THE RAFFLES BULLETIN OF ZOOLOGY 1995 43(2): 289-298

A REVIEW OF THE GUITARFISHES OF THE GENUS *RHINOBATOS* (RAJIFORMES: RHINOBATIDAE) FROM OMAN, WITH DESCRIPTION OF A NEW SPECIES

John E. Randall and **Leonard J. V. Compagno**

ABSTRACT.- Twenty-six species are recognized in the guitarfish genus *Rhinobatos*, of which the following four are recorded from Oman: *R. granulatus* Cuvier, *R. halavi* (Forsskål), *R. punctifer* Compagno & Randall, and *R. salalah*, new species. *Rhinobatos salalah*, a species of the subgenus *Acroteriobatus*, is described from a single specimen from the Arabian Sea coast of southern Oman. It is distinct in having a heart-shaped disc with a width of 2.9 in total length; a short, bluntly pointed snout (preoral length 8.7 in total length, the snout angle 88°); 197 vertebrae; two cutaneous folds on posterior edge of spiracle; and tan colour with faint, dark-edged , bluish white spots the size of pupil or smaller on outer part of disc and on pelvic fins. Its closest relative appears to be *R. blochii* Müller & Henle from South Africa which differs in having a single spiracular fold and a broader space between spiracles (5.6-7.6%, compared to 5.1% for *R. salalah*).

INTRODUCTION

Norman (1926) revised the rays of the family Rhinobatidae, popularly known as guitarfishes or shovelnose rays. He recognized 20 species of the largest genus, *Rhinobatos* Linck, of which 15 occur in the Indo-Pacific region. Since Norman's revision, four Indo-Pacific species of the genus have been described: *R. petiti* Chabanaud, 1929, from Madagascar; *R. batillum* Whitley, 1939, from Western Australia, regarded as a junior synonym of *R. typus* Bennett by Last & Stevens (1994); *R. variegatus* Nair & Lal Mohan, 1973, described from one specimen taken in 200 fathoms (369 m) in the Gulf of Mannar; and *R. punctifer* Compagno & Randall, 1987, from the Red Sea. A new species from northwestern Australia illustrated by Gloerfelt-Tarp & Kailola (1984: 29) as *Rhinobatos* sp. 1, by Sainsbury et al. (1985: 45) as *Rhinobatos* sp. 1, and *Rhinobatos* sp. 2, by Allen & Swainston (1988: pl. 3) as *Rhinobatos* sp., and by Last & Stevens (1994: 269) as *Rhinobatos* sp. A, remains undescribed.

John E. Randall - Bishop Museum, Box 19000-A, Honolulu, Hawaii 96817, USA; and Hawaii Institute of Marine Biology, University of Hawaii, Box 1346, Kaneohe, Hawaii 96744, USA. **Leonard J.V. Compagno** - Shark Research Centre, South African Museum, P.O. Box 61, Cape T'own 8000, South Africa.

Fouda & Hermosa (1993) listed *Rhinobatos annulatus* Smith and *R. granulatus* Cuvier in a checklist of fishes from Oman, though without indicating any basis for these records. Since *R. granulatus* is known to occur from China to the Persian Gulf, this listing is probably correct, but the record of *R. annulatus*, a species previously known only in South Africa from the Cape of Good Hope to Natal (Wallace, 1967), is questionable. Perhaps Fouda & Hermosa followed Hare (1990) who listed *R. annulatus* as the only species of the genus from trawl catches he reported from the Gulf of Oman. Mahdi (1971: 6, pl. 12, fig. 5) recorded *R. annulatus* from Iraq, and this record was accepted as valid for the Persian Gulf by Kuronuma & Abe (1986). However, Mahdi's illustration is sketchy, and his description is not diagnostic for *R. annulatus*. The illustration of the dorsal surface shows a guitarfish with a few regular, symmetrical, white spots and a relatively long snout, hence more similar to *R. punctifer* than to *R. annulatus*.

In the present paper we recognize four species of *Rhinobatos* for Oman, one of which is new. It is described herein from a single specimen obtained in the fish market in Salalah, southern Oman. Subsequent visits to the market and diving off the coast of Oman failed to yield further material of the species. The holotype is deposited in the Bernice P. Bishop Museum, Honolulu (BPBM). The total length measurement used in proportions in the description is taken from the snout tip to the end of the upper caudal lobe when held in the median position. The accounts of the four Oman species of *Rhinobatos* are presented below in alphabetical order.

TAXONOMY

Rhinobatos granulatus Cuvier, 1829
(Fig. 1)

Rhinobatus granulatus Cuvier, 1829, Règne Animal, ed. 2, vol. 2, p. 396 (no type locality given).

Diagnosis.- Width of disc 3.05-3.2 in total length; snout pointed, the lateral margin concave; snout long, its preorbital length 4.7-4.9 in total length; distance between spiracles 3.3-3.7 in preorbital length; rostral ridges close together for most their length, diverging only basally; a broad median band of enlarged denticles passing posteriorly from anterior interorbital space, with a middorsal series of large thorn-like denticles commencing a short distance behind spiracles; a transverse row of two or three large thorn-like denticles on each side at level of greatest width of disc; a row of moderate tubercles medial to each spiracle and eye and curving anterior to eye; another smaller series on each rostral ridge; spiracles with two cutaneous folds on their posterior margin; nostrils about half width of mouth; dorsal fins about twice as high as their base. Grey-brown dorsally, the entire snout translucent a short distance anterior to eyes, except for rostral ridges; median fins and outer part of paired fins light tan; ventrolateral dermal fold on tail and narrow edge of pelvic fins white. Largest reported, 215 cm total length (Norman, 1926).

Remarks.- Norman (1926) gave the distribution of this guitarfish as coasts of India, Sri Lanka, and China. Fowler (1941) expanded the distribution to the Andaman Islands, Thailand, Singapore, East Indies (including the Philippines), and in Australia from the Northern Territory, Queensland, and New South Wales. Paxton et al. (1989) listed only the NE coast of Queensland for the Australian distribution, but Last & Stevens (1994) did not include the species in their "Sharks and Rays of Australia". Fowler (1941, 1956) reported *R. granulatus* from the Red

Sea, but Compagno & Randall (1987) regarded this record as highly doubtful. Blegvad (1944: 46, fig. 6), Mahdi (1971: 6, pl. 2), and Sivasubramaniam & Ibrahim (1982: 163, col. fig.) recorded the species from the Persian Gulf , and our illustrated specimen is from the Gulf. Although we have not collected or observed this fish in Oman waters, we accept the listing by Fouda & Hermosa (1993) as probable for Oman.

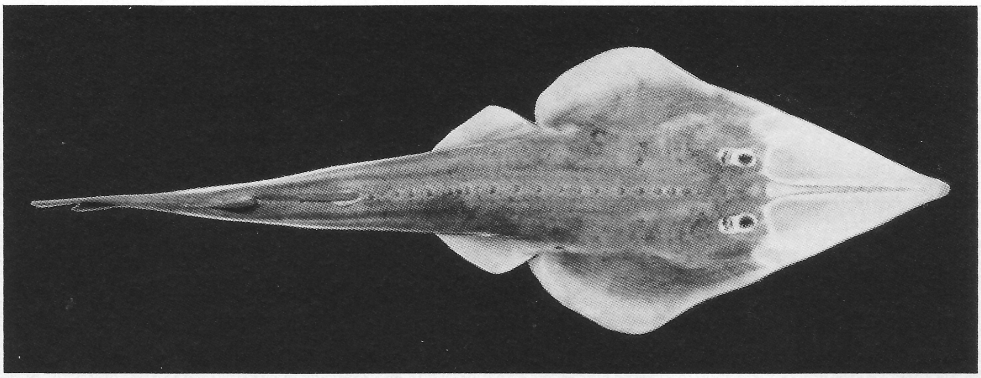

Fig. 1. *Rhinobatos granulatus*, BPBM 33217, 390 mm, Kuwait Bay, Persian Gulf (J. Randall).

***Rhinobatos halavi* (Forsskål, 1775)**
(Fig. 2)

Raja halavi Forsskål, 1775, Descriptiones Animalium..., pp. 8, 19 (type locality, Jeddah).

Diagnosis.- Width of disc 3.05-3.15 in total length; snout bluntly pointed, its lateral edge nearly straight, the preorbital length 7.0-7.4 in total length; distance between spiracles 2.6-2.7 in preorbital length; rostral ridges close together most of their length, diverging anteriorly and posteriorly; a median band of enlarged denticles commencing behind spiracles, with a middorsal row of large blunt tubercles; a row of tubercles median to spiracle and eye, curving anterior to eye; a row of small tubercles on each rostral ridge; spiracle with two cutaneous folds on posterior margin, the inner one small; nostrils about 1.5 in width of mouth; dorsal fins subequal, the first nearly twice as high as its base; uniform tan dorsally, except for large translucent area on snout to each side of rostral cartilages; ventrolateral fold on tail, margin of pelvic fins (and claspers of males), and lower edge of caudal fin white. Largest reported, 171 cm (Gohar & Mazhar, 1964).

Remarks.- Norman (1926) gave the range of *Rhinobatos halavi* as Red Sea, Persian Gulf, and China; however he was apparently in error in thinking Muscat is in the Persian Gulf, instead of the Gulf of Oman. The Muscat locality was first reported by Boulenger (1889), mistakenly as *R. schlegelii*. The species is still not known from the Persian Gulf. Day (1878) reported *R. halavi* from India, and Annadale (1909) followed Day in this record, but Norman (1926) corrected Day's Indian record to *R. obtusus* Müller & Henle. Fowler (1941) examined three specimens of *R. halavi*, two from the Red Sea and a juvenile of 173 mm from Burma. He also reviewed the literature for the species and gave the localities as Red Sea, Arabia, India, Burma, Philippines, Vietnam, China, and Australia, adding that the species has also been reported from the West African coast. No Australian record is recognized by Paxton et al. (1989) or by Last & Stevens (1994). We suggest that any localities other than

those from the Red Sea to the Gulf of Oman should be confirmed. Our one Oman specimen was collected in shallow water at Duqm on the central coast. Gohar & Mazhar (1964) reported the food in the northwestern Red Sea as mainly crustaceans, especially prawns. They added that the species is common along sandy shores in the northwestern Red Sea from May to October, especially females which seek shallow water to give birth to their young. Litter size up to ten; size at birth about 29 cm.

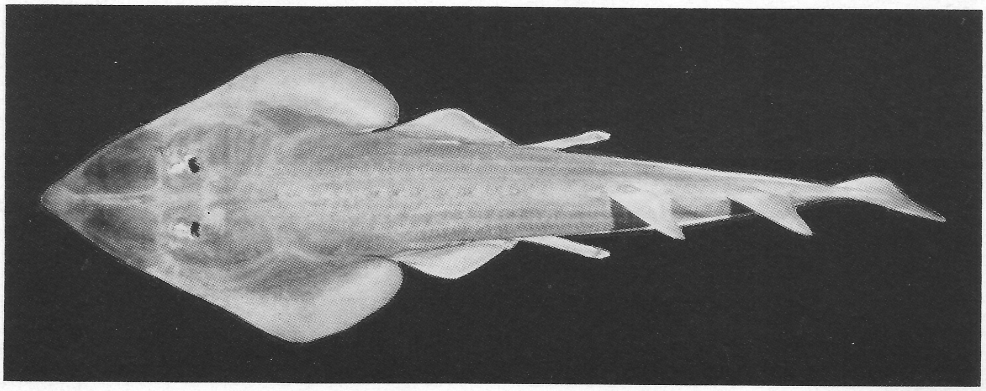

Fig. 2. *Rhinobatos halavi*, BPBM 36080, 995 mm, Duqm, central coast of Oman (J. Randall).

Rhinobatos punctifer Compagno & Randall, 1987
(Fig. 3)

Rhinobatos punctifer Compagno and Randall, 1987, Proc. Calif. Acad. Sci., vol. 44, no. 14, p. 336, fig. 1 (type locality, Gulf of Aqaba, Red Sea).

Diagnosis.- Width of disc 2.6-2.9 in total length; snout bluntly pointed, its lateral edge slightly concave near tip, the preorbital length 7.3-7.6 in total length; distance between spiracles 2.3-2.5 in preorbital length; eyes relatively large, the greatest diameter 3.2-3.5 in preorbital length (two specimens, 70.5-75.2 cm total length); rostral cartilages well-separated, diverging a little basally and slightly convergent anteriorly; a middorsal row of moderately large, blunt tubercles beginning an orbit diameter behind spiracles, becoming small between dorsal fins; two prominent cutaneous folds on posterior edge of spiracles, the inner one shorter; nostril length 1.3 in width of mouth; dorsal fins triangular with slightly convex anterior margin, the first dorsal slightly larger than second; base of first dorsal fin 1.75 in height of fin; dorsal surface brownish grey, the median fins, pelvic fins, outer part of disc, and most of snout lateral to rostral ridges tan; widely scattered white spots the size of pupil or smaller and large diffuse dark grey spots (more evident on Gulf of Oman specimen); ventrolateral cutaneous fold, edge of pelvic fins, and lower edge of caudal fin pale. Largest specimen, 80.5 cm.

