

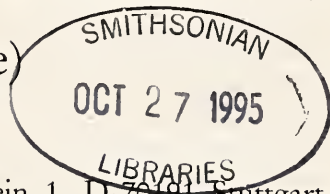
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Raja pita, a New Species of Skate from the Arabian/Persian Gulf (Elasmobranchii: Rajiformes)

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With 2 figures and 1 table

Summary

The skate *Raja pita* n. sp., a member of the subgenus *Raja* (*Okamejei*), is described from shallow waters of the northern Arabian/Persian Gulf. It is characterized by a quadrangular-shaped disc, the snout (preoral) about one-half head length, the preorbital length 15% of total length, the eye diameter smaller than interorbital distance, the spiracle length three-fourths of eye diameter, 46 tooth rows in upper jaw, the distance between the two dorsal fins much smaller than base length of first dorsal fin, a complete row of thorns between level of spiracles and first dorsal fin base, and the dorsal surface with numerous brown spots and short streaks, but without ocelli.

Zusammenfassung

Der Rochen *Raja pita* n. sp., ein Mitglied der Untergattung *Raja* (*Okamejei*), wird aus seichtem Wasser des nördlichen Arabischen/Persischen Golfes beschrieben. Er wird durch die folgenden Merkmale charakterisiert: Körperscheibe nahezu quadratisch, Präorallänge etwa halbe Kopflänge, Präorbitallänge 15% der Totallänge, Augendurchmesser kleiner als Interorbitaldistanz, Spritzlochlänge $\frac{3}{4}$ des Augendurchmessers, 46 Zahnreihen im Oberkiefer, Interdorsaldistanz viel kleiner als die Länge der ersten Rückenflossenbasis, eine vollständige Dornenreihe auf der Rückenmitte zwischen dem Hinterrand der Spritzlöcher und dem Beginn der ersten Rückenflosse, und Körperoberseite mit vielen braunen Flecken und kurzen Streifen, aber ohne Augenflecken.

1. Introduction

The family Rajidae is cosmopolitan, living benthic on soft substrates. *Raja* Linnaeus, 1758 sensu strictu is one of the largest genera, comprising several subgenera. Major revisions of Indo-Pacific species were published by ISHIYAMA (1958, 1967, Japan), HULLEY [1986, South Africa, 18 species of *Raja*, none of the subgenus *Raja* (*Okamejei*)], and LAST & STEVENS [1994: 323–356, Australia, total of 23 species of *Raja* from Australia, 13 species from Indian Ocean side, only a single species of *Raja*

(*Okamejei*): "Raja sp. N," Thintail skate, from off Perth to NW Shelf]. The Western North Pacific species of *Raja* were revised by ISHIHARA (1987).

The subgenus *Raja* (*Okamejei*) was first described by ISHIYAMA (1958: 354) for 7 species of Japanese skates. It was characterized by its short snout, numerous rows of thorns on the tail [except *R. (O.) kenojei*], the less developed electric organ, a specialized clasper structure, and a relatively low number of abdominal vertebrae. McEACHRAN & FECHHELM (1982) discussed the characteristics and affinities of the subgenus *Raja* (*Okamejei*). They concluded that the subgenus is closest to *Raja* (*Dipturus*), and that there is but a single character distinguishing the two subgenera, the structure of the anterior margin of the anterior neurocranial fontanelle, together with a smaller body size in *Raja* (*Okamejei*).

Rajid fishes of the Indian Ocean were revised by STEHMANN (1976), who recognized 9 valid species. STEHMANN recorded 6 species of the genus *Raja* from the northern Indian Ocean:

