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Two new species of *Parananochromis* from Cameroon, Central Africa (Teleostei: Cichlidae)

Anton Lamboj*

Parananochromis elobatus, new species, is an elongate species distinguished from congeners by the combination of: three tubular infraorbital bones, scales absent from the chest, a weakly developed pharyngeal pad, and short dorsal fin lappets. *Parananochromis orsorum*, new species, is diagnosed by the presence of four tubular infraorbitals, pelvic fin with black tips in females, and absence of silvery dots on body scales of males.

Introduction

The cichlid genus *Parananochromis* Greenwood, 1987 includes six species of small- to medium-sized cichlids restricted to rivers in the Rio Muni drainage, Gabon and southern Cameroon. A review was provided by Lamboj (2004: 173–174), where two undescribed species were noted (*P. sp.* “Ntem” and *P. sp.* “Sanaga”), but left undescribed. The purpose of the present paper is to provide formal descriptions for these two species.

Material and methods

External counts and measurements follow Barel et al. (1977). All measurements were taken on the left side of specimens with digital calipers. Two specimens of *P. orsorum* were cleared and double stained following Dingerkus & Uhler (1977). Skin from below of eye on the right side was also removed from several specimens of both species to

allow examination of infraorbital bones. Descriptions of live coloration and behavior are based on several wild-caught specimens. Museum abbreviations: AMNH, American Museum of Natural History, New York; BMNH, Natural History Museum, London; CAS-SU, California Academy of Sciences (ex-Stanford University), San Francisco; CU, Cornell University, Ithaca; MCZ, Museum of Comparative Zoology, Cambridge; MHNG, Muséum d’Histoire Naturelle, Genève; MRAC, Musée Royal de l’Afrique Centrale, Tervuren; NMW, Naturhistorisches Museum, Wien; ZSM, Zoologische Staatssammlung, München. The following abbreviations are used: SL, standard length; HL, head length.

Parananochromis elobatus, new species (Figs. 1–2)

Holotype. NMW 95250, male, 58.3 mm SL; Cameroon: Ntem river system, creek on road Sang-

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Fig. 1. *Parananochromis elobatus*, NMW 95250, holotype, 58.3 mm SL, male; Cameroon: Ntem river system.

melima-Djoum, 2.61°N 12.10°E; C. Dening, Sep 2011.

Paratypes. NMW 95251, 1 male, 1 female, 44.4–46.0 mm SL; same data as holotype. – MCZ 35389, male, 56.4 mm SL; Cameroon: Takbayme near Edea, near coast on Sanaga mainstream; Schwab, Jul 1921. – MRAC 93-085-P-0334-0340 (paratypes of *P. breviostris*), 3 males, 4 females, 30.0–45.4 mm SL; Cameroon: Ntem system, riv. Lé (affl. Ntem), avant Abang-Minkoo, 2°20'N 11°26' E; A. Kamden, May 1993.

Diagnosis. *Parananochromis elobatus* is distinguished from all congeners except *P. breviostris* and *P. ornatus* by presence of 3 (versus 4) tubular infraorbital bones (including the dermosphenotic), and from all congeners except *P. breviostris* by absence (vs. presence) of scales on chest and a weakly (vs. well) developed pharyngeal pad. It is distinguished from *P. breviostris* in lacking (vs. having) elongated fin lappets in the dorsal fin and in having golden dots scales of mid-lateral scale row and row immediately below (vs. in 2–3 ventralmost lateral scale rows).

Description. Measurements and meristics for holotype and 10 paratypes in Table 1. A small species of cichlid; largest specimen (holotype), a mature male (58.3 mm SL). Sexual dimorphism well developed. Males usually 20 % larger than females, with soft dorsal- and anal-fin rays in males more elongated. First ray of pelvic fin longest in adult males; second pelvic-fin ray in females

of equal length or slightly longer than first ray in some individuals. Tip of pelvic fin reaching anus in large males. Caudal fin rounded in both sexes. Snout moderately rounded.

Infraorbital series consisting of lachrymal and three tubular elements. Small gap between second (tubular) infraorbital and small dermosphenotic. Lachrymal portion of infraorbital sensory canal with four openings.

Premaxilla and dentary with 3–4 rows of numerous, acutely cusped, unicuspid teeth, with minor size difference between teeth of inner and outer rows. Lower pharyngeal bone narrowly triangular, with numerous slender, shouldered unicuspid teeth on lateral parts of the bone and few larger asymmetric bicuspid teeth in central field.

First gill arch with 6–7 tuberculate gill rakers on ceratobranchial and 3–4 pointed gill rakers on epibranchial. Hanging pad on roof of pharynx poorly developed.

Scales cycloid. Cheek with 1–2 scale rows; 4 horizontal rows on opercle. Dark spot on outer edge of opercle unscaled. Chest naked or with few, small and deeply embedded scales. Upper lateral line separated from dorsal-fin base at highest point (8th pored scale) by 1–2 scales; on last pored scale by 0–½ scales. Posteriormost point of upper lateral line not overlapping lower. Basal third to half of caudal fin covered with scales; other fins unscaled.

Coloration. In life (Fig. 2), adult base body coloration light brown, darker dorsally than ven-

▷
Fig. 2. *Parananochromis elobatus*, all specimens from Cameroon, imported by aquarium-fish trade, not measured, not preserved. a, male in neutral coloration; b, male in aggressive coloration; c, female in neutral coloration; d, female in breeding coloration with prominent midlateral stripe.





trally. Dark spot on outer edge of opercle extending anteriorly and posteriorly into mid-lateral stripe. Anterior part of dorsal fin and upper part of caudal fin with narrow red margin, usually more developed in males. Posterior part of dorsal fin with white margin, often absent in females. Soft dorsal, caudal and posterior parts of anal fin in both sexes clear to bluish gray, with rows of dark or red spots in males; spots absent or very weakly developed and much less distinct in fe-

males. Dorsal part of caudal fin in some males with 4–5 black dots on distal margin. Anterior part of anal fin violet to bluish, always more intensely-colored in males. Pelvic fin pale bluish to white, with dark anterior edge, more intensely-colored in males than in females. Pectoral fins clear. Two dark horizontal stripes on body visible in most behavioral situations: upper one more diffuse and often absent, at level of two uppermost scale rows on body, reaching from center of eye

Table 1. Morphometric and meristic data of holotype and 10 paratypes of *Parananochromis elobatus* and holotype and 31 paratypes of *P. orsorum*. Values of holotype included in range.

	<i>P. elobatus</i>				<i>P. orsorum</i>			
	holotype	range	mean	SD	holotype	range	mean	SD
Standard length [mm]	58.3	30.0–58.3	41.4		57.5	32.4–70.8	49.8	
In percents of standard length								
Body depth	31.0	22.6–28.6	26.0	1.7	30.2	27.3–33.7	30.6	1.5
Head length	31.5	29.2–33.8	32.1	1.4	36.4	32.3–37.9	34.6	1.5
Caudal peduncle length	14.1	12.1–15.1	13.4	0.9	13.7	12.8–15.9	14.2	0.7
Caudal peduncle depth	14.2	12.1–14.1	13.0	0.6	13.1	11.9–15.1	13.9	0.7
Dorsal-fin base	57.7	53.3–59.9	56.2	2.1	52.3	49.7–59.6	54.3	2.4
Anal-fin base	19.3	17.1–20.8	18.7	1.1	19.9	15.8–19.7	18.0	1.0
Predorsal distance	28.2	27.6–33.6	29.7	1.8	33.5	29.4–52.3	33.0	3.8
Preanal distance	67.8	64.4–69.4	67.1	1.6	67.4	64.4–73.4	68.2	2.0
Prepectoral distance	33.0	32.1–37.9	35.3	2.0	36.3	34.8–40.1	37.4	1.6
Prepelvic distance	37.1	34.5–42.7	37.8	2.4	38.8	26.2–44.6	39.8	1.7
Longest dorsal-fin ray	19.5	15.5–23.7	18.2	2.5	24.0	15.0–26.4	19.8	3.2
Longest anal fin-ray	22.4	16.6–22.6	19.3	1.9	27.1	18.0–33.6	23.1	4.4
Longest pectoral-fin ray	20.7	14.8–23.1	20.8	2.7	21.6	19.1–23.9	21.7	1.3
Longest pelvic-fin ray	25.8	21.4–28.8	25.0	2.3	27.1	20.0–32.3	25.5	3.0
In percents of head length								
Head depth	55	48–65	55.6	5.5	61	42–71	60.0	4.7
Snout length	29	22–33	25.3	3.1	36	27–53	34.7	4.2
Eye diameter	30	28–36	33.0	2.1	27	24–31	27.6	1.6
Postorbital distance	41	39–44	41.7	1.9	38	20–44	37.7	3.9
Interorbital distance	18	17–20	18.8	1.2	17	15–26	19.2	2.5
Cheek depth	22	19–27	22.2	2.4	26	21–32	27.8	2.7
Lower jaw length	35	5–9	33.0	4.4	37	30–40	35.3	2.6
Preorbital distance	15	13–23	15.7	3.0	23	19–28	22.3	18.6
In percents of caudal peduncle depth								
Caudal peduncle length	99	89–116	103.6	8.6	105	89–120	101.9	6.8
Meristics								
			median				median	
Upper lateral-line scales	18	16–20	18		19	17–20	19	
Lower lateral-line scales	8	6–8	7		7	5–9	6	
Total lateral-line scales	27	24–29	27		28	26–29	27	
Circumpeduncular scales	12	12			12	12		
Dorsal-fin spines	14	15–17	15		15	14–16	15	
Dorsal-fin rays	10	9	9		9	9–10	8	
Anal-fin spines	3	3			3	3		
Anal-fin rays	8	7–8	8		8	7–8	7	
Pectoral-fin rays	14	12–13	12		12	12–13	12	
Gill rakers (lower limb of first arch)	8	6–7	6		8	7–9	8	
Total gill rakers	11	10–11	10		13	11–15	13	



to end of dorsal fin base; lower stripe runs mid-laterally from snout through eye, extending to base of caudal fin. Stripes occasionally absent (e.g. submissive, non-territorial specimens) or replaced by pattern of 7–8 dark, irregular blotches in upper half of body (e.g. aggressive or courting specimens). Interorbital, narial and lachrymal stripes on head usually visible. Ripe females with rosy to violet belly and white genital papilla. Upper lips brownish, lower lips light gray. Body scales with dark margins across entire body in males; margins usually less prominent and restricted to dorsal parts of body in females. Males with one or two scale rows (at level of lower lateral line and row immediately below) with small golden dots at center. Juveniles of both sexes (up to a size of about 10 mm SL) with two rows of irregular dark spots on brown background coloration. Adult coloration appearing with increasing size.

In preserved specimens (Fig. 1), head and body brown to brownish-gray, with dorsal half darker than ventral. A black midlateral stripe, continuous from eye (contiguous with dark opercular spot) to base of caudal fin; sometimes fragmented as seven to eight diffuse and irregular dark blotches. Unpaired fins dusky gray or brownish. Soft dorsal, anal, and caudal fins with rows of black spots in males.

Breeding behaviour. In aquaria, *P. elobatus* is a monogamous and pair-bonding cave spawner. Eggs and larvae are normally guarded by the female and only rarely by the male. Hatching of larvae occurs after approximately three days post-spawn. Larvae are usually deposited on the bottom of the cave. Juveniles are free swimming 8 or 9 days post-hatching and are guarded by both parents for about 4 to 6 weeks. Breeding and guarding individuals of both sexes regularly exhibit the dark, longitudinal stripe.

Distribution. Known only from northern tributaries of the Ntem river system and the Sanaga river system in south Cameroon (Fig. 3).

Etymology. Combination of prefix e- (Latin) meaning without and lobatus (Latin) meaning lobed, referring to the short lappets of the dorsal fin. An adjective.

Remarks. *Parananochromis elobatus* was recently found in abundance in small forested creeks and streams (marigots) of the Ntem river system (C. Dening, M. Keijmans, pers. comm.). *Parananochromis* is otherwise not recorded from the Sanaga River, and thus the locality information of the single paratype from the Sanaga River (MCZ 35389; Lamboj, 2004: 174) is accepted with reservation.

The paratypes of *P. brevirostris* (MRAC 93-085-P-0334-0340) constituted the only record of that species in the Ntem drainage. The revised identification here as *P. elobatus* means that *P. brevirostris* is restricted to the Ivindo and Ogowe drainages (cf. Lamboj & Stiassny, 2003).

