Description of a new cichlid species from Lake Malawi, with reexamination of *Cynotilapia afra* (Günther, 1893) and *Microchromis zebroides* Johnson, 1975

by

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ABSTRACT. - A reexamination of the type specimens of the cichlid genera *Cynotilapia* and *Microchromis* from Lake Malawi is given, revealing significant differences between them, and confirming the validity of *Microchromis*. *Microchromis zebroides*, type species of the genus, is reexamined with additional material. *Microchromis aurifrons*, a new species is described. It differs from the type species of the genus, with which it lives sympatrically in the lake, by wider melanic pattern on the flanks and absence of such coloration on the brow of adults. The distinction between *Cynotilapia* and *Microchromis* and the relationships with the bicuspid-toothed genus *Maylandia*, of which *Microchromis* is possibly a plankton-eater specialized offshoot, are debated.

RÉSUMÉ. - Description d'une nouvelle espèce de cichlidé du lac Malawi, avec réexamen de *Cynotilapia afra* (Günther, 1893) et *Microchromis zebroides* Johnson, 1975.

Un réexamen des spécimens types des genres de cichlidés du lac Malawi *Cynotilapia* et *Microchromis* révèle des différences significatives confirmant la validité de *Microchromis*. *Microchromis zebroides*, espèce type du genre, est réexaminé avec du matériel supplémentaire. *Microchromis aurifrons*, une nouvelle espèce, est décrite. Elle diffère de l'espèce type du genre, avec laquelle elle est en sympatrie dans le lac, par un patron mélanique plus étendu sur les flancs et par l'absