followed by a key to the six Red Sea species of the genus: *A. neglecta* nov. sp. (Plate 1 A–C); *A. diagonalis* (Plate 1 D–F); *A. steinitzi* (Plates 1 G–H, 2A); *A. sungami* (Plate 2 B–D); *A. triguttata* (Plate 2 E–F) and *A. wheeleri* (Plate 2 G–H).

MATERIALS AND METHODS

Specimens examined in this study are lodged at the Bernice P. Bishop Museum, Honolulu (BPBM); the South African Institute for Aquatic Biodiversity, Grahamstown (SAIAB); Senckenberg Museum, Frankfurt (SMF), and the National Museum of Natural History, Washington D.C. (USNM). Measurements and counts were made following Randall (2004). Lengths of all specimens are given in standard length (SL) and the head length is abbreviated as HL when used in proportions. Measurement of the length of the first dorsal fin is made from the base of the first dorsal spine, past the sixth dorsal spine, to the point of attachment of the first dorsal fin membrane to the dorsum. Values obtained from the holotype are provided in the description with range values of paratypes given within parentheses.

Amblyeleotris neglecta sp. nov.

Fig. 1, Plate 1 A–C, Table 1

Holotype. BPBM 18291, female, 54.0 mm, off desalination plant, Eilat, Gulf of Aqaba, Red Sea, 15 m, spear, J.E. Randall, 28 September 1974.

Paratypes. BPBM 19893, male, 34.0 mm, locality as holotype, 15 m, spear, J.E. Randall, 3 November 1975; SAIAB 80947, male, 31.8 mm, locality as holotype, 15 m, rotenone, J.E. Randall, 28 September 1974.

DIAGNOSIS. Dorsal fin rays VI + I, 12–14; anal fin rays I, 13–15; pectoral fin rays 18–19; pelvic fin rays I, 5, pelvic fins joined basally by a membrane, pelvic

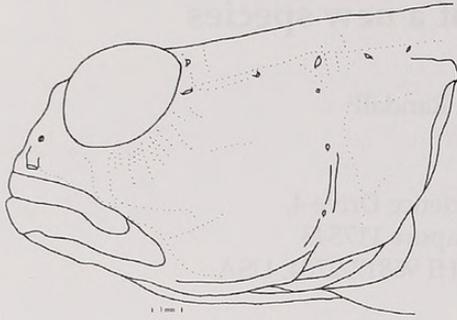


Fig. 1. Head showing pores and papillae pattern of the holotype of *Amblyeleotris neglecta*, BPBM 18291, 54 mm.

frenum present, fifth pelvic soft fin ray slightly shorter than fourth, branched once mid-ray, branches not separated (occur close together and run parallel to each other throughout the ray); longitudinal scale series 77–85; median predorsal scales 15–17, scales embedded anteriorly, squamation extending to above upper end of preopercular margin; gill opening reaching forward to below middle of opercle. Colour in alcohol beige, with five narrow dark brown bars, broadly bordered in lighter brown, the first from nape across operculum, the last on caudal peduncle; bars progressively less oblique, the last near-vertical; pale interspaces with irregular dark brown line, sometimes branching, often ending dorsally in dark spot; branchiostegal membranes dark brown; caudal fin with dark brown arc at base, limbs of arc narrowing posteriorly to midfin; remaining fins unmarked.

DESCRIPTION. Dorsal fin rays VI + I,12 (VI + I,13–14); anal fin rays I,13 (VI + I,14–15); pectoral fin rays 19 (18–19); pelvic fin rays I, 5 (I, 5), segmented caudal fin rays 17 (17), branched caudal fin rays 14 (14). Longitudinal scale series 83 (77–85); scales ctenoid, small, becoming smaller and cycloid anterior to posterior margin of first dorsal fin; scales on pectoral fin base cycloid; transverse scale count backwards 20 (19–20); transverse scale count forward 22 (21–22); predorsal (midline) scales 17 (15–16), embedded anteriorly, squamation extending anterior to a vertical with the preopercular margin; no scales on side of head. Body depth at anus 12.4% SL (10.0–10.4% SL); body width just posterior to gill opening 6.5% SL (5.0–5.6% SL); predorsal length 22.9% SL (21.2–21.7% SL); prepelvic length 28.0% SL (26.7–28.8% SL); preanal length 55.4% (50.9–53.5% SL); length of caudal peduncle 13.7% SL (13.2–14.7% SL); depth at caudal peduncle 8.0% SL (6.3–7.4% SL). Head length 25.9% SL (26.4–29.1% SL); head deeper than wide; head depth 42.9% SL (39.4–40.5% SL); head width 34.3% SL (28.3–34.5% SL); orbit diameter (measured to fleshy edge) moderate 29.3% HL (27.3–27.4% HL); bony interorbital space narrow, 4.3% HL (2.4–3.0% HL); gill opening moderately wide, extending forward to below

middle of opercle; snout profile blunt, steep; posterior nasal opening small; anterior nasal opening in a short tube; reduced transverse papillae pattern on cheek (Fig. 1), supraorbital papillae well-developed.

Mouth large, oblique; lower jaw slightly projecting; upper jaw length 37.1% HL (32.3–37.1% HL); tongue truncate; teeth in upper jaw villiform, inward curving, in four rows, outermost row largest, two large recurved canines on either side of upper jaw, distance between canines about three-quarters of orbit diameter; teeth in lower jaw villiform, inward curving, in four to five rows, outermost row largest, one large recurved canine on either side of lower jaw, canines situated along second outermost row; margin of lips with papillae, papillae absent posteriorly on both upper and lower lips; teeth absent on vomer and palatine; snout short, snout length 9.3% HL (9.5–10.1% HL).

First dorsal fin triangular in males, somewhat triangular with rounded edges in females; third spine longest at 20.7% SL (17.0–19.7% SL); length of first dorsal fin base 16.5% SL (17.6–18.1% SL); length of second dorsal fin base 31.1% SL (30.5–32.1% SL); length of anal fin base 28.0% (28.0–28.5% SL); pectoral fin length 24.3% SL (24.1–25.2% SL); pectoral fin height 7.0% SL (5.0–5.3% SL); pelvic fin long, tips reaching anus; pelvic fin length 28.9% SL (23.5–25.2% SL); pelvic fins joined basally by a membrane for 6.6% of pelvic fin length (6.6–10.2% of pelvic fin length), pelvic frenum present, fifth pelvic fin ray shorter than fourth ray, branched once at mid-fin, branches not separated (branches occur close together and run parallel to each other throughout the ray); caudal fin weakly lanceolate, moderately long, caudal fin length 36.3% SL (30.8–31.2% SL).

Colouration. In life, first dorsal fin hyaline with broad, light-brown bar on proximal two-thirds of fin, three to four rows of light-blue elliptical spots on light-brown region, spots situated on inter-ray membrane; second dorsal fin hyaline with narrow light-brown bar on proximal one-third of fin, two to three rows of light-blue spots on light-brown region, one to two light-blue spots on dorsal margin, spots situated on inter-ray membrane; anal fin hyaline, narrow light brown bar on proximal one-quarter of fin; colours do not persist in preservative. Two light-blue longitudinal lines along pelvic fin, lines lost in preservative. Dark arc on base of caudal fin, base of arc extending posteriorly into caudal fin, forming horizontal bar at ventral area of caudal fin, bar terminates midfin, radiating rows of light blue spots on inter-ray membrane, spots lost in preservative. In alcohol, base colour beige; narrow dark brown bars present, one on head, four on body; bars extending to ventral region of flank, first four anterior bars anteroventrally oblique, fifth bar vertical; first bar on nape across opercle to ventral area of branchiostegal membranes; second bar under first dorsal fin, third and fourth bars under second dorsal fin; last bar on caudal peduncle; pale interspaces with an irregular

Table 1. Counts and measurements of the types of *Amblyeleotris neglecta*.