Remarks.- This guitarfish is known only from the 70.5-cm holotype from the Gulf of Aqaba (BPBM 20843), one 75.2-cm specimen from Muscat (BPBM uncat.), and four specimens from the Suez market, 62-80.5 cm (misidentified as *R. schlegelii* by Gohar & Mazhar, 1964).

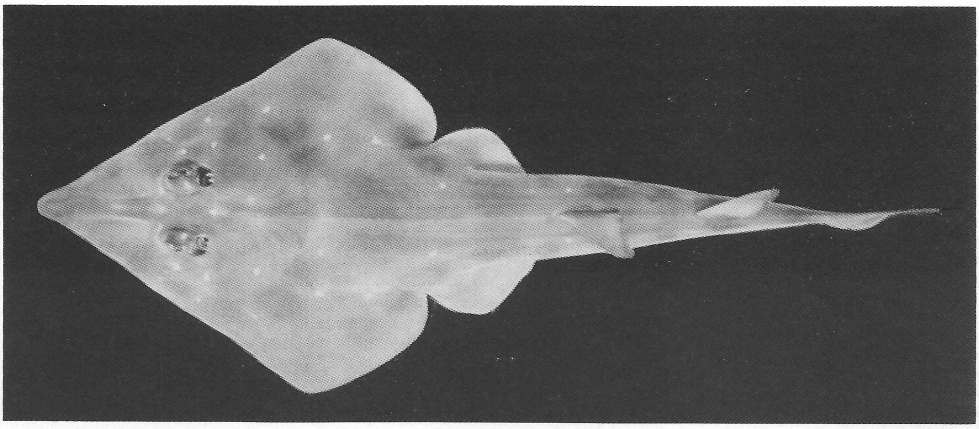

Fig. 3. *Rhinobatos punctifer*, BPBM 21336, 752 mm, Mutrah, Gulf of Oman (J. Randall).

Rhinobatos salalah, new species
(Fig. 4)

Material examined.- Holotype - BPBM 36358, 540 mm TL, Arabian Sea, Oman, Salalah fish market, coll. J.E. Randall and I. McLeish, 8 Feb.1993.

Diagnosis.- Width of disc about 2.9 in total length; disc broadly wedge-shaped anteriorly, the lateral edge slightly convex; margin of posterior half of disc strongly convex, without any angularity; tip of snout bluntly pointed, the snout angle 88°; snout short, the preorbital length 8.7 in total length; distance between spiracles 2.15 in preorbital length; eye 4.2 in preorbital length; rostral ridges well-separated throughout their length, diverging slightly anteriorly and posteriorly; a middorsal row of moderately large, blunt tubercles; two prominent cutaneous folds on posterior edge of spiracles, the inner one shortest; length of nostrils about 1.6 in width of mouth; dorsal fins subequal, triangular, the height nearly twice width of base; vertebrae 197, the total centra 179. Tan dorsally with scattered, dark-edged, bluish white spots the size of pupil or a little larger on outer part of disc and on pelvic fins; ventrolateral cutaneous fold on tail, posterior edge of disc, and edge of pelvic fins whitish.

Description.- Proportional measurements of the holotype are expressed below as percentages of the total length (540 mm): Snout to: nostrils 9.8; eyes 11.2; mouth 13.8; fifth gill openings 23.9; pectoral apices 26.6; pectoral rear tips 37.9; first dorsal origin 58.1; pelvic origins 34.2; vent 38.8; upper caudal origin 86.9. Distance between: front edge of eye and rear margin of spiracle 4.7; eye to pectoral axil 20.3; outer edge of nostril perpendicular to rim of disc 4.7; first and second dorsal bases 13.1; pelvic and first dorsal origins 22.2; pelvic and first dorsal bases 13.1; second dorsal base and upper caudal origin 6.7; pelvic bases and lower caudal origin 43.5. Eye: length of eye 3.1; length of cornea 2.0; interorbital width 3.9. Nostril: diagonal width 3.6; length 1.9; least internarial width 3.1. Spiracle: length 3.4; least width 1.2; interspiracular space 5.3. Mouth: width, 6.3; length 0.4. Gill openings: first 1.4; second 1.5; third 1.6; fourth 1.5; fifth 1.2. Height of: head at eyes 3.7; trunk at pectoral insertions 5.6; trunk at pelvic insertions; 4.8. Width of trunk at: pectoral insertions 13.3; pelvic insertions 11.4. Disc width: 34.1. Disc length: 37.8. Tail length (vent to caudal fin tip): 59.5. Pelvic fin: length of anterior margin 9.1; width perpendicular to base 5.4; base length 9.2; inner margin length 7.4; length from origin to rear tip 17.0. Claspers: length (portion free from pelvics) 4.8; width 1.1. First dorsal fin: anterior margin length 8.9; height