R. (Amblyraja) reversa Lloyd, 1906 (off Beluchistan, 1500 m depth); *R. (Dipturus) johannisdavisi* Alcock, 1899 (Laccadive Sea, 410–520 m depth); *R. (?Okamejei) philipi* Lloyd, 1906 (Gulf of Aden, 238 m depth); *R. (Okamejei) powelli* Alcock, 1898 (Gulf of Aden and off Burma, 123–220 m depth); *R. (Rajella) annandalei* Weber, 1913 (Indonesia, 397–827 m depth); *R. (Rostroraja) alba* Lacepède, 1803 (Madagascar, 70–80 m depth). The northern Indian Ocean rajid fauna was considered depauperate, with only two species living in relatively shallow water (subgenus *Okamejei*) while the others were deepwater species. Additional species were recorded by HULLEY [1966: *Raja (Raja) clavata* Linnaeus, 1758, South Africa and Madagascar]; McEACHRAN & FECHHELM [1982: *Raja (Okamejei) heemstrai* McEchran & Fechhelm, 1982, off Kenya, 260 m depth]; MEISSNER (1987: *Raja taaf* Meissner, 1987, Crozet Archipelago, 310–390 m depth); SÉRET [1989: *Raja (Dipturus) crosnieri* Séret, 1989, Madagascar, 300–850 m depth]. McEACHRAN & FECHHELM (1982) presented arguments that *Raja (Okamejei) philipi* is probably a synonym of *Raja (Okamejei) powelli*. This brings the total number of species of *Raja* known from the Indian Ocean to 9, with 2 species belonging to the subgenus *Raja (Okamejei)*. None of the species was recorded from a depth shallower than 123 m.

It was a surprising finding when the junior author collected in 1992 a skate from mud bottoms off the short Iraqi coastline in the northern Arabian/Persian Gulf, not living deeper than approximately 15 m. It turned out to represent a new species of the subgenus *Raja (Okamejei)*, which is described in the present paper.

2. Methods

Methods follow BIGELOW & SCHROEDER (1953) and ISHIYAMA (1958); some lengths have been slightly modified according to McEACHRAN & FECHHELM (1982). Important standardized lengths are taken as follows:

Total length: Tip of snout to distal tip of tail;

Disc-length: Tip of snout to middle of cloaca;

Disc-width: Distance between lateral angles of pectoral fins;

Tail length: Middle of cloaca to tip of tail;

Head length: Tip of snout to level of 5th gill slits;

Eye diameter: Maximum eye diameter including integument;

Interorbital distance: Minimum distance between orbits.

Other lengths are self-explanatory.

For length ratios, the total length is used as standard unit. The total length is preferred to the disc width for the reasons discussed in STEHMANN (1970: 79).

The holotype of the new species is deposited in the fish collection of the Staatliches Museum für Naturkunde, Stuttgart (SMNS).

3. *Raja (Okamejei) pita* new species (Figs 1, 2)

Holotype: SMNS 14381, female, 461.1 mm TL, Iraq, Fao, 29°54'N 48°25'E, L. A. J. AL-HASSAN, Mar. 1992.

Etymology

"Pita" ist a tasty Arabian bread with brown spots. The new species resembles a pita bread in shape and colouration.

Diagnosis

Disc nearly quadrangular-shaped; snout (preoral) about one-half head length; preorbital length 15% of total length; eye diameter smaller than interorbital distance; spiracle length three-fourths of eye diameter; distance between first gill slits 14% of total length; distance between fifth gill slits 9.4% of total length; tooth rows in upper jaw 46; distance between dorsal fins much smaller than base length of first dorsal fin; a complete row of thorns between level of spiracles and first dorsal fin base; dorsal surface with numerous brown spots and streaks, but without ocelli.

Description

Disc nearly quadrangular-shaped, 0.84 times as long as broad (see Tab. 1). Maximum angle in front of spiracles 85°. Margin of disc first slightly concave, then convex to level of mid-eye, then very slightly concave, then again convex towards outer corners; outer corners narrowly rounded, posterior margins straight or very slightly convex. Axis of greatest width 128% of distance from tip of snout to axil of pectoral fins. Pelvic fins moderately incised, anterior lobe broad, not pointed, anterior margin 49% as long as distance from origin of anterior lobe to posterior extreme of fin. Tail relatively broad basally, moderately depressed, its width at midlength about two-thirds diameter of eye. Tail with lateral fold along ventrolateral surface, running from slightly before midlength to near tip of tail. Length of tail from middle of cloaca to tip 0.99 times distance from tip of snout to middle of cloaca.

Preorbital length 3.6 times as long as orbit. Preoral length 1.8 times internarial distance. Interorbital distance 1.2 times length of orbit. Orbit length 1.5 times as long as spiracle. Upper and lower jaws slightly arched near symphysis. Teeth with pointed cusps near symphysis but with rounded cusps near margin of jaws; teeth in quincunx arrangement.

Distance between first gill slits 1.7 times as great as between nares. Distance between fifth gill slits 1.1 times as great as between nares. Length of first gill slits 1.4 times length of fifth gill slits and 0.3 times mouth width. Second dorsal fin base length 1.2 times first dorsal fin base length; both fins about equal in height and shape. Distance between second dorsal fin base and epichordal caudal fin lobe 4.3 times in second dorsal fin base. Epichordal lobe of caudal fin relatively small, low, base length 2.6 times in second dorsal fin base length.

Upper surface of disc with small scattered denticles all around except for an oval area centrally on each wing, a kidney-shaped area on each side of the snout, an oval

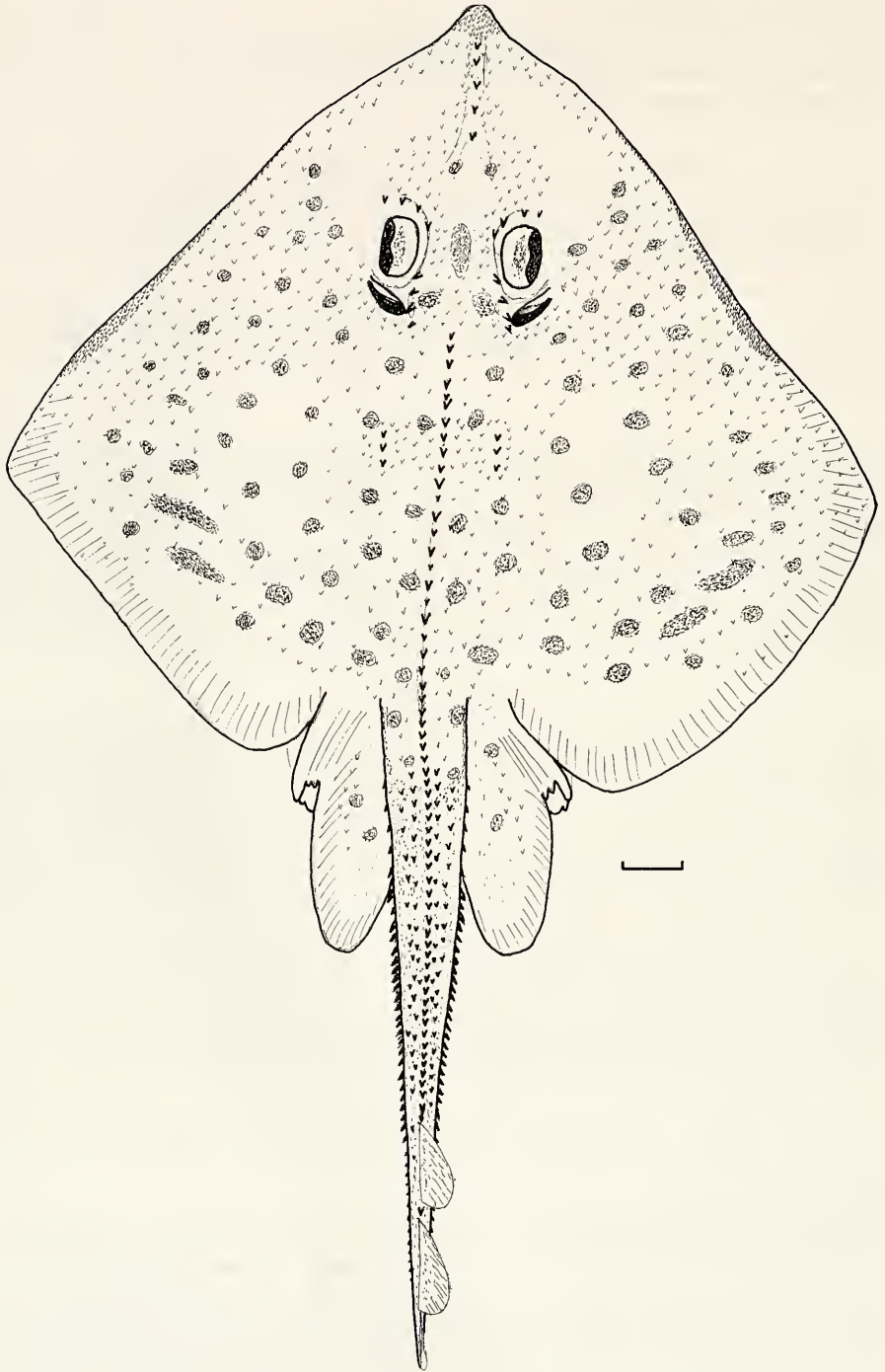


Fig. 1. *Raja (Okamejei) pita* n.sp.; holotype, SMNS 14381, female, 461.1 mm TL, Fao, Iraq; dorsal view. — Scale indicates 20 mm.

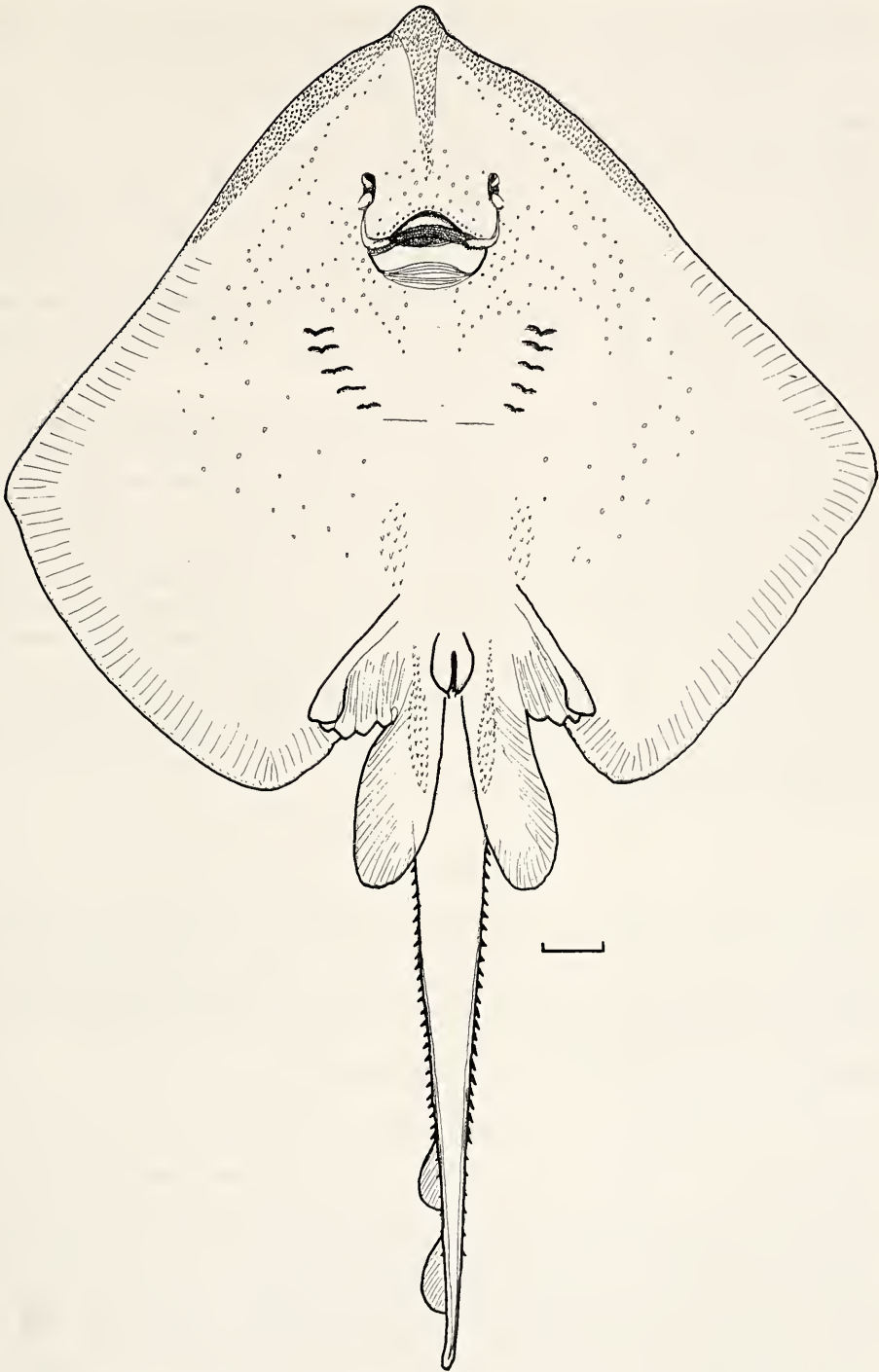


Fig. 2. *Raja (Okamejei) pita* n.sp.; holotype, SMNS 14381, female, 461.1 mm TL, Fao, Iraq; ventral view. — Scale indicates 20 mm.

area before the eyes, and the posterior margin of the pectoral and pelvic fins. Middle anterior margin of each anterior disc side and tip of snout densely covered with denticles. Ventral side with two oval areas with denticles before axil of pelvic fin, an elongate area with denticles basally on posterior lobes of pelvic fins, and anterior margins of disk and rostrum densely covered with denticles. Ventral side otherwise smooth. Orbit dorsally with 5 thorns; three thorns above dorsal margin of spiracle. Five thorns in a row dorsally on anterior two-thirds of snout. Back with a complete median dorsal row of 31 thorns. Besides this median row, a small group of three thorns on each side of mid-disc. Tail with five rows of thorns dorsally, the median row regular (consisting of 29 thorns), the other four irregular, each two of left and right sides joining into one at midlength of tail. Also two lateral rows of large thorns reaching from level of pelvic notch to level of mid of second dorsal fin base. Total tail thorn rows 7 (posteriorly 5). 1 interdorsal thorn.

Sensory pores on ventral side densely scattered around the mouth and along the pectoral fin bases. No sensory pores on the anterior parts of the snout except for two lateral rows; also no pores between the posterior gill openings and on the belly.

Neurocranium with a relatively short and stout rostral shaft. Rostral appendices flat, relatively short. Propterygia of pectoral girdle extending to two-thirds of length of rostral shaft. Nasal capsules relatively large, oval, set about 10° angle to transverse axis of neurocranium. Interorbital region relatively broad. Preorbital processes poorly developed. Anterior fontanelle elliptical anteriorly. Posterior fontanelle narrow, with slightly concave lateral margins. Jugal arches relatively broad.

Color in alcohol: Body light brown, tail slightly darker; disc and basal area of pelvic fins on dorsal side with irregular dark brown blotches of half size of spiracle. Posterior distal part of pectoral fin with three short dark brown streaks. Dorsal and caudal fins brown. Ventral surface pale brownish.

Distribution

This new species is known only from the type locality at Fao, Iraq in the northernmost corner of the Arabian/Persian Gulf. This is the coolest area of the Gulf, but still has an average winter temperature of 20°C and an average summer temperature of 27°C. The specimen was collected on mud bottom, not deeper than 15 m. The distribution is probably limited to mud bottoms along the Iraqi and part of the Iranian coast of the Gulf, possibly including Kuwaiti waters.

Relationships

Raja pita n.sp., is characterized as a member of the subgenus *Raja* (*Okamejei*) by the distinct anterior margin of the anterior neurocranial fontanelle, the small body size, the few abdominal vertebrae, and the snout length about twice in head length.

The new species differs from the other two species in the Indian Ocean, *R. powelli* and *R. heemstrai*, which were found at depths of 123–260 m, in the shorter and less pointed snout, the lacking ocelli, the dorsal side more heavily armed with thorns and denticles (total thorns on disc 58 in *R. pita*, 9–17 in *R. powelli*, 11 in *R. heemstrai*), the single interdorsal thorn in *R. pita* (*R. powelli*: 5–6 interdorsal thorns; *R. heemstrai*: 2 interdorsal thorns), the much smaller space between the dorsal fins, and a number of proportional differences (see Tab. 1). *Raja pita* is the only species of the family Rajidae found in the Arabian/Persian Gulf.