	Holotype		Paratypes	
	BPBM 18291	BPBM 19893	SAIAB 80947	
	54.0 mm SL	34.0 mm SL	31.8 mmSL	
Counts				
Second dorsal-fin rays	I, 12	I, 14	I, 13	
Anal-fin rays	I, 13	I, 15	I, 14	
Left pectoral-fin rays	19	18	19	
Right pectoral fin-rays	I, 5	I, 5	I, 5	
Segmented caudal-fin rays	17	17	17	
Branched caudal-fin rays	14	14	14	
Longitudinal scale series	83	77	85	
Transverse (backwards) scale count	20	19	20	
Transverse (forward) scale count	22	22	21	
Predorsal midline	17	11*	16	
Morphometric measurements (in %HL)				
Head width	34.3	28.3	34.5	
Head depth	42.9	39.4	40.5	
Snout length	9.3	10.1	9.5	
Interorbital distance	4.3	3.0	2.4	
Orbit diameter	29.3	27.3	27.4	
Upper jaw length	37.1	32.3	35.7	
Morphometric measurements (in %SL)				
Head length	25.9	29.1	26.4	
Predorsal length	22.9	21.2	21.7	
Prepelvic length	28.0	28.8	26.7	
Preanal length	55.4	53.5	50.9	
Length of D1 base	16.5	17.6	18.9	
Length of D2 base	31.1	32.1	30.5	
Length of anal fin base	28.0	28.5	28.0	
Length of caudal peduncle	13.7	14.7	13.2	
Depth of caudal peduncle	8.0	7.4	6.3	
Length of pelvic fin	28.9	23.5	25.2	
Length of caudal fin	36.3	31.2	30.8	
Body depth at anus	12.4	10.0	10.4	
Body width posterior to gill opening	6.5	5.6	5.0	
Length of pectoral fin	24.3	24.1	25.2	
Height of pectoral fin	7.0	5.3	5.0	
Length of first spine of first dorsal fin	18.7	16.8	12.3	
Length of second spine of first dorsal fin	20.0	18.2	14.2	
Length of third spine of first dorsal fin	20.7	19.7	17.0	
Length of fourth spine of first dorsal fin	17.0	15.0	11.9	
Length of spine of second dorsal fin	9.8	damaged	9.4	
Length of first ray of second dorsal fin	11.5	damaged	10.7	
Length of spine of anal fin	6.9	6.8	8.8	
Length of first ray of anal fin	8.9	8.5	10.7	
Length of pelvic fin spine	8.7	10.0	8.2	
Measurements (in % pelvic fin length)				
Extent of unification of pelvic fin	6.6	6.6	10.2	

* some scales missing

dark brown line, sometimes branching, often ending dorsally in dark spot. Anterior region of head light green in life, colour does not persist in preservative; dark spot above posterior end of maxilla; branchiostegal membrane dark brown; short post-orbital dark brown line coursing posteriorly, terminating posterior to preopercular margin; iridescent blue spots on nape, becoming light-brown in preservative, spot elliptical in holotype, diffuse in paratypes; small iridescent spots on operculum, becoming light-brown in preservative.

ETYMOLOGY. The specific name alludes to the fact that this species was first collected and photographed 34 years ago but only recently recognized as new.

REMARKS. The three type specimens of this species were collected in 1974 and 1975 at a depth of 15 m on a sand substratum with patches of the invasive seagrass *Halophila stipylacea* and occasional small coral heads. The underwater photograph in Plate I C was taken in the same general area in 1986, but at 33.5 m, where the substrate consisted of coarse sand and gravel. The desalination plant that was the landmark for the type locality of *Amblyeleotris neglecta* has been deactivated, but there has been concern over extensive pollution caused by the rearing of fish in cages off the North Beach of Eilat. Jacob Dafni, who is continuing a long-term a survey of the marine environment in the northern Gulf of Aqaba, reported that the goby's type locality is "not polluted, but not at its best."

This species was observed to live in symbiotic association with an alpheid shrimp, but the shrimp was neither collected nor photographed. Eight species of shrimps of the genus *Alpheus* are reported to live in association with nine species of gobies in the northern areas of the Red Sea (Karplus et al. 1981). The classification of the shrimps is in slow progress due to insufficient specimens. The shrimps in plates I and 2 were identified by Dr Arthur Anker. Shrimps in plates I F and II C are undescribed, and that in Plate II A is believed to be part of the *Alpheus* "ochrostriatus" species complex (Anker pers. comm.).

