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Rhinogobius brunneus (Gobiidae) in the Arabian Gulf

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The Khwar 'Abd Allah, in the north-west corner of the Arabian Gulf, is a shallow (5–12 m), marine (30–34‰) inlet (ca 1500 km²) flanked by the mouth of the Shatt-el-Arab to the east and Bubiyan Island to the west; coastline and deposit range from sand to mud. A faunal survey of this area has yielded nine examples of a gobiid fish (standard and caudal fin lengths 49+12.5 to 67+14 mm, trawled 20 March 1972), which has proved impossible to identify among previous major works on the gobies of the western Indian Ocean and Red Sea (summarised by Hoese and Winterbottom, 1979; Goren, 1979). Externally, the species (Fig. 1) is moderately elongate, with prominent snout (Fig. 2A), branchiostegal membrane attached to lateral border of isthmus, rounded caudal fin about equal head length, large scales [in lateral series mostly 30–31 (range 27–32)], naked head and anterior nape (scaled at sides and midline to opposite preopercle), short second dorsal and anal fins (modally I/8), no free pectoral rays, and rounded pelvic disc with laterally-lobed anterior transverse membrane (Fig. 2B). Morphometric and meristic details are given in Table 1. At first, meristic and pelvic disc features suggested identity with the rare *Lobulogobius omanensis* Koumans, discovered offshore in the Arabian Gulf and redescribed by Larson and Hoese (1980), with further records from the Gulf of Aden, Vietnam, and Western Australia (Larson, 1983). However, as confirmed from examination of the holotype and another specimen, *L. omanensis* differs from the Khwar 'Abd Allah fish in possessing a modified dentition, with large isolated canines including prominent paired inner tusks near the symphysis of the lower jaw, more extensive nape squamation, and branchiostegal membrane free from the sides of the isthmus. Comparison of the head lateral-line system, while showing basic similarity in 'abbreviate' pattern (Miller *et al.*, 1980), also revealed that Khwar 'Abd Allah material (Fig. 2A) differs from *L. omanensis* (Larson and Hoese, 1980: figs. 533, 534) in (i) continuity of rows *d* and *d'*, (ii) more oblique row *a*, not so convergent on row *b*, (iii) only one papilla representing row *cp*, and (iv) retention of posterior oculoscapular head canal ($\rho^1-\rho^2$). The holotype of *L. omanensis* has only one pore λ, probably an individual abnormality from the paired condition seen in the Khwar 'Abd Allah fish. In the caudal skeleton, the latter have two epural bones (Fig. 2C), a more generalised state than the single element found on radiography of *L. omanensis*.

Extending the search among gobioid genera from other parts of the Indo-Pacific, including the temperate faunas of the northern Pacific and Australasia, it is soon apparent that the Khwar 'Abd Allah goby displays all the features of species belonging to the *Rhinogobius*/*Tukugobius* complex, occurring in waters entering the Japan and China Seas of the Central Indo-Pacific region, with abbreviate head papillae, paired pores λ, two epurals, low to moderate number of scales in lateral series, short second dorsal and anal fins, and lobed, circular pelvic disc (Mizuno, 1960, 1961; Takagi,

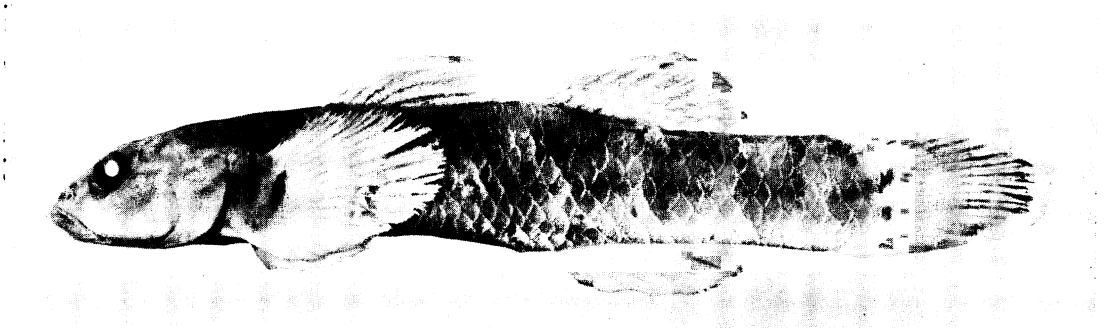

Fig. 1. *Rhinogobius brunneus*, female, standard length 53 mm, caudal fin length 13.5 mm, Khwar 'Abd Allah, Arabian Gulf.