Tab. 1. Proportional measurements and meristic values of the three northern Indian Ocean species of *Raja* (*Okamejei*). Values for *Raja heemstrai* and *R. powelli* from MCEACHRAN & FECHHELM (1982: 443). Lengths are given as hundredths of total length.

	<i>Raja pita</i> n.sp Holotype, female	<i>R. heemstrai</i> (n = 6)	<i>R. powelli</i> (n = 2)
Total length (mm)	461.1	219 - 515	347 - 347
Disc width	64	56 - 63	61 - 63
Disc length	54	48 - 53	53 - 53
Snout length (preocular)	15	15 - 17	15 - 16
Snout length (preoral)	16	16 - 19	17 - 17
Snout to maximum width	37	31 - 34	30 - 32
Prenasal length	7	13 - 16	13 - 13
Orbit diameter	4.1	3.6- 4.0	3.5- 3.6
Interorbital distance	5.1	3.4- 3.7	4.5- 4.8
Orbit and spiracle length	7.3	4.7- 5.0	5.4- 5.4
Spiracle length	2.7	1.3- 1.8	1.9- 2.1
Distance between spiracles	8.2	5.0- 5.6	5.6- 5.6
Mouth width	5.5	6.5- 7.4	8.2- 8.7
Nare to mouth	3.5	4.0- 4.7	4.4- 4.5
Distance between nostrils	8.6	6.5- 7.2	7.6- 7.6
Width of first gill opening	2.0	1.3- 1.5	1.5- 1.7
Width of third gill opening	1.9	1.1- 1.5	1.9- 2.0
Width of fifth gill opening	1.3	0.7- 1.0	1.4- 1.5
Distance between first gill openings	14	12 - 13	17 - 17
Distance between fifth gill openings	9.4	6.8- 7.9	8.5- 8.6
Length of anterior pelvic lobe	11	10 - 12	10 - 12
Length of posterior pelvic lobe	15	12 - 14	14 - 15
Tail width at axil of pelvic fins	6.5	2.7- 3.0	2.6- 3.2
Distance snout to cloaca	50	44 - 48	48 - 48
Distance cloaca to 1st dorsal fin origin	34	31 - 38	32 - 34
Distance cloaca to caudal fin origin	43	47 - 51	46 - 48
Distance cloaca to caudal fin tip	50	52 - 56	52 - 52
Number of tooth rows (upper jaw)	46	31 - 35	72 - 75
Number of trunk vertebrae	22	29 - 30	30 - 31
Number of predorsal tail vertebrae	58	47 - 53	49 - 55
Number of pectoral fin radials	77	78 - 80	77 - 78
Number of pelvic fin radials	21	19 - 23	19 - 19

From other species of the subgenus *Raja* (*Okamejei*), including LAST & STEVENS'S (1994) "*Raja* sp. N" from Western Australia, the new species mainly differs in the complete row of thorns on the back of the disc, the head shape, and a number of counts and proportions.

4. Key to the Indian Ocean species of the subgenus *Raja* (*Okamejei*)

- 1 Dorsal side without ocelli, but with numerous brown spots and streaks; back with a complete row of thorns between spiracles and first dorsal fin base; 1 interdorsal thorn; prenasal length less than 10% of total length; distance between spiracles more than 7% of total length; distance between 5th gill openings more than 9% of total length *Raja* (*Okamejei*) *pita* n.sp.
- Dorsal side with ocelli; back without a complete row of thorns; 2-6 interdorsal thorns; prenasal length more than 12% of total length; distance between spiracles less than 6% of total length; distance between 5th gill openings less than 8.8% of total length 2

- 2 Numerous ocelli at base of pectoral fins; orbit greater than interorbital distance; number of tooth rows in upper jaw 31–35; interorbital distance less than 4% of total length; mouth width less than 7.5% of total length *Raja (Okamejei) heemstrai*
- A single ocellus at base of each pectoral fin; orbit less than interorbital distance; number of tooth rows in upper jaw 72–75; interorbital distance more than 4.2% of total length; mouth width more than 8% of total length *Raja (Okamejei) powelli*.

5. Acknowledgments

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