COMPARISONS TO CONGENERS IN THE RED SEA. *Amblyeleotris neglecta* differs from *A. sungami*, *A. triguttata* and *A. steinitzi* in the presence of predorsal midline scales (vs. absent). The extent of unification of the pelvic fin of *A. neglecta* is restricted to only the base (not more than 10.2%) while *A. sungami*, *A. triguttata* and

A. wheeleri have the innermost rays of the pelvic fins attached to at least a quarter of the total pelvic fin length. *Amblyeleotris neglecta* differs from *A. diagonalis* primarily in the longitudinal scale counts (83–85 vs 59–75) and the presence of a pelvic frenum (vs. absent). The first of three narrow oblique bands on the head of *A. diagonalis* originates from the anterior orbital margin and terminates on the anterior margin of upper lip. This narrow dark brown band is diagnostic for this species and is absent in *A. neglecta*.

Comparative material examined. *Amblyeleotris diagonalis*: [paratype] USNM 218981, 59 mm, Bond Island, Eastern Andaman, 8 March 1977; BPBM 19770, 5: 37–46 mm, Sudan, Suakin Harbor, silty sand and small rubble, at 10–14 m, 15 October 1975; BPBM 28420, 43 mm, Saudi Arabia, off north end of Jeddah, sloping silty sand bottom, at 46 m, 17 May 1982; BPBM 30375, 2: 56–64 mm, Saudi Arabia, Yanbu, sand adjacent to patch reef, at 12 m, 29 May 1984; USNM 263588, 2: 22–23 mm, Saudi Arabia, reef on north side of Jeddah harbor, 10 April 1977. *Amblyeleotris steinitzi*: BPBM 13431, 3: 33–43 mm, Gulf of Aqaba, Sinai Peninsula, El Hamira, sandy reef, at 1.5–3 m, 9 June 1972; BPBM 18139, 41 mm, Gulf of Aqaba, 8–12 September 1974; BPBM 20357, 3: 32–38 mm, Sudan, Towarit Reef Complex, at 10 m, 10 October 1974; BPBM 37812, 2: 39–50 mm, August 1976; USNM 264394, 30 mm, Israel, Gulf of Aqaba, Bay at El Hameira, 8 September 1969; USNM 264407, 3: 34–36 mm, Israel, Gulf of Aqaba, Bay at El Hameira, 16 July 1969. *Amblyeleotris sungami*: [paratype] SMF 9620, 51 mm, Sudan coast, Suakin Harbor; BPBM 17879, 4: 39–65 mm, Gulf of Aqaba, Eilat, 25–30 m, 9–10 September 1974; BPBM 19287, 10: 28–84 mm, Gulf of Aqaba, Eilat, at 15 m, 28 September 1974; BPBM 20372, 3: 55–70 mm, Sudan, Suakin Harbor, at 1.5–2.5 m, 11 October 1974; USNM 263361, 3: 27–52 mm, Israel, Gulf of Aqaba, Bay at El Himeira, 9 September 1969; USNM 263371, 11: 16–47 mm, Israel, Gulf of Aqaba, Bay at El Himeira, 8 September 1969. *Amblyeleotris triguttata*: [holotype] BPBM 30374, 65 mm, Saudi Arabia, Yanbu, sand adjacent to reef patch, at 12 m, 29 May 1984; [paratypes] BPBM 28372, 3: 50–67 mm, Saudi Arabia, Sharm Abhur, north of Jeddah, 10 May 1982; [paratype] BPBM 35717, 69 mm, Yemen, Hanish Islands, sand and rubble, at 17 m, 18 May 1993. *Amblyeleotris wheeleri*: BPBM 27469, 37 mm, Sudan, entrance to Port Sudan Harbor, rubble and sand patch in fringing reef, at 5 m, 14 January 1980; BPBM 36030, 2: 50.0–57.0 mm, Oman.

KEY TO THE RED SEA SPECIES OF AMBLYELEOTRIS

- 1a. Pelvic fins united by membrane for at least one-fourth of its length 2
- 1b. Pelvic fins separate or united by membrane only at extreme base 4
- 2a. Pelvic fins with a frenum; predorsal midline scales absent; anal rays 13–15; longitudinal scale series 96–106; orange to brownish red bars on body narrower than white interspace 3

- 2b. Pelvic fins without a frenum; predorsal midline scales present; anal rays 12; longitudinal scale series 59–68; red to brown bars on body equal to or broader than white interspaces *wheeleri*
- 3a. Anal soft rays 14 or 15; caudal fin length 2.75–3.25 in SL; a black spot on nape above opercle; two black spots on first dorsal fin; a curving dark brown line from below eye to posterior margin of maxilla; irregular brown markings in white spaces between brownish-red bars on body *triguttata*
- 3b. Anal soft rays 13; caudal fin length 2.25–2.7 in SL; marking not as above; numerous small pale-blue spots and occasional small orange-yellow spots on white spaces between orange-red bars on body *sungami*
- 4a. Predorsal midline scales absent; prepelvic region naked; anal soft rays 12; white spaces between brownish-red bars on body devoid of markings *steinitzi*
- 4b. Predorsal midline scales present; prepelvic region with scales (may be embedded); anal soft rays 12–14; dark markings on white spaces between reddish bars on body present 5
- 5a. Scales in longitudinal series 59–75; pelvic frenum absent; three narrow, oblique, orange-red to dark brown bands on head; first band originates from orbital anterior margin, terminates on the anterior margin of upper lip; second band originates on nape across head, terminating at the posterior margin of upper and lower maxilla; third bar broader than the second, originates on nape across head terminating at ventral region of operculum; a broad white horizontal bar at one-third proximal base, of anal fin, bordered distally with a blue-edged orange band *diagonalis*
- 5b. Scales in longitudinal series 83–85; pelvic frenum present; markings not as above; anal fin hyaline, white horizontal band at proximal one-quarter of anal fin base *neglecta* nov. sp

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PLATE 1



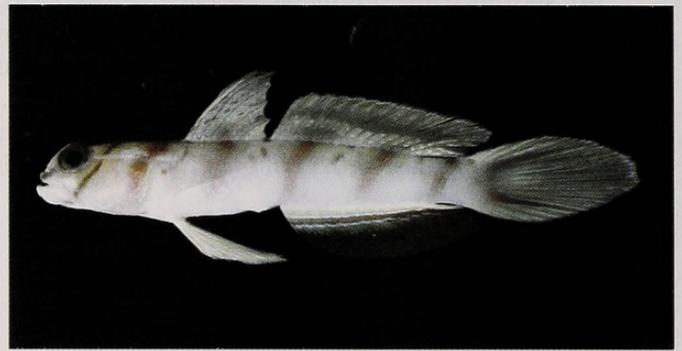
A. Holotype of *Amblyeleotris neglecta*, BPBM 18291, 54.0 mm SL, Eilat, Gulf of Aqaba.



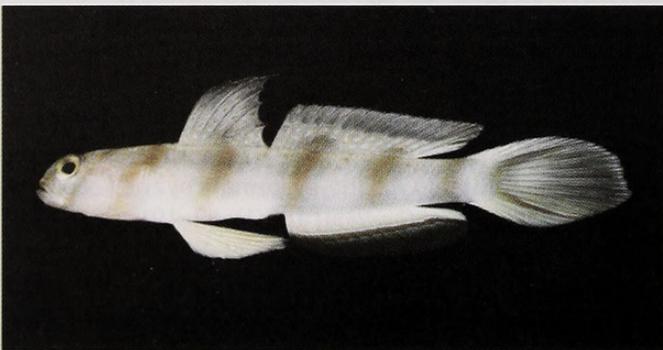
B. Paratype of *Amblyeleotris neglecta*, SAIAB 80947, 31.8 mm SL, Eilat, Gulf of Aqaba.



C. Underwater photo of *Amblyeleotris neglecta*, about 60 mm SL, Eilat, Gulf of Aqaba.



D. *Amblyeleotris diagonalis*, BPBM 19770, 43 mm, Suakin, Sudan.



E. *Amblyeleotris diagonalis*, BPBM 28420, 44 mm, Jeddah, Saudi Arabia.



F. Underwater photo of *Amblyeleotris diagonalis* with *Alpheus* cf. *bedlulus*, Jeddah, Saudi Arabia.



G. *Amblyeleotris steinitzi*, BPBM 13431, 35 mm, El Hamira, Gulf of Aqaba.



H. Underwater photo of *Amblyeleotris steinitzi* with *Alpheus djeddensis*, Eilat, Gulf of Aqaba.



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