

***Rita macracanthus*, a new riverine catfish (Teleostei: Bagridae) from South Asia**

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Abstract

A new species of bagrid catfish of the genus *Rita* is described from the Indus River drainage in South Asia. *Rita macracanthus* differs from all congeners in having a unique combination of the following characters: dorsal spine reaching to middle of adipose-fin base; pectoral-spine length 28.7–30.0% SL; depth of caudal peduncle 7.6–8.4% SL; maximum length of premaxillary tooth band 4.8–6.4 times its maximum width; eye diameter 6.9–8.7% HL; interorbital distance 39.4–44.1% HL; dorsal surface of head between eyes and supraoccipital covered with thin skin wherein the underlying bone is visible; two distinct vomerine tooth patches with rounded peg-like teeth. The new species has been identified up until now as *Rita rita*, but is distinguished from that species in having longer dorsal and pectoral spines, a more slender caudal peduncle, and a longer premaxillary tooth band.

Key words: *Rita*, Bagridae, Indus River, new species

Introduction

Bagrid catfishes of the genus *Rita* Bleeker, 1854 are found in large rivers throughout the Indian subcontinent and Myanmar, and are capable of reaching sizes to 1500 mm TL (Talwar and Jhingran, 1991), although mature specimens of ca. 200–300 mm SL are more commonly encountered. The genus is diagnosed by the following synapomorphies (Mo, 1991): single pair of mandibular barbels, elongated Weberian apparatus firmly sutured to the basioccipital, and the sensory canal on the posttemporal enclosed within the bone. *Rita* and its sister taxon *Nanobagrus* Mo, 1991 are the sister group to all other members of Bagridae (Mo, 1991). The most recent review of *Rita* was provided by Ferraris (1999) in his redescription of *R. sacerdotum* Anderson, 1879 in which five valid species of *Rita* were recognized: *R. rita* (Hamilton, 1822), *R. gogra* (Sykes, 1839), *R. kuturnee* (Sykes, 1839), *R. chrysea* Day, 1877 and *R. sacerdotum* Anderson, 1879.

While comparing material identified as *Rita rita* from the Ganges and the Indus River drainages, differences were observed which suggested that the Indus River material belong to an undescribed species, which is described below.

Material and methods

Measurements were made point to point with dial calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of specimens whenever possible. Subunits of the head are presented as proportions of head length (HL). Head length and measurements of body parts are given as proportions of standard length (SL). Measurements follow those of Ng and Dodson (1999) [dorsal to adipose distance is defined as the distance between the base of the last dorsal-fin ray and the origin of the adipose fin] with the addition of the maximum premaxillary toothplate lengths and widths, which are measured following Teugels (1986).

Material examined in this study is deposited in the following institutions: California Academy of Sciences, San Francisco (CAS); Field Museum of Natural History, Chicago (FMNH); Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Department of Zoology, Oklahoma State University, Stillwater (OSUS); Nationaal Natuurhistorisch Museum, Leiden (RMNH); University of Michigan Museum of Zoology, Ann Arbor (UMMZ); and National Museum of Natural History, Smithsonian Institution, Washington DC (USNM).

Rita macracanthus sp. nov. (Fig. 1)

Pimeladus [sic.] *rita* (non Hamilton, 1822) – McClelland, 1842: 575.

Rita buechanani (non Bleeker, 1853) – Day, 1877: 454, Pl. 103 Fig. 1, Pl. 104 Fig. 2 (in part); Day, 1880: 231; Day, 1889: 165, Fig. 60 (in part).

Rita rita (non Hamilton, 1822) – Zugmayer, 1913: 24; Khan, 1934: 661; Ahmad, 1943: 326; Sufi, 1957: 221; Qureshi, 1965: 43, Fig. 109 (in part); Jayaram, 1966: 440 (in part); Islam and Siddiqi, 1971: 38; Mirza, 1972: 179; Husain, 1973: 321; Mirza, 1973: 254; Mirza and Kashmiri, 1973: 180; Ahmad and Khan, 1974: 126; Mirza, 1974: 79; Mirza and Ahmad, 1974: 101; Ahmad et al., 1976: 243; Misra, 1976: 118, Fig. 22 (in part); Mirza, 1976: 117; Jayaram, 1977: 40 (in part); Coad, 1981: 15; Mirza and Omer, 1984: 87; Butt, 1986: 30; Mirza and Ahmad, 1987: 261; Qureshi et al., 1988: 184; Khan et al., 1991: 24; Talwar and Jhingran, 1991: 578, Fig. 192 (in part); Mirza and Jan, 1993: 20; Afzal et al., 1995: 137; Mirza and Bhatti, 1995: 27; Iqbal et al., 1997: 56; Jayaram, 1999: 227 (in part); Mirza, 2000: 356; Mirza and Alam, 2002: 33; Mirza, 2003: 17.

Type material. Holotype: UMMZ 237502, 262.8 mm SL, male; Pakistan: Indus River at Attock; L. Roe, 1988.

Paratypes: MCZ 22186, 2 ex., 228.7 mm SL, female, 271.1 mm SL, male; Pakistan: Punjab, Chenab River; M. M. Carleton, 1872. RMNH 8795, female, 243.7 mm SL; Pakistan: Lahore; F. Day, date unknown.

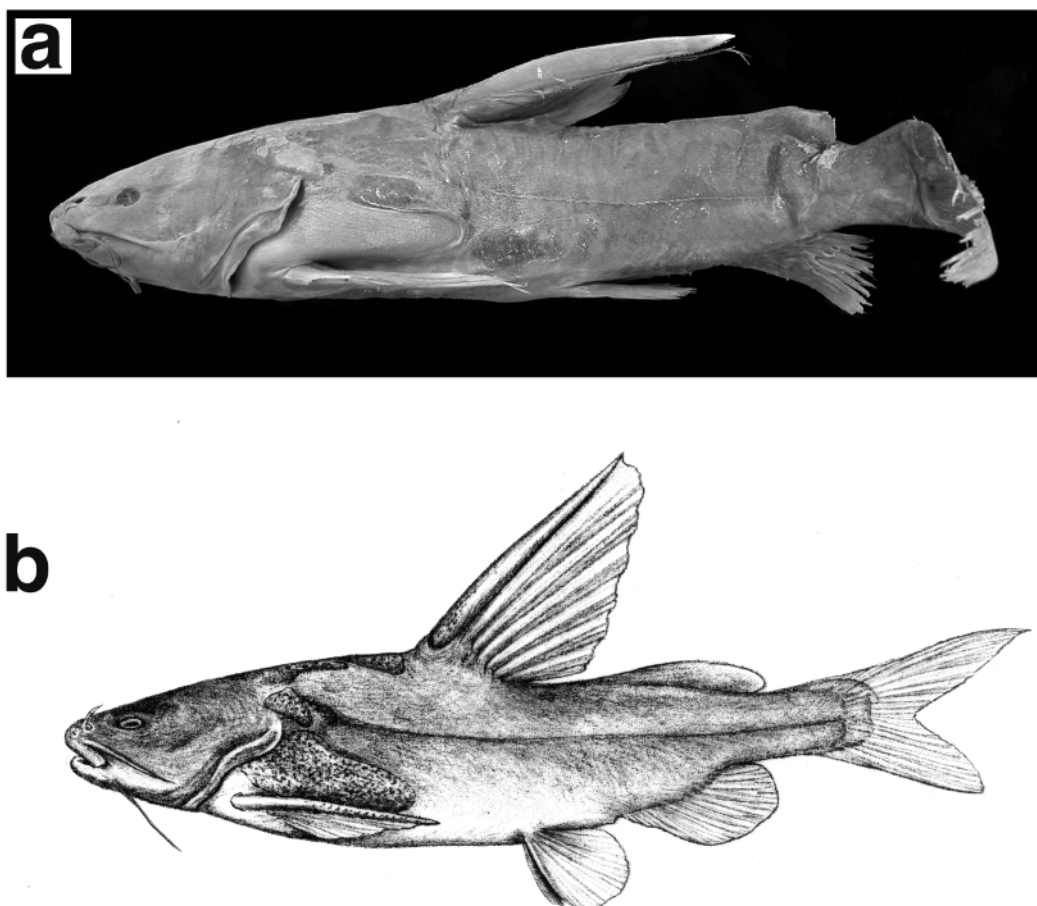


FIGURE 1. *Rita macracanthus*: a. Holotype: UMMZ 237502, 262.8 mm SL, male; Pakistan: Indus River at Attock; b. Paratype, MCZ 22186, 228.7 mm SL; Pakistan: Chenab River.

Diagnosis. *Rita macracanthus* differs from *R. chrysea*, *R. gogra* and *R. kuturnee* in having relatively small eyes (6.9–8.7% HL vs. 14.3–29.2) set further apart (interorbital distance 39.4–44.1% HL vs. 28.7–37.9). It further differs from *R. gogra* in having the dorsal surface of the head between the eyes and supraoccipital covered with thin skin (vs. a thick layer of muscle), from *R. kuturnee* in having moderately elongate vomerine tooth patches with rounded, peg-like teeth (vs. very narrow patches with villiform teeth), from

R. chrysea in having a granulated anterior margin of the dorsal spine (vs. middle third with large serrations) and from *R. sacerdotum* in having a long dorsal spine that reaches to the middle of the adipose fin (vs. short spine not reaching the origin of the adipose fin). *Rita macracanthus* can also be distinguished from both *R. chrysea* and *R. sacerdotum* in having the vomerine teeth in two distinct lateral patches (vs. a single median patch).

Rita macracanthus resembles *R. rita* very closely, but can be distinguished from it in having, in specimens greater than 100 mm SL, a longer dorsal (reaching to middle of adipose-fin base when appressed vs. to origin of adipose-fin base; 37.2–45.5% SL vs. 25.6–41.7) spine, a longer pectoral spine [reaching to three-quarters (vs. to less than half) the distance between tip of cleithral process and pelvic-fin origin; 28.7–30.0% SL vs. 22.1–25.5], a more slender caudal peduncle (7.6–8.4% SL vs. 8.2–10.7), and a shorter premaxillary tooth band in which the maximum width is 4.8–6.4 (vs. 3.1–4.5) times its maximum length (Fig. 2).

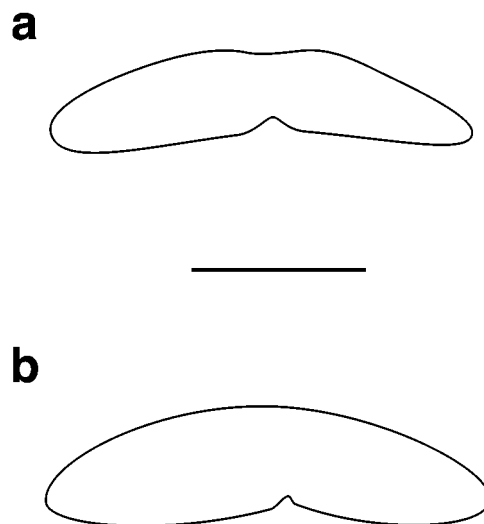


FIGURE 2. Schematic illustration showing outline of premaxillary tooth plate of: a. *Rita macracanthus*, MCZ 22186, paratype, 271.1 mm SL; b. *R. rita*, MCZ 22213, 345 mm SL. Scale bar represents 10 mm.

Description. Morphometric data as given in Table 1. Head slightly depressed; dorsal profile slightly convex posteriorly and ventral profile almost straight. Bony elements of dorsal surface of head covered with thin skin; bones readily visible, ornamented with numerous small tubercles. Eye ovoid, horizontal axis longest; located entirely in dorsal half of head. Orbit with free margin. Gill openings wide, extending from posttemporal to beyond isthmus. Gill membranes free from isthmus, with 6 branchiostegal rays. First branchial arch with 4+9 gill rakers.

TABLE 1. Select morphometric data for *R. macracanthus*, new species (n=4).

	Holotype	Range	Mean±SD
%SL			
Head length	30.0	30.0–31.0	30.5±0.6
Head width	23.2	23.2–24.4	23.8±0.6
Head depth	19.0	19.0–20.1	19.3±0.5
Predorsal length	43.3	42.3–47.0	44.3±2.0
Preanal length	75.7	75.7–77.6	76.6±1.0
Prepelvic length	56.3	56.3–57.8	57.2±0.7
Prepectoral length	27.5	27.5–29.5	28.5±0.8
Body depth at anus	16.7	15.7–16.7	15.9±1.0
Length of caudal peduncle	16.9	15.1–16.9	16.1±0.8
Depth of caudal peduncle	7.6	7.6–8.4	8.0±0.4
Pectoral-spine length	damaged	28.7–30.0	29.3±0.7
Pectoral-fin length	26.3	26.3–34.5	31.3±4.4
Dorsal-spine length	damaged	37.2–45.5	40.7±4.4
Length of dorsal-fin base	16.4	15.5–17.4	16.4±0.8
Pelvic-fin length	15.6	14.4–17.0	15.6±1.1
Length of anal-fin base	13.7	10.7–13.7	12.1±1.2
Caudal-fin length	damaged	25.2–28.3	26.8±2.2
Length of adipose-fin base	11.1	9.9–13.0	11.1±1.3
Maximum height of adipose fin	4.1	4.1–5.2	4.5±0.5
Dorsal to adipose distance	19.4	17.9–21.4	18.1±3.2
Post-adipose distance	14.2	13.6–15.5	14.6±0.9
%HL			
Snout length	36.8	36.8–37.8	36.9±0.9
Interorbital distance	44.1	39.4–44.1	40.3±2.8
Eye diameter	7.9	6.9–8.7	7.9±0.8
Nasal barbel length	13.4	8.3–14.6	12.4±2.8
Maxillary barbel length	77.6	58.8–77.6	69.5±7.9
Mandibular barbel length	63.5	45.1–63.5	55.6±7.8

Mouth subterminal, fleshy upper lip extending anteriorly beyond upper jaw. Oral teeth small, of two kinds, in irregular rows on all tooth-bearing surfaces. Premaxillary tooth band rounded, of equal width throughout, with villiform teeth. Dentary tooth band much narrower than premaxillary tooth band at symphysis, becoming slightly wider before tapering again posterolaterally; teeth on anterior quarter villiform; those on posterior three-quarters bluntly rounded, peg-like. Vomerine tooth patches somewhat elliptical, paired, along lateral margins of palate; teeth on first to sixth anteriormost rows somewhat villiform, those on rest of tooth patch bluntly rounded, peg-like.

Barbels in three pairs. Maxillary barbel short and slender, not extending beyond opercle. Nasal barbel slender, extending to halfway between its base and anterior margin of orbit. Mandibular-barbel origin close to midline; barbel thicker and longer than nasal barbel, extending to three-quarters of distance between its base and base of pectoral spine.

Body slightly compressed, becoming more so towards caudal peduncle. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin and sloping gently ventrally from origin of dorsal fin to end of caudal peduncle. Ventral profile horizontal to anal-fin base, then sloping gently dorsally from there to end of caudal peduncle. Skin smooth. Lateral line complete and midlateral in position. Anterior and cephalic canal pores ramifying in asymmetric pattern in humeral region and dorsal surface of head respectively. Vertebrae $14+20=34$, $15+19=34$ or $16+19=35$ (holotype: $14+20=34$).

Dorsal fin located above middle of body; origin nearer tip of snout than caudal flexure; with 6 rays. Dorsal-fin margin convex, usually with anterior branch of fin-rays longer than other branches. Dorsal-fin spine long, straight and robust; spine extending to middle of adipose fin (distal tip of spine damaged in holotype). Anterior margin of spine produced into sharp keel; lateral and posterior surfaces smooth.

Pectoral fin with stout spine, sharply pointed at tip, and 9 or 10 (holotype: 9) rays. Anterior spine margin with 32–42 strong serrations along entire length; posterior spine margin with 28–31 strong serrations along entire length (spine is broken near the base in holotype). Pectoral-fin margin straight anteriorly, convex posteriorly.

Pelvic-fin origin at vertical through posterior end of dorsal-fin base. Pelvic fin with i,7 rays and slightly convex margin; tip of appressed fin not reaching anal-fin origin. Anus and urogenital openings located at vertical through middle of appressed pelvic fin.

Adipose fin with convex margin for entire length; posterior end deeply incised. Anal-fin base ventral to posterior half of adipose fin. Fin with iv,8-10 (holotype: iv,9) rays and slightly curved margin.

Caudal peduncle moderately slender. Caudal fin deeply forked, with i,7,7,i or i,7,8,i (holotype: i,7,8,i) principal rays; upper and lower lobes pointed (caudal fin damaged in holotype). Procurrent rays symmetrical, extending only slightly anterior to fin base.

Coloration. In 70% alcohol: brown on dorsal region and upper half of flank, gradually fading to dark yellow on lower two-thirds of flank and ventral region. Base of dorsal fin brown, base of pectoral, pelvic and anal fins dark yellow, other parts of all fins yellow. Proximal quarter of barbels brown, distal three-quarters dirty white.

Distribution. Known from the Indus River drainage in Afghanistan, Pakistan and northwestern India.

Etymology. From the Greek *makros*, meaning long, and *akantha*, meaning thorn, in reference to the relatively long dorsal and pectoral spines of this species. Used as a noun.

Biology. According to Khan (1934), *R. macracanthus* (as *R. rita*) feeds on invertebrates and small fishes. Males have branched and comb-like testes and in the Jhelum River (a tributary of the Indus River), breeding season lasts from June to the end of July, during which the fish migrates to colder waters in shoals.

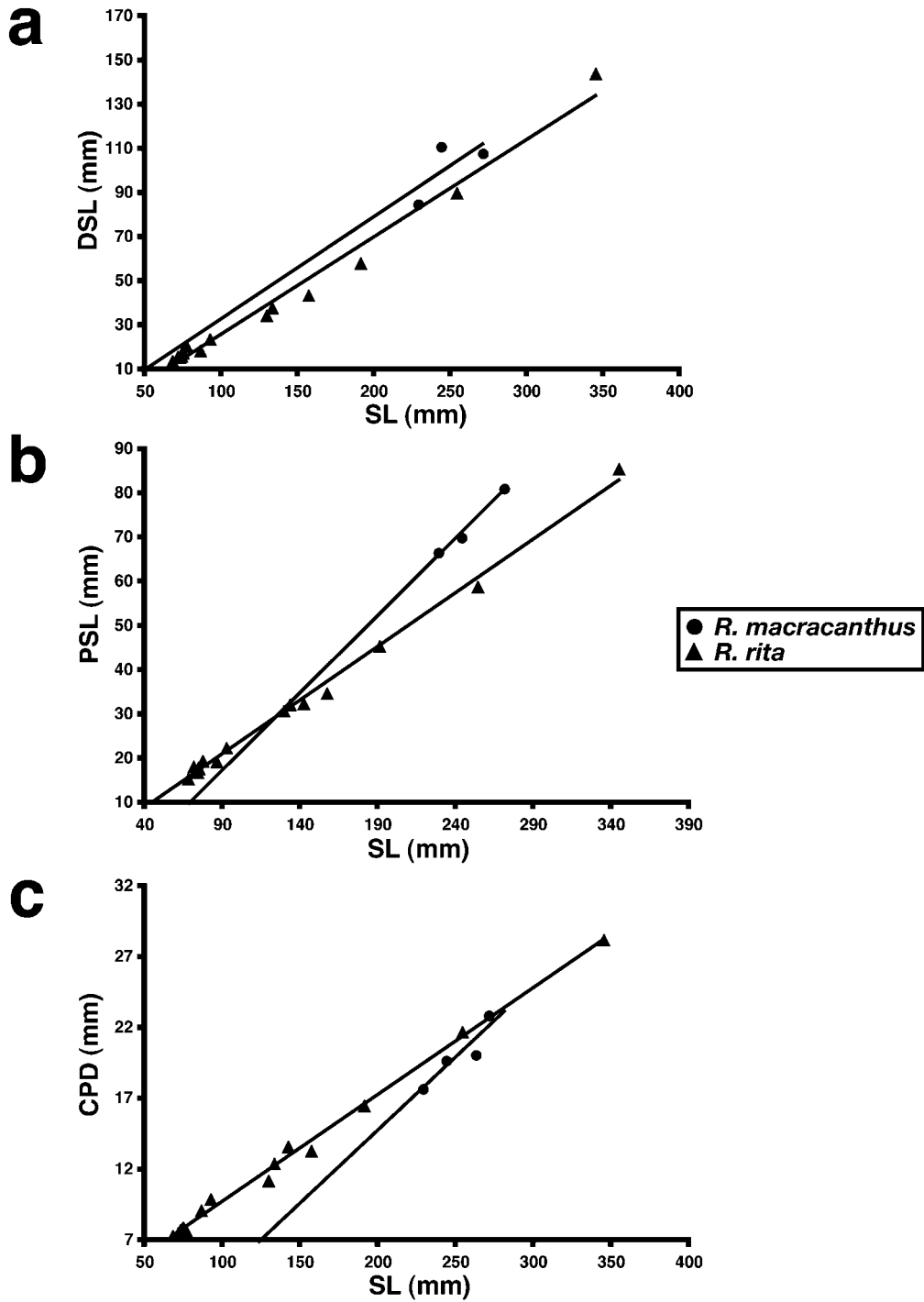


FIGURE 3. Scatterplots of: a. dorsal spine length (DSL), b. pectoral spine length (PSL), and c. caudal peduncle depth (CPD) plotted against standard length for *R. macracanthus* and *R. rita*.

Discussion

Rita macracanthus and *R. rita* are very similar-looking species (both species would key out as *R. rita* using Ferraris, 1999), so the possibility that the differences outlined in this study are solely due to ontogeny must be ruled out. A bivariate analysis (ANCOVA) of the pectoral-spine length, dorsal-spine length and caudal peduncle depth against SL (Fig. 3) shows that the differences are not solely ontogenetic, as the regression lines are significantly different ($P < 0.00001$, $P = 0.03706$ and $P = 0.01658$ respectively).

The shapes of the tooth plates in catfishes are known to undergo ontogenetic changes, especially those on the palate. In *R. rita*, as in many other catfishes, the palatal tooth plates tend to fuse along their medial margins in large specimens, giving the appearance of one large median tooth plate. However, the premaxillary tooth plate appears to undergo little ontogenetic change in shape. It was not possible to measure the premaxillary toothplates of all of the specimens of *R. rita* and *R. macracanthus* in this study without seriously damaging them (due to the condition they were preserved in), but those for which accurate measurements were possible support the utility of the premaxillary tooth plate morphology as a diagnostic character for the two species; the relationship between the premaxillary width:length ratio against size (SL) is significantly different for the two species ($t = 2.573$, $P = 0.0422$; Fig. 4).

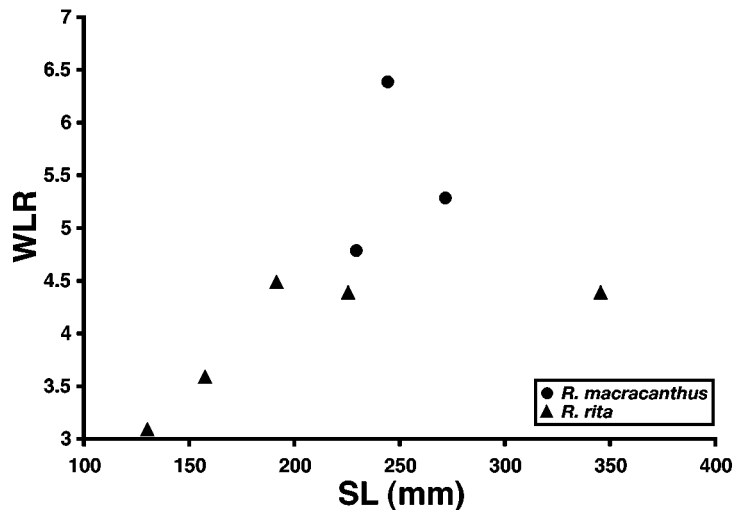


FIGURE 4. Scatterplot of premaxillary tooth plate width:length ratio (WLR) against standard length for *R. macracanthus* and *R. rita*.

The fauna of the Indus River drainage is poorly studied. It is likely that many of the freshwater fish species currently thought to occur in both the Indus and Ganges River

drainages are separate (one Indus and one Gangetic) species, as noted in *Sperata* by Mirza (2003). Prior to the collision of the Indian subcontinent with Asia, the paleo-Indus River was more west-flowing and formed part of a larger twin river system (much like that of the Ganges-Brahmaputra system today) with the west-flowing paleo-Ganges on the southern edge of the Asian continent. The collision of India and the subsequent tectonic uplift caused both the Indus to become more south-flowing, and the Ganges to switch from a west- to an east-flowing river system, linking with the Brahmaputra River in the process (Qayyum et al., 1997). The possibility of this being the vicariant event that led to the allopatric speciation of *R. macracanthus* and *R. rita* should be further investigated.

Comparative material

Rita chrysea: CAS 61855 (42), 57.5–201.6 mm SL; India: Orissa State, Mahanadi River basin, fish market at Sonapur.

Rita gogra: CAS 62088 (4) 147.1–202.5 mm SL; India: Karnataka State, Bellary district, Krishna River basin, Tungabhadra River and reservoir at Hospet, Hampi and Kampli. MCZ 60947 (30), 28.0–43.0 mm SL; India: Withal Wadi River.

Rita kuturnee: CAS 134868 (1), 92.5 mm SL; India: Maharashtra State, Poona. UMMZ 189650 (1), 74.0 mm SL; India: Andhra Pradesh, Tungabhadra River at Kurnool.

Rita rita: CAS 114132 (1), 254.2 mm SL; CAS 134866 (9), 68.0–92.5 mm SL; MCZ 22213 (1), 345.0 mm SL; India: West Bengal State, Calcutta. OSUS 16507 (1), 191.1 mm SL; Nepal: Nawalparasi, Narayani River at Tribuni Ghat. OSUS 16968 (1), 157.1 mm SL; Nepal: Nawalparasi, Narayani River below Rapti River confluence around gharial conservation camp. UMMZ 187880 (2), 129.6–142.2 mm SL; UMMZ 208826 (2), 30.0–30.9 mm SL; Bangladesh: Comilla district, Meghna River at Chandpur. UMMZ 208297 (1), 133.3 mm SL; Bangladesh: Comilla district, Meghna River downstream of mouth of Gumti River. UMMZ 208362 (1), 38.1 mm SL; Bangladesh: Meghna River, upstream from Chandpur, just downstream from Gumti River at Kanudi. UMMZ 208427 (1), 27.0 mm SL; Bangladesh: Barisal district, Meghna River at Kaliganj. UMMZ 208593S (1), skeleton, 225 mm SL; Bangladesh: Chandpur downtown fish market.

Rita sacerdotum: FMNH 51557 (3), 107.8–122.0 mm SL; Myanmar: Rangoon. USNM 348211 (2), 189.2–204.6 mm SL; Myanmar: Yangon Division, Insein market.

Key to species of *Rita* (modified after Ferraris, 1999)

1. Dorsal surface of head, between eyes and supraoccipital, covered with thick layer of muscle; pelvic fin black *Rita gogra*
- Dorsal surface of head covered only with skin (bones visible); pelvic fin pale..... 2
2. Eye small, 7–13% HL 3

- Eye large, 17–29%HL 5
- 3. Dorsal spine as long, or longer than head, spine extending to or beyond adipose-fin origin (in specimens greater than 100 mm SL); vomerine teeth in two elliptical patches, not meeting at midline (in specimens smaller than ca. 300 mm SL) 4
- Dorsal spine no longer than head minus snout, spine not reaching adipose-fin origin; vomerine teeth in single crescentic patch extending across midline of palate.....
..... *Rita sacerdotum*
- 4. Dorsal spine reaching to middle of adipose-fin base (37.2–45.5% SL); pectoral spine reaching to three quarters of distance between tip of cleithral process and pelvic-fin origin (length 28.7–30.0 % SL); caudal peduncle depth 7.6–8.4% SL; premaxillary toothband short (maximum width 4.8–6.4 times maximum length). *Rita macracanthus*
- Dorsal spine reaching to origin of adipose-fin base (25.6–41.7% SL); pectoral spine reaching to less than half of distance between tip of cleithral process and pelvic-fin origin (length 22.1–25.5 % SL); caudal peduncle depth 8.2–10.7% SL; premaxillary tooth band long (maximum width 3.1–4.5 times maximum length)..... *Rita rita*
- 5. Vomerine teeth in slender patches along lateral margin of palate, no larger than teeth in upper jaw; tooth patches not meeting at midline, dorsal-fin spine smooth anteriorly, except for few serrae basally..... *Rita kuturnee*
- Vomerine teeth in large quadrangular patch covering most of palate, large and molariform in middle of patch and smaller laterally; dorsal-fin spine with single row of antrorse serrae anteriorly for at least basal two-thirds of spine..... *Rita chrysea*

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