7.0; base length 4.4; inner margin length 2.3; length from origin to free rear tip 6.7. Second dorsal fin: anterior margin length 9.4; height 6.1; base length 5.1; inner margin length 2.2; length from origin to free rear tip 6.9. Caudal fin: dorsal margin length 13.6; preventral margin 7.8. Disc width 90% disc width; snout to greatest disc width 70% of disc length; snout short and broad, the angle at apex 86°; snout to vent length 1.55 in tail length from vent to caudal-fin tip; tail nearly flat ventrally, moderately convex dorsally; tail width at pelvic insertion slightly more than twice distance between spiracles; tail width the same to about origin of first dorsal fin, then gradually tapering to posterior end; tail with ventrolateral dermal folds beginning at tips of claspers and ending an orbit diameter posterior to origin of upper caudal-fin lobe; cutaneous folds posteriorly on spiracles well developed, the lateral twice length of medial; fifth gill opening about three-fourths length of fourth gill opening; posterolateral nasal flap extending from posterior margin of incurrent aperture to half length of excurrent aperture; free edge of anterior nasal flap extending to within 2.5mm of median line of internarial space; teeth transversely oval, flat, without any ridge; varying gradually from about 0.4 mm in length at edge of mouth to 0.6 mm at symphysis; upper teeth in 69 transverse rows and 7 longitudinal rows; the lowers in 66 transverse rows and 11 longitudinal rows; first dorsal fin slightly larger than second; both dorsal fins triangular, the anterior margins slightly convex, the posterior nearly vertical, the inner margins straight; inner margin of first dorsal fin half length of base; inner margin of second dorsal fin 2.2 in length of base; apices of dorsal fins slightly rounded; lower posterior corner angular, the angle slightly greater than 90°; interdorsal space slightly greater than greatest width of tail, twice height of second dorsal fin; distance from rear base of second dorsal fin to origin of upper lobe of caudal fin equal to height of first dorsal fin; anterior margin of pelvic fins slightly convex, the apex broadly rounded, the posterior margin nearly straight; inner margin straight, the free rear end acutely angular with rounded tip; base of pelvic fins 1.9 in length of fins from origin to free rear tip; claspers extending 8 mm posterior to free tip of pelvics; origin of upper lobe of caudal fin slightly anterior to origin of lower lobe; dorsal margin of caudal fin slightly convex, its length nearly equal to distance from snout tip to mouth; preventral margin convex, the apex strongly rounded, the postventral margin slightly convex and undulating.

Denticles minute, close-set, covering all of head and body, those dorsally with three ridges ending posteriorly in a sharp spinule, the middle one largest; denticles ventrally on body very close-set, flat, and without ridges and spinules; a middorsal row of 55 moderately enlarged denticles on a narrow middorsal ridge, commencing a spiracle diameter behind spiracles and ending at origin of first dorsal fin (denticles bluntly pointed and projecting posteriorly); a row of slightly smaller denticles rimming front and medial edge of orbits and along medial edge of spiracles; two groups of two to four enlarged denticles on each side of shoulder region; scattered denticles in interorbital and interspiracular spaces two to three times larger than remaining denticles.

Rostral cartilage: cranial rostrum with dorsal edges convergent anteriorly, well separated, and not constricting the precerebral fenestra. Rostrum tapering anteriorly, moderately slender, with broad anterior rostral appendices. Rostral length from base to tip about three times width of rostrum at its base and about 1.2 times nasobasal length.

