

Rhabdalestes yokai
(Characiformes: Alestidae),
a new species from the Léfini and Sangha River basins
(Congo River basin), Africa

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Rhabdalestes yokai, new species, is described from the Léfini basin (Middle Congo River, Republic of Congo) and the Sangha basin (Middle Congo River, Central African Republic). It is distinguished from the other *Rhabdalestes* species by the following combination of characters: 5-7 outer row premaxillary teeth with 5 (exceptionally 3) cusps; 8 mandibular teeth with 5-7 cusps; a complete lateral line with 25-26 pored scales; 4½ scales above the lateral line; 3 unbranched and 18-19 (exceptionally 17) branched anal-fin rays and 13-14 gill rakers on the lower limb of the first gill arch.

Introduction

The family Alestidae was initially included as a subfamily of the Characidae. However, nowadays the monophyly and the family level classification of the Alestidae are well established (see Buckup, 1998; Calcagnotto et al., 2005; Hubert et al., 2005a,b). Although Paugy & Schaefer (2007) also rejected the former subfamily level classification of the Alestidae, they maintained the present arrangement of the genera into three tribes as a matter of convenience, while recognizing the inadequate and artificial nature of this classification as clearly outlined by Hubert et al. (2005a). These three tribes are mainly differentiated based on their tooth morphology: 1) the genus *Hy-*

drocinus characterised by a single row of large caniniform, mostly conical teeth (Paugy, 2003); 2) Alestiini sensu stricto comprising the genera *Alestes*, *Brycinus* and *Bryconaethiops* characterised by pluricuspid teeth of a more modest size and with the inner row premaxillary teeth molariform; and 3) Petersiini, commonly referred to as the dwarf Alestidae (Poll, 1967; Paugy, 1990a), characterised by their smaller size and the presence of small pluricuspid teeth with the inner row premaxillary teeth non molariform (Paugy, 1990b, 2003; Paugy & Schaefer, 2007).

The genus *Rhabdalestes* is one of the 16 genera of the tribe Petersiini (Paugy, 1990a). Poll (1967) distinguished *Rhabdalestes* from the other Petersiini based on the following combination of

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characters: absence of inner row mandibular teeth; 4-6 teeth with 3-5 cusps in outer premaxillary row; 8-10 teeth with 3-7 cusps in inner premaxillary row; 8-11 teeth with 1-7 cusps on the lower jaw; 12-17 gill rakers on the lower limb of the first branchial arch; 2-3 unbranched and 15-19 branched anal-fin rays; $4\frac{1}{2}$ - $6\frac{1}{2}$ scales above lateral line; $2\frac{1}{2}$ - $4\frac{1}{2}$ scales below lateral line, 22-37 scales in the longitudinal series, and a complete or abbreviated lateral line with 17-38 pored scales.

Currently the genus *Rhabdalestes* comprises eight valid species: *R. aeratis*, known only from Lake Tumba near Irebu (Democratic Republic of Congo) (Stiassny & Schaefer, 2005); *R. brevidorsalis*, known only from the Tchad River basin (Lake Tchad, Gribingui and Mayo Kebbi River basins) (Central African Republic and Tchad) (Blache, 1964; Poll, 1967; Paugy, 2003); *R. leleupi*, from Lake Jipe, the Nyamba ya Mungu reservoir and the Pangani River (Kenya and Tanzania) (Poll, 1967; Bailey & Denny, 1978); *R. maunensis*, from Bechuanaland (Botswana) (Poll, 1967); *R. rhodesiensis*, from the Bangwelo-Luapula system, the Kafue River, the Upper Zambezi, Lake Kariba, the Kalomo River [Botswana, Democratic Republic of Congo, Zambia, Zimbabwe] (Poll, 1967; Bell-Cross, 1972); *R. septentrionalis*, from the Wouri River basin (Cameroon) in the east to the Senegal River basin (Senegal) in the west (Paugy, 2003; Paugy & Schaefer, 2007); *R. smykalai*, from the Lower Niger River basin (Nigeria) (Paugy, 2003; Paugy & Schaefer, 2007) and *R. tangensis*, from the Tanga River (Tanzania) (Poll, 1967). Two of these species only (*R. aeratis*, *R. rhodesiensis*) are known from the Congo River basin.

While studying *Rhabdalestes* specimens from the Léfini 2004 expedition (Republic of Congo), we were unable to attribute these to any of the presently known *Rhabdalestes* species and we describe it as a new species.

Material and methods

Nineteen measurements and 11 counts were taken on 15 specimens in the type series. Measurements and counts follow Paugy et al. (2003). All measurements were taken point to point except for the caudal peduncle length which was defined as the horizontal distance between the posterior border of the anal-fin base and the caudal-fin base. Number of lateral line scales and dorsal and

anal fin rays follow Ibala Zamba et al. (2007).

Institutional abbreviations: AMNH, American Museum of Natural History, New York; MRAC, Musée Royal de l'Afrique Centrale, Tervuren. Other abbreviations are as: SL, standard length; HL, head length. All locality data were translated in English.

Rhabdalestes yokai, new species

(Fig. 1)

Holotype. MRAC 2004-046-P-0258, 38.7 mm SL; Republic of Congo: Léfini River, access canal to Lake Itsotso, left bank of Louna River, Lésio-Louna Natural Reserve, $3^{\circ}03'S$ $15^{\circ}49'E$; V. Mamonekene, J. Snoeks & E. Vreven, 16 Sep 2004.

Paratypes. AMNH 239654 (former MRAC 2004-046-P-270-272), 3, 32.9-35.7 mm SL; same data as holotype. – MRAC 2004-046-P-0259-269, 11, 31.4-41.6 mm SL; same data as holotype.

Additional specimens. MRAC 2004-046-P-0273-0646, 374, 13.0-43.6 mm SL; MRAC 2004-046-P-0647-0648, 2, 34.1-35.9 mm SL; same data as for holotype. – AMNH 227602, 13, 41.9-52.2 mm SL; Central African Republic: Sangha River, Kenie creek bridge in village of Bayanga, $2^{\circ}58'03"N$ $16^{\circ}15'52"E$; J. P. Sullivan, 21 Jun 1998.

Diagnosis. *Rhabdalestes yokai* can be distinguished from all other *Rhabdalestes* by the following combination of characters: 25-26 lateral line scales (vs. 27-39 in *R. aeratis*, *R. leleupi*, *R. maunensis*, *R. rhodesiensis* and *R. tangensis*); a complete lateral line with 25-26 pored scales (vs. incomplete with 6-7 pored scales in *R. brevidorsalis*); $4\frac{1}{2}$ scales above the lateral line (vs. $5\frac{1}{2}$ - $6\frac{1}{2}$ in *R. smykalai*); 5-7 outer premaxillary teeth with 5 cusps in the upper jaw, 3 unbranched and 18-19 [exceptionally 17 (1 specimen)] branched anal-fin rays, and no black spot on the dorsal-fin tip [vs. 4 (exceptionally 6) outer premaxillary teeth with 3-5 cusps; 3 unbranched and 13-17 branched anal-fin rays, and a black spot on the dorsal-fin tip in *R. septentrionalis*].

Description. Maximum size 52.2 mm SL. Measurements and counts are given in Table 1. Mouth terminal. Lower jaw feebly prognathous. Teeth of upper jaw in two rows. Teeth of outer row with 5 [exceptionally 3 (2 specimens)] cusps and teeth of inner row with 5-7 cusps. Teeth of lower jaw

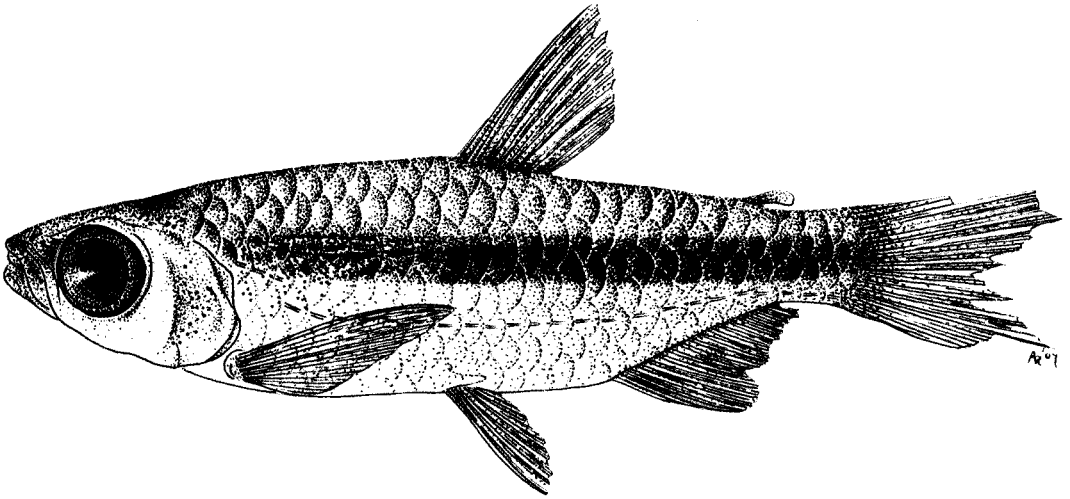


Fig. 1. *Rhabdalestes yokai*, MRAC 2004-046-P-0258, holotype, 38.7 mm SL; Republic of Congo: Léfini River basin.

with 3-7 cusps (Fig. 2). Frontoparietal fontanel present. Origin of pelvic fin just below origin of dorsal fin. Sexual dimorphism in anal-fin shape with concave distal border in males and straight in females (Fig. 3).

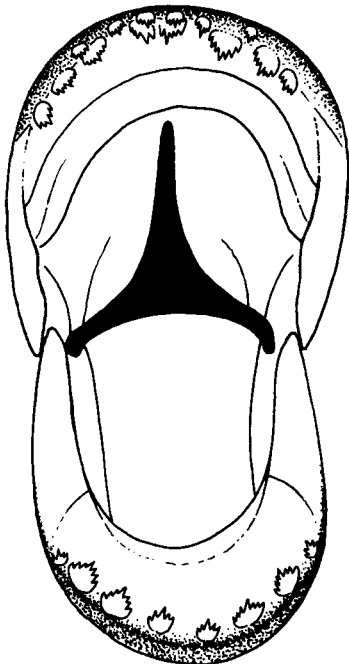


Fig. 2. *Rhabdalestes yokai*, MRAC A4-046-P-0258, holotype, 38.7 mm SL; mouth open in lingual view.

Coloration. Coloration of preserved specimens. Body pale brown, darker on dorsal midline and lighter, yellowish, ventrally. A dark brown band along lateral side of body, from posterior border of opercle to caudal-fin base. Snout and upper surface of head blackish. Head yellowish-white below eye. Opercle generally with numerous small, blackish, spots. Anal fin translucent, whitish, with a thin dark band at its base. Pectoral fin translucent, whitish, with numerous blackish points on upper fin rays giving a blackish appearance to upper part of fin. Pelvic fin translucent, whitish. Dorsal and caudal fins with a light blackish hue due to a fine blackish pigmentation.

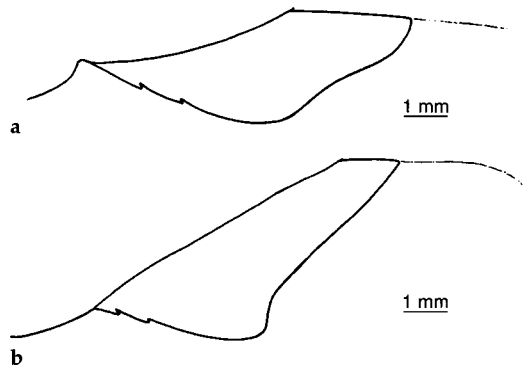


Fig. 3. *Rhabdalestes yokai*, sexual dimorphism in anal-fin shape. **a**, concave distal edge in male (MRAC 2004-046-P-0647-0648, 34.1 mm SL); and **b**, straight distal edge in females (MRAC 2004-046-P-0647-0648, 35.9 mm SL).

Etymology. *Rhabdalestes yokai* is dedicated to Dr. Paul Yoka, Director of the “Institut de Développement Rural” at the University of Marien Ngouabi at Brazzaville (Republic of Congo) in recognition of his administrative help during the Léfini 2004-2008 Expeditions.

Distribution. *Rhabdalestes yokai* is known from the type locality, the canal connecting Lake Itsotso to the Louna River, left bank of the Louna River, right bank affluent of the Léfini River, and sub-affluent of the right bank of the Congo River basin (Republic of Congo). In addition, a single

sample confirms its presence in the Sangha River basin (Central African Republic). Based on these records, the species seems to be endemic to the Congo River basin (Fig. 4).

Ecology. All Léfini specimens of *R. yokai* were captured using a large dip net from a pirogue in the canal connecting Lake Itsotso with the Louna River. Stiassny & Schaefer (2005) used cast nets from pirogues to collect *R. aeratis*. The additional specimens from the Sangha River were captured using cast nets (Sullivan, pers. comm.). Use of these particular collecting methods might partly

Table 1. *Rhabdalestes yokai*; morphometric and meristic data.

	holotype	holotype + paratypes			
		min	max	n	mean
Morphometrics					
Standard length (mm)	38.7	31.4	41.6	15	34.8
In percent of head length					
Snout length	24.4	23.1	26.3	15	25.1
Eye diameter	43.3	40.6	44.8	15	43.1
Interorbital width	29.5	27.3	33.0	15	30.6
In percent of standard length					
Head length	28.1	27.3	28.6	15	27.9
Predorsal distance	52.5	52.2	53.4	15	52.9
Prepectoral distance	39.4	28.1	30.5	15	29.3
Prepelvic distance	53.3	52.1	54.5	15	53.4
Preanal distance	74.1	71.0	74.1	15	72.5
Dorsal-fin base length	10.0	9.1	10.6	15	10.2
Anal-fin base length	18.5	17.7	20.7	15	19.0
Dorsal-adipose distance	24.3	22.6	25.0	15	23.7
Dorsal-fin length	24.8	24.0	26.9	15	25.0
Anal-fin length	14.7	11.5	16.1	14	14.0
Pectoral-fin length	23.2	22.5	24.8	15	23.9
Pelvic-fin length	17.7	17.4	18.3	15	17.9
Caudal peduncle length	12.4	11.5	13.4	15	12.4
Caudal peduncle depth	10.3	9.2	10.5	15	10.0
Body depth	28.0	26.3	31.0	15	27.7
Meristics					
Gill rakers on lower limb first arch	14	13	14	15	14
Gill rakers on upper limb first arch	9	8	9	15	8
Lateral line scales	26	25	26	15	26
Longitudinal line scales	26	25	26	15	26
Scales above lateral line	4½	4½	4½	15	4½
Scales below lateral line	3½	3½	3½	15	3½
Caudal peduncle scales	10	10	10	15	10
Dorsal-fin rays	ii.8	ii.8	ii.8	15	ii.8
Anal-fin rays	iii.18	iii.17	iii.19	15	iii.18
Teeth in outer row of upper jaw	6	5	7	15	6
Teeth in inner row of upper jaw	8	8	8	15	8
Teeth in lower jaw	8	8	8	15	8

explain why *Rhabdalestes* species have largely remained uncollected from the Congo River basin until recently.

All Léfini specimens of *R. yokai* were captured from a school trying to enter the canal. Schooling might be a characteristic of *Rhabdalestes* as Bell-Cross (1976) and Copley (1958) also mentioned schooling in *R. rhodesiensis* and *R. tangensis*.

Within a sub-sample of 80 of the 376 non-type specimens of *R. yokai* collected at the type locality we found 36 females (maximum size 43.6 mm SL) and 44 males (maximum size 40.8 mm SL). This seems to indicate that *R. yokai* females and males attain similar sizes and that the sampled school contains a sex ratio of about 1 to 1. Johnels (1954) however reported for another *Rhabdalestes* species (*R. septentrionalis*) that females attain a larger size than males (52.4 vs. 45.7 mm SL). Daget (1964) found the same for *Micralestes eburneensis* (cited as a *Rabdalestes* by Poll, 1967). He added that males seemed to be less abundant than females as he collected 41 males for 20 females of respectively 39.0 to 41.0 mm SL for the males and 38.0 to 60.0 mm SL for the females. This is probably a lapsus as the data show that the males are the most abundant. The larger females of *Rhabdalestes yokai* all contain well-developed eggs indicating that the individuals are clearly mature at this size.

Discussion

Poll (1967) and Paugy (1984) recognised seven *Rhabdalestes* species: *R. eburneensis*, *R. leleupi*, *R. loennbergi*, *R. maunensis*, *R. rhodesiensis*, *R. septentrionalis* and *R. tangensis*. According to Paugy (1990a) the character provided by Géry (1977) to diagnose *R. loennbergi* from *R. septentrionalis* (a black versus a hyaline point of the dorsal fin) was not convincing. Therefore, he synonymised *R. loennbergi* with *R. septentrionalis*. *Rhabdalestes eburneensis* was transferred to the genus *Micralestes* due to the presence of two inner mandibular teeth (Paugy, 1990a-b). In addition to the absence of two inner mandibular teeth, *R. yokai* is distinguished from *M. eburneensis* by having 25-26 pored lateral line scales (vs. 27-29) and in missing a black spot at the top of the longest dorsal fin rays (vs. spot present).

Hemigrammopetersius brevidorsalis and *Alestopetersius smykalai* have been transferred to the

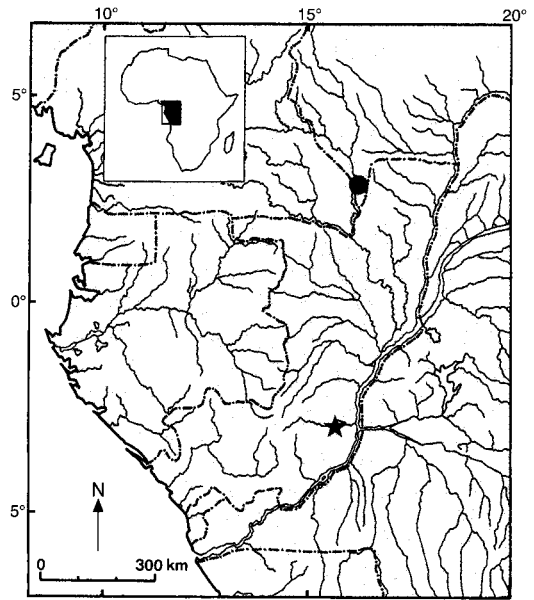


Fig. 4. Distribution of *Rhabdalestes yokai*: ★, type locality (Republic of Congo); ●, additional specimens (Central African Republic).

genus *Rhabdalestes* by Paugy (1990a) and have therefore been included in the differential diagnosis of *R. yokai*. However, unfortunately Paugy (1990a) gave no detailed justification for this transfer. According to Stiassny & Schaefer (2005), the transfer of *A. smykalai* to the genus *Rhabdalestes* might have been motivated by the fact that this species is only known from the Niger whereas all other *Alestopetersius* are endemic to the Congo River basin. However, according to Stiassny & Schaefer (2005), *R. smykalai* has elongated dorsal and anal (the latter not confirmed by our observations) fins in males, features lacking in *Rhabdalestes* but typical for many *Phenacogrammus*, *Nannopetersius* and *Alestopetersius*. Therefore, Stiassny & Schaefer (2005) did not further compare their new species (*R. aeratis*) with *R. smykalai*.

Despite the absence of inner mandibular teeth, Géry (1995) described and placed *Micralestes ambiguus* within the genus *Micralestes*, which is characterised by the presence of inner mandibular teeth, based on habitus and morphometric similarities to members of the *M. argyrotaenia* group. This seemingly natural group of tree species (*M. argyrotaenia*, *M. congicus*, *M. lualabae*) is characterised by relatively high number of 30-32 lateral line scales and a lateral band (Géry, 1995).

The species name *ambiguus*, means changeable, uncertain, doubtful or of double meaning (Brown, 1956), and as such refers to the difficulty of placing the species in the proper genus (Géry, 1995). Despite the similarities of *M. ambiguus* with *Rhabdalestes*, the new species is readily distinguished from *M. ambiguus* by the fewer gill rakers on the lower limb of the first branchial arch (13-14 vs. 16) and a longer prepelvic distance (52.1-54.5 % SL vs. 46.6-50.6 % SL).