Parananochromis orsorum, new species

(Figs. 4–5)

Holotype. CAS-SU 155750, male, 57.5 mm SL; Cameroon: Lokounje system, Bikui River at Lolodorf; A. I. Good, Sep 1938.

Paratypes. All from Cameroon. CAS-SU 154942, 2 males, 46.0–42.3 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Oct 1935. – CAS-SU 154946, 2 males, 50.0–64.1 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Oct 1935. – CAS-SU 154980, 3 males, 49.1–54.5 mm SL; Lokounje system, Bkui River, Nsola, 20 miles north of Bipindi; A. I. Good, Jan 1936. – CAS-SU 155047, 1 male, 1 female, 36.8–41.4 mm SL; Lokounje system, Bkui River, Nsola, 20 miles north of Bipindi; A. I. Good, Jan 1936. – CAS-SU 155074, 2 females, 41.6–51.6 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Oct 1935. – CAS-SU 155077, 1 male, 3 females 33.5–49.7 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Oct–Nov 1935. – CAS-SU 155155, 1 male, 5 females, 41.9–70.8 mm SL; Ntem system, Mfiande River, Ebolowa; A. I. Good, Aug 1940. – CAS-SU 69874, 1 male, 2 females, 38.5–55.3 mm SL; Lokounje system, Bikui River at Lolodorf; A. I. Good, Sep 1938. – CAS-SU 168498, 1, 32.4 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Dec 1935. – NMW 95252, 2 males, 53.7–66.3 mm SL; Ntem system, Mfiande and Seng Rivers, Ebolowa; A. I. Good, Oct 1935. – NMW 95253, 3 males, 49.4–51.3 mm SL; Ntem system, road Kribi-Ebolowa, stream near village Metondo, 2°42'30" N 10°43'46" E; A. Lamboj, Feb 2009.



Fig. 3. Distribution of *Parananchromis elobatus* (●) and *P. orsorum* (★).

Diagnosis. *Parananchromis orsorum* is distinguished from *P. brevirostris*, *P. elobatus* and *P. ornatus* by the presence of 4 (vs. 3) tubular infraorbital bones (including the dermosphenotic), from *P. brevirostris* and *P. elobatus* by the presence (vs. absence) of scales on the chest and a well (vs. weakly) developed pharyngeal pad, and from *P. axelrodi* by a shallower body depth (27.3–33.7 % SL vs. 35.6–42.2). It differs from *P. caudifasciatus* by a greater preorbital distance (19–28 % HL vs. 17–19), absence of dots on caudal fin of females (vs. rows of dots in females) and more pointed snout, and from *P. gabonicus* by fewer rows of teeth in both jaws (2 rows in both jaws vs. 2–4 in upper jaw and 2–3 in lower jaw of *P. gabonicus*; 2 rows in latter species only in specimens smaller than 40.2 mm SL) and in coloration (intense and regular rows of pale blue spots in soft dorsal, caudal and soft anal fins of males; yellow coloration of distal part of anal fin of both sexes; black

coloration of tip of pelvic fin of females vs. rows of spots in fins absent or pale and restricted to proximal parts of fins; distal part of anal fin clear; tip of pelvic fin clear to pale white in *P. gabonicus*), and from *P. longirostris* by coloration (absence of the following features in *P. orsorum*: silver centers on body scales in both sexes, red coloration across dorsal portion of eye, spots in dorsal, caudal and anal fins of females) and smaller size (largest known specimen 70.8 mm SL vs. 105.2).

Description. Measurements and meristics for holotype and 31 paratypes in Table 1. A medium sized, moderately elongate cichlid. Sexual dimorphism well developed. Males usually 20–30 % larger than females, soft dorsal- and anal-fin rays in males more elongated. First ray of pelvic fin longest in adult males; second pelvic-fin ray in females of equal length or slightly longer than first ray in some individuals. Tips of pelvic fin in adult males reaching to or beyond anterior origin of anal-fin base. Caudal fin rounded in both sexes. Snout moderately acute.

Infraorbital bone series consisting of lachrymal and four tubular elements. Small gap between third (tubular) infraorbital and dermosphenotic. Lachrymal portion of infraorbital sensory canal with four openings.

Premaxilla and dentary usually with 2 rows of acutely cusped, unicuspid teeth. Outer row teeth slightly larger than those of inner rows. Lower pharyngeal bone narrowly triangular, with numerous, slender, shouldered unicuspid teeth on lateral parts of bone and larger, asymmetric bicuspid teeth in central field.

First gill arch with 7–9 tuberculate gill rakers on ceratobranchial and 4–6 pointed gill rakers on epibranchial. Well-developed hanging pad on pharynx roof.



Fig. 4. *Parananchromis orsorum*; CAS-SU 155750, holotype, 57.5 mm SL, male; Cameroon: Ntem river system.



Fig. 5. *Parananochromis orsorum*, all specimens from Cameroon, not measured, not preserved, Ntem system, collected with NMW 95253. **a**, male in neutral coloration; **b**, female in neutral coloration; **c**, female in submissive coloration with rows of black dots.



Scales cycloid. Cheek with 2–4 scale rows, 3–4 horizontal scale rows on opercle. Dark unscaled spot on outer edge of opercle. Chest scales very small and deeply embedded, 5–7 scales between pectoral- and pelvic-fin insertions. Upper lateral line separated from dorsal-fin base at highest point (8th pored scale) by 1–2 scales, on last pored scale by 0–1 scales. Posteriormost point of upper lateral line not overlapping lower. Basal quarter to third of caudal fin covered with scales; other fins unscaled.

Coloration. In life (Fig. 5), adult base body coloration grayish to brownish, darker dorsally than ventrally. Dark spot on outer edge of opercle. Dark margins around body scales, prominent in males and restricted to dorsal half of body in females. Coloration of fins always more intense in males. Dorsal fin and dorsal edge of caudal fin with thin red margin, preceded by white or off-white submargin. Pelvic fins with white anterior edge, black coloration between first and second ray, and remainder of fin yellowish in males, rosy in females. Pectoral fins clear to pale yellowish. A black midlateral band visible in some behavioral situations (e. g., submissive, but not stressed specimens, or females guarding fry) passing from forehead through eye and extending onto base of caudal fin. Lachrymal stripe well developed. Midlateral band occasionally absent, rarely (mainly in stressed and/or submissive specimens) fragmented to series of black dots, with first dot immediately behind eye (anterior margin of dot on outer edge of opercle), 6–7 dots on body and last dot on base of caudal fin. Dark band on uppermost part of dorsum sometimes visible, but often absent completely or rarely (in stressed specimens) fragmented to 6–8 irregular dark blotches. Upper edge of eye yellow. Lips gray-brown to pale yellow.

Male specific coloration: anterior portion of dorsal fin yellowish, fin membranes of soft dorsal fin parts dark reddish with some rows of pale blue spots. Lower edge of caudal fin with pale yellow coloration. Rest of fin with 9–11 rows of pale blue spots. Some males with few small black dots on upper edge of soft dorsal and upper edge of caudal. Outer parts of anal fin yellowish, rest of fin reddish. Posterior parts of anal fin with 8–9 rows of pale blue spots.

Female specific coloration: spiny dorsal and anteriormost portion of fin with iridescent silvery to rosy coloration, other parts of fin clear. Central

portion of caudal fin clear to pale reddish. Anal fin yellowish to clear. Pelvic fins with black tips. Belly of ripe females dark rosy to violet.

Juveniles of both sexes: body brown with two rows of irregular dark spots in specimens up to about 10–12 mm SL. Adult coloration appearing with increasing size.

In preserved specimens (Fig. 4), head and body brown to reddish brown, with dorsal half darker than ventral. Black midlateral stripe, continuous from eye (contiguous with dark opercular spot) to base of caudal fin, sometimes fragmented as seven to eight well defined black dots. Unpaired fins reddish brown. Soft dorsal and anal fin and caudal fin with rows of black spots in males.

Breeding behavior. In aquaria, *P. orsorum* is a monogamous and pair-bonding cave spawner. Eggs are guarded by both sexes, but much more intensively by the female and only rarely by the male. Hatching of larvae occurs at approximately three days post-spawn. Larvae are usually deposited on the bottom of the cave. Juveniles are free swimming 8–9 days after hatching and are guarded by both parents for about 5–6 weeks. Breeding and guarding individuals of both sexes regularly exhibit a dark, longitudinal stripe.

Distribution. Known only from upper tributaries of the Lokounje river system and northern tributaries of the Ntem river system in south Cameroon (Fig. 3).

Etymology. The species is named after Rose and Tony Orso (Vernon, USA), who helped the author import a number of new species of cichlids over the years and donated specimens for scientific research; this provided the initial stimulus to check collections for additional species of the genus *Parananochromis*.

Discussion

The relationship of *Parananochromis* to other genera of chromidotilapiine cichlids, as well as the intrarelationships of the genus are currently unclear. Within *Parananochromis*, two groups are tentatively recognisable based on the number of tubular infraorbital bones. This includes the *P. brevirostris*-group (*P. brevirostris*, *P. elobatus* and *P. ornatus*), members of which exhibit three tubu-



lar infraorbital bones (including the dermosphenotic), and the *P. caudifasciatus*-group (all remaining species), which exhibit four tubular infraorbital bones (including the dermosphenotic). Within the *P. breviostris*-group, *P. elobatus* appears to be most closely related to *P. breviostris* in the absence of scales on chest and a weakly developed pharyngeal pad, what may represent synapomorphies uniting the two species; the second character could alternatively be interpreted as the result of convergence, associated with a shift in foraging behavior away from substrate sifting. Within the *P. caudifasciatus*-group, *P. longirostris* and *P. axelrodi* share a distinct coloration and development of sexual dichromatism, which may be indicative of a close relationships between the two. *Parananochromis orsororum* resembles *P. caudifasciatus* as well as *P. gabonicus*, with stronger similarities to the latter species in the body shape and coloration differences between sexes.

Comparative material. *Parananochromis axelrodi*: All from Gabon: AMNH 230714, holotype; AMNH 233351, 1 paratype; AMNH 230665, 1 paratype; CU 87044, 1 paratype; AMNH 233350, 3 paratypes; MRAC A2-046-P-1, 1 paratype; MHNG 2203.047, 1 paratype.

P. breviostris: AMNH 232536, holotype, Gabon; AMNH 230720, 23 paratypes, Gabon; AMNH 230707, 4 paratypes, Gabon; MRAC 73-02-P-2147-150, 4 paratypes, Gabon; MRAC A2-11-P-15, 1 paratype, Gabon; MRAC A2-11-P-16, 1 paratype, Gabon; MRAC A2-11-P-17, 1 paratype, Gabon; MRAC A2-011-P-18, 1 paratype, Gabon; BMNH 2002.8.8.4-6, 3 paratypes, Gabon; NMW 94630, 3 paratypes, Gabon; ZSM 53449, 2, Cameroon; ZSM 35413, 1, Cameroon; ZSM 35389, 30, Cameroon.

P. caudifasciatus: All from Cameroon: BMNH 1904.7.1.244-249, 6 syntypes; BMNH 1908.7.28.185-190, 7 syntypes; BMNH 1909.7.9.79-80, 2 syntypes; BMNH 1909.7.9.81-82, 2 syntypes; BMNH 1913.10.29.28-30, 3 syntypes; BMNH 1914.5.27.16, 1 syntype; MRAC 73-03-P-11-17; MRAC 76-14-P-681-684, 4.

P. gabonicus: All from Gabon: BMNH 1967.10.12.57, holotype; CU 8073712; NMW 94628, 4.

P. longirostris: BMNH 1903.7.28.77-83, 7 syntypes, Cameroon; MRAC 16881, 1; MRAC 173288-289, 2, Rio Muni; MRAC 73-18-P-3359-364, 6, Cameroon; NMW 94629, 4, Gabon.

P. ornatus: All from Gabon: MRAC A2-011-P-10, holotype; MRAC A2-011-P-11-14, 4 paratypes; NMW 94632, 2 paratypes; AMNH 230704, 4 paratypes; AMNH 232113, 2 paratypes; AMNH 233349, 4 paratypes.

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Parananochromis orsorum, female (photograph by A. Lamboj)

Anton Lamboj

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