Paired fin skeletons: pectoral-fin skeleton with 32 propterygial radials, 7 mesopterygial radials, 3 neopterygial radials, and 25 metapterygial radials (total radials, 67). Pelvic fin with enlarged radial on the puboishiadic bar and 26 radials on the pelvic basipterygium.

Vertebral column: 197 total segments, including 179 total centra (synarcual + free centra) and 168 free centra. Synarcual with 16 centrum-less anterior segments and 11 posterior centra; monospondylous precaudal centra 29, diplospondylous precaudal centra 105, and diplospondylous caudal centra 34.

Colour in alcohol: dorsal surface tan with round, dark-edged, pale bluish spots of 5 to 7mm diameter on outer part of disc, including snout, and on pelvic fins (19 on one side of disc posterior to anterior edge of eye, 16 on the other; 13 on snout, one of which is median, and a small one over each side of rostral cartilage near tip; and three on each pelvic fin); a broad zone of snout (wider than distance between outer edges of orbits) paler than rest of head, the transition to darker colour abrupt a short distance before eyes, with a triangular projection of darker tan colour extending anteriorly over each rostral cartilage; tip of snout over rostral cartilages a little darker; ventrolateral fold of tail whitish; posterior edge of disc and posterior edge of pelvic fins narrowly whitish; ventral surface white. Colour when fresh essentially the same, the spots more evident.

Etymology.- This species is named *salalah* for the city of southern Oman where the only specimen was obtained; the name is to be treated as a noun in apposition.

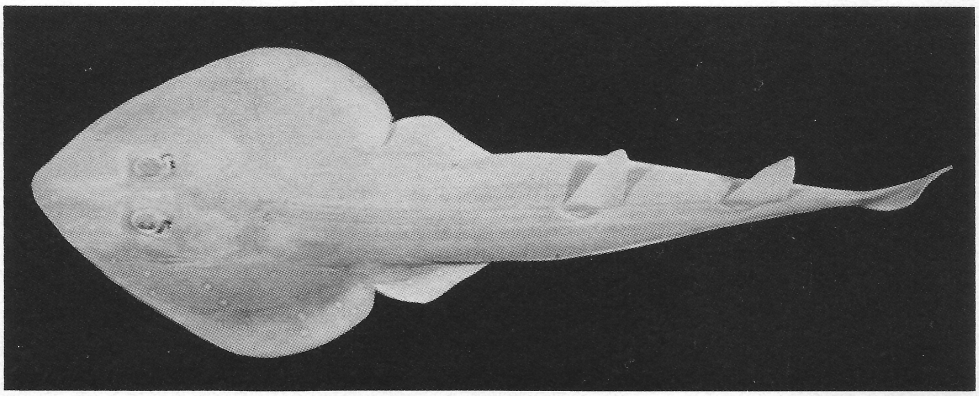

Fig. 4. Holotype of *Rhinobatos salalah*, new species, BPBM 36358, 540 mm, Salalah, southern Oman (J. Randall).

Remarks.- *Rhinobatos salalah* falls in the subgenus *Acroteriobatus* Giltay, 1928, of which the type species is *R. annulatus* Smith in Müller & Henle, 1841. The subgenus is characterized by having the anterior nasal flaps extending medial to the excurrent aperture, nearly meeting at the midline of the internarial space; the nostril width is between 1.7-2.1 times the mouth width, 0.8-1.3 times the internarial space. Other species of the subgenus are: *R. blochii* Müller & Henle, 1841; *R. leucospilus* Norman, 1926; *R. ocellatus* Norman, 1926; *R. zanzibarensis* Norman, 1926; and *R. variegatus* Nair & Lal Mohan, 1973. Four of the seven species of the subgenus, *R. annulatus*, *R. blochii*, *R. leucospilus* and *R. ocellatus*, occur in southern Africa; *R. blochii* is reported to extend its range to western and northern Africa in the Atlantic, but this should be confirmed. *R. zanzibariensis* is still known only from the two type specimens from Zanzibar, and *R. variegatus* from a single specimen from the Gulf of Mannar off the southern tip of India in 200 fathoms (610 m).