The monotypic genus *Virilia* was described by Roberts (1967) based on an important thickening of the segments of the third unbranched anal-fin ray in males of the type species *Phenacogrammus pabrensis*. Paugy (1990a) however placed the species into *Micralestes* whereas Géry (1995) placed it into *Rhabdalestes*. According to Stiassny & Schaefer (2005) the placement of the species remains problematic and must await thorough phylogenetic analysis. Certainly other *Rhabdalestes* species, such as *R. aeratis* (see Stiassny & Schaefer, 2005: fig. 3a), *R. eburneensis* (see Zanata & Vari, 2005: fig. 39) and *R. septentrionalis* (Paugy, 1990b: fig. 20.36) exhibit a similar modification and expansion of the male anal fin. Indeed, according to Zanata & Vari (2005) not only *Rhabalestes* (i.e. *R. eburneensis*, *R. loenningi*, *R. rhodesiensis* and *R. septentrionalis*) and *Virilia* (i.e. *V. pabrensis*) but also the *Hemigrammopetersius* species examined (i.e. *H. barnardi* and *H. intermedius*) all are characterised by an anteroposterior thickened and distinctly curved third unbranched anal-fin ray (Zanata & Vari, 2005: characters 182 and 183). *Rhabdalestes yokai* is characterised by an elongation of the third unbranched anal-fin ray (compared to the first and the second ones). However, whereas in *P. pabrensis*, and also for instance in *R. aeratis*, the first and the second unbranched anal-fin rays are small compared to the third one, in *R. yokai* the second one is of intermediate size between the small first one and the larger third one. Further, *R. yokai* lacks such an anteroposterior thickening (compared to the branched fin rays) and distinctly curving of this fin ray as found in *P. pabrensis* as well as *R. aeratis*. In addition *R. yokai* can be readily distinguished from *P. pabrensis* by a higher number of outer premaxillary teeth (5-7 vs. 4) and a complete lateral line with 25-26 tubes (vs. an incomplete lateral line with 6-10 tubes).

Rhabdalestes yokai is morphologically closest to *R. septentrionalis*. Poll (1967) mentioned 4-6

outer premaxillary teeth for the species. According to Paugy (1990a, 1990b), Paugy et al. (2003) and Paugy & Schaefer (2007), *R. septentrionalis* has 4 outer premaxillary teeth with 3-5 cusps, 3 unbranched and 13-17 branched anal-fin rays and a characteristic black spot at the tip of the dorsal fin. Our study confirms the observations of Paugy (1990a,b), Paugy et al. (2003) and Paugy & Schaefer (2007) except for the outer premaxillary teeth of single specimen originating from Sierra Leone (MRAC 73-10-P-2105), which has 6 instead of the usual 4 outer premaxillary teeth.

According to the actual MRAC catalogue, MRAC 7093 is a syntype of *R. septentrionalis*. Unfortunately, Boulenger (1911) in his original description did not mention the exact number of type specimens. In 1916, Boulenger specified that there are five syntypes all originating from the "Geba River at Bafata" and collected by W. J. Ansorge [BMNH 1912.4.1.44-49 (actually only five specimens while, according to the collection numbers, there should be six)]. According to these data only the BMNH syntypes seem to have type status. The oldest label associated with MRAC 7093 and the old MRAC catalog both specifies that it is a "co-type" and the locality only refers to Portuguese Guinea and not to "Geba River at Bafata" as reported by Boulenger (1916). Therefore, the MRAC specimen should be disregarded as a type.

Comparative material. *Micralestes eburneensis*: MRAC 154716-717, 2, 36.7-40.8 mm SL; Ivory Coast: Cavally River, Toulepleu. – MRAC 73-10-P-2219-229, 11, 24.3-51.6 mm SL; Ivory Coast: Cavally River, Sahilli. – MRAC 86-18-P-816-831, 16, 65.9-89.3 mm SL; Ivory Coast: Cavally River, Flampleu.

Rhabdalestes leleupi: MRAC 153759, 1, 44.9 mm SL; Kenya: Lake Jipe, Teita district. *R. mauensis*: MRAC 89-12-P-586-605, 20, 24.7-41.1 mm SL; Botswana: Okavango mainstream. *R. rhodesiensis*: MRAC 88837-845, 9, 41.6-57.1 mm SL; Democratic Republic of Congo: Kando. *R. septentrionalis*: MRAC 7093, 1, 37.6 mm SL; Portuguese Guinea: Gamba River at Bafata. – MRAC 154725-726, 2, 41.0-44.1 mm SL; Senegal: Niokolo National Park. – MRAC 73-5-P-1273-276, 4, 34.4-39.5 mm SL; Gambia: Georgetown, Gambia River. – MRAC 91-24-P-157-194, 38, 24.0-40.0 mm SL; Nigeria: Orashi River, Idu. – MRAC 73-10-P-2105, 1, 36.9 mm SL; Sierra Leone: Waanje River and backwaters, Tujehum. *R. smykala*: MRAC 153776, 1, 47.7 mm SL; Nigeria: Lower Niger, Aba. – MRAC 153777, 1, 46.1 mm SL; Nigeria: Lower Niger, Aba.

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