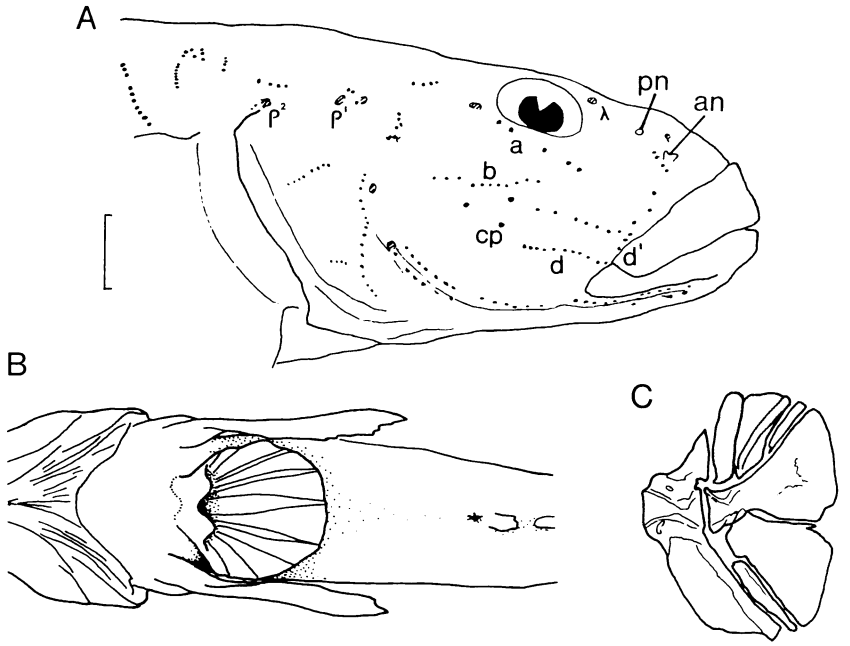

Fig. 2. *Rhinogobius brunneus* from the Khwar 'Abd Allah. A, head lateral-line sensory papillae and canal pores (cross-hatched) of male, 64.5+15 mm; B, pelvic disc of female, 53+13.5 mm; C, caudal skeleton (epurals stippled) of male, 67+14 mm. Abbreviations: an, pn, anterior and posterior nostrils; otherwise as text. Scale 3 mm (A), 4 mm (B), 2 mm (C).

Table 1. Morphometric and meristic data for *Rhinogobius brunneus* from the Khwar 'Abd Allah. Morphometrics, as percentage of standard length, from 6 individuals (SL 49–64.5 mm); values given are range and, in parentheses, mean and standard deviation. Meristics from 8 individuals; values are range of more frequent, and in parentheses, overall range and number of observations, for each value.

Head length	23.1–25.9	(24.3±0.84)	Caudal fin length	23.3–26.0	(25.1±1.01)
Head width	13.6–15.1	(14.4±0.57)	Pectoral fin length	19.9–23.1	(21.4±1.01)
Snout length	7.6–10.9		Pelvic disc length	14.3–17.6	(16.0±1.11)
Eye diameter	5.4– 6.0	(5.8±0.19)	Pelvic disc origin to anus	26.8–30.0	(28.3±1.23)
Postorbital length	10.9–13.5	(11.8±0.89)	Body depth at pelvic disc origin	15.7–18.3	(16.6±0.93)
Cheek depth	5.5– 9.2	(7.1±1.23)	Body depth at anal fin origin	17.4–18.9	(18.1±0.54)
Interorbital width	6.1– 6.6	(6.3±0.17)	Body width at anal fin origin	12.2–15.4	(12.8±1.41)
Snout to first dorsal fin origin	34.5–36.5	(35.7±0.61)	Caudal penducle depth	13.6–15.2	(14.5±0.61)
Snout to second dorsal	57.4–60.4	(59.3±0.95)	First dorsal rays	VI (VI: 8)	
Snout to above anus	52.7–58.0	(55.0±1.97)	Second dorsal rays	I/8 (8–10; 8: 5, 9: 2, 10: 1)	
Snout to above anal fin origin	57.1–64.0	(60.4±2.41)	Anal rays	I/8 (8: 8)	
Snout to above pelvic disc origin	23.1–26.9	(25.3±1.25)	Pectoral rays	18–20 (17–20; 17: 1, 18: 3, 20: 4)	
Caudal peduncle length	23.3–26.4	(25.3±1.12)	Scales in lateral series (left side)	30–31 (29–32; 29: 1, 30: 3, 31: 6, 32: 2)	
First dorsal fin-base	14.0–16.6	(14.9±0.86)	Vertebrae (including urostyle)	26 (25–26; 25: 1, 26: 5)	
Second dorsal fin-base	15.4–17.6	(16.2±0.83)			
Anal fin-base	12.9–14.9	(13.9±0.71)			

1963; Hayashi, 1976; Prince Akihito *et al.*, 1984). There is an exact correspondence in head lateral-line system between the Khwar 'Abd Allah goby and *R. brunneus* (Temminck et Schlegel) from Japan (Takagi, 1963: fig. 22A; Prince Akihito *et al.*, 1984: fig. 153) with which the former also agrees in the naked anterior nape. Coloration resembles that of the 'dark' type (Inouye *et al.*, 1978) of *R. brunneus* (N. Mizuno, pers. comm.).

Aberrant low values for number of pectoral rays (17–20), in comparison to a range of 19–22 for eastern Asian *R. brunneus*, may be a phenotypic response to higher environmental temperatures during development, widely reported in other teleosts (Garside, 1970).

It is not impossible for such a disjunct distribution of *Rhinogobius* to have arisen naturally but, nowadays, a more likely explanation is that the Khwar 'Abd Allah has been colonised by a species, here suggested to be *R. brunneus* from Japan, accidentally introduced in the ballast water of ships, perhaps most likely oil supertankers, plying between the northern Arabian Gulf and Japan. The feasibility of the transport in ballast water of fish and other organisms is reviewed by Carlton (1985). Essentially freshwater, *R. brunneus* is a taxon composed of various forms, with different ecological preferences which include an amphidromous life-history and juveniles in estuarine habitats of high salinity and temperature (Prince Akihito *et al.*, 1984; N. Mizuno, pers. comm.). The likelihood of trapping *R. brunneus* in ballast water would depend on the salinity around domestic shipping-terminals and the immediate movements of the vessel after discharge of cargo. Elsewhere, and most likely also introduced in ballast water, two other Japanese coastal gobies, *Acanthogobius flavimanus* (Temminck et Schlegel) and *Tridentiger trigonocephalus* (Gill), have become established in New South Wales (Williams *et al.*, 1978; Middleton, 1982) and California (Haaker, 1979). In conclusion, the authors believe that the origin of the Khwar 'Abd Allah gobies could be conclusively demonstrated by electrophoretic studies once field work in the area can again provide specimens. Present material is deposited in the British Museum (Natural History) (BMNH 1983. 3. 20. 1–7).

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アラビア湾から採集されたヨシノボリ

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アラビア湾の北西部の水深 5–12 m からトロールによって，これまで当海域から報告されていないハゼ科魚類が採集された．本種は孔器や他の外部形質によって，ヨシノボリと査定された．ヨシノボリの現在の分布を考慮すると，今回採集された標本はタンカーのバラスト・タンクに入って運ばれたと考えられる．