Of the species of the subgenus *Acroteriobatus*, *Rhinobatos salalah* is closest to *R. blochii*, sharing with it the very broad snout with bluntly rounded tip and the heart-shaped disc. The snout angle is 88° in *R. salalah* and 82-95° in 16 specimens of *R. blochii*. The only other species of the genus with a similar broad blunt snout and heart-shaped disc is *R. obtusus* Müller & Henle, but it has a very different nostril structure and belongs in the subgenus *Scobatus* Whitley. Both *R. salalah* and *R. blochii* have a colour pattern of symmetrical pale spots without prominent dark rings (pale spots may be obscure in large adults of *blochii*). Both have very similar vertebral counts, the total segments 187-197, mean 193, with total centra 175-184, mean 180 in *R. blochii* vs. 197 and 179 in *R. salalah*, and both agree in most morphometrics.

Rhinobatos blochii differs from *R. salalah* in having only a single prominent spiracular fold (a vestigial second fold was present in one large specimen examined), a broader interspiracular space (5.6-7.6% total length vs. 5.1 in *R. salalah*), a smaller and narrower nasal flap, poorly developed scapular spines, flatter interorbital and interspiracular space (slightly concave in *R. salalah*), and a smooth interorbital with small denticles but without small enlarged thorns (these are present in *R. salalah* and give the interorbital a rough texture). The cranial rostrum of *R. blochii* is much broader, with thicker lateral walls and less anterior taper than that of *R. salalah*; the rostral base width is 2.5-3.2 in the width across the nasal capsules of *R. blochii*, compared to about 3.5 in *R. salalah*.

Rhinobatos salalah bears some resemblance in colour to *R. leucospilus*, but the latter differs in having more pale spots, larger spots on the pectoral fins and snout, elongate pale spots on the snout, pale spots and dark barring on the dorsal and caudal fins, and two medial rows of dark spots dorsally on the trunk and tail. *R. leucospilus* differs further in a smooth interorbital space covered by small denticles and two sets of enlarged thorns on the scapular region on each side; *R. salalah* has small thorns interspersed among the small denticles of the interorbital space and only one set of enlarged scapular thorns. *R. leucospilus* has slightly more vertebrae, with counts of 200-208 total segments for 33 individuals counted by Wallace (1967) plus three counted by us, vs. 197 total segments for *R. salalah*. Our three specimens of *R. leucospilus* have 188 total centra vs. 179 for *R. salalah*. The three *R. leucospilus* also have a slightly shorter interdorsal space (11.0-12.3% total length, compared to 12.8% in *R. salalah*).

R. ocellatus and *R. zanzibariensis* differ from *R. salalah* (and *R. blochii*) in having a higher ratio of nostril width to internarial width (1.2 in *R. salalah* compared to 1.3-1.6, mean 1.4, in *R. ocellatus* and 1.6 in *R. zanzibariensis*) and a narrower nostril to snout-edge space (measured horizontally from the incurrent apertures of the nostril to the lateral edge of the snout relative to the nostril width (1.8 in *R. salalah* compared to 1.3-1.5, mean 1.4 in *R. ocellatus* and 1.0 in the narrow-snouted *R. zanzibariensis*).

The internarial width of *R. ocellatus* is about 2.0-2.4% total length vs. 2.9% in *R. salalah*, and the disc width of the more slender *R. ocellatus* is 28.2-32.0% total length vs. 34.1 in *R. salalah*. In addition, *R. ocellatus* has more vertebrae, with counts of 218- 232, mean 225, total segments and 205-222, mean 212, total centra in seven specimens, compared to 197 and 179 in *R. salalah*. Also, *R. ocellatus* has a bold colour pattern of numerous dark-edged, bluish grey ocelli.

R. variegatus differs notably in colour from *R. salalah* in having conspicuous dark barring on the snout. *R. variegatus* and *R. leucospilus* may form a species pair within the

subgenus *Acroteriobatus*, but the former needs investigation of characters not covered by Nair & Lal Mohan (1973).

LITERATURE CITED

Allen, G.R. & R. Swainston, 1988. The Marine Fishes of North-Western Australia. Western Australian Museum, Perth. Pp. vi + 201. Annandale, N., 1909. Report on the fishes taken by the Bengalfisheries steamer "Golden Crown". Part I. Batoidei. *Mem. Indian Mus.*, **2**(1): 1-60.

Blegvad, H., 1944. *Fishes of the Iranian Gulf.* Einar Munksgaard, Copenhagen. 247 pp.

Boulenger, G.A., 1889. Second account of the fishes obtained by Surgeon Major A.S.G. Jayakar at Muscat, east coast of Arabia. *Proc . Zool. Soc. London* 1889, pt. **2**: 236-246.

Compagno, L.J.V. & J.E. Randall, 1987. *Rhinobatos punctifer*, a new species of guitarfish (Rhinobatiformes: Rhinobatidae) from the Red Sea, with notes on the Red Sea batoid fauna. *Proc. Calif. Acad. Sci.*, **44**(14): 335-342.

Day, F., 1875-1878. *The Fishes of India.* Bernard Quaritch, London. Pp. xx + 778.

Fouda, M.M. & G.V. Hermosa, Jr., 1993. *A Checklist of Oman Fishes.* Department of Fisheries Science & Technology, Sultan Qaboos University, Muscat. 42 pp.

Fowler, H.W., 1941. Contribution to the biology of the Philippine Islands and adjacent regions. The fishes of the groups Elasmobranchii,...adjacent seas. *Bull. U.S. Natl. Mus.*, 100, vol. **12**: x + 879 pp.

Fowler, H.W., 1956. *Fishes of the Red Sea and Southern Arabia.* Volume I. Branchiostomida to Polynemida. Weizmann Science Press of Israel, Jerusalem. 240 pp.

Giltay, L., 1928. Notes ichthyologiques. II.—Une espèce nouvelle de Rhinobatus du Congo belge (*Rhinobatus congolensis*, nov. sp.). *Ann. Soc. Roy . Zool. Bruxelles*, **59**: 21-27.

Gloerfelt-Tarp, T. & P.J. Kailola, 1984. *Trawled Fishes of Southern Indonesia and Northwestern Australia.* The Australian Development Assistance Bureau, Australia; The Directorate General of Fisheries, Indonesia, and the German Agency for Technical Cooperation, Germany. Pp. xvi + 406.

Gohar, H.A.F. & F.M. Mazhar, 1964. The elasmobranchs of the North-Western Red Sea. *Publ. Mar. Biol. Sta. Al-Ghardaqa* (Red Sea), No. **13**: 1-144.

Hare, S.R., 1990. Sampling manual for data collectors aboard demersal trawlers. *Oman Mar. Sci. Fish. Cent. Spec. Rep.*, **1**: 1-96.

Kuronuma, K. & Y. Abe, 1986. *Fishes of the Arabian Gulf.* Kuwait Institute for Scientific Research, Kuwait City. Pp. xii +356.

Last, P.R. & J.D. Stevens, 1994. *Sharks and Rays of Australia.* CSIRO, Australia. 513 pp.

Mahdi, N., 1971. Addition to the marine fish fauna of Iraq. *Iraq Nat. Hist. Mus. Pub.*, **28**: 1-43.

Müller, J. & F.G.J. Henle, 1838-1841. *Systematische Beschreibung der Plagiostomen.* Veit & Co., Berlin. 200 pp.

Nair, R.V. & R.S. Lal Mohan, 1973. On a new deep sea skate, *Rhinobatos variegatus*, with notes on the deep sea sharks *Halaelurus hispidus*, *Eridacnis radcliffei* and *Eugaleus omanensis* from the Gulf of Mannar. *Senckenbergiana Biol.*, **54**(1/3): 71-80.

Norman, J.R., 1926. A synopsis of the rays of the family Rhinobatidae, with a revision of the genus *Rhinobatus*. *Proc. Zool. Soc. London* 1926(**62**): 941-982.

Paxton, J.R., D.F. Hoese, G.R. Allen, & JE. Hanley, 1989. *Zoological Catalogue of Australia. Volume 7. Pisces. Petromyzontidae to Carangidae*. Australian Government Publishing Service, Canberra. Pp. xii + 665.

Sainsbury, K.J., P.J. Kailola, & G.G. Leyland, 1984. *Continental Shelf Fishes of Northern and North-Western Australia*. Clouston & Hall and Peter Pownall Fisheries Information Service, Canberra. 375 pp.

Sivasubramaniam, I. & M.A. Ibrahim, 1982. *Common Fishes of Qatar*. University of Qatar, Doha. Pp. iii + 172.

Wallace, J.H., 1967. The batoid fishes of the east coast of southern Africa. *Invest. Rep. Oceanogr. Res. Inst.*, No. **15**: 1-32.

Whitley, G.P., 1939. Taxonomic notes on sharks and rays. *Austral. Zool.* **9**(3): 227-262.

Received 17 Feb 1995
Accepted 06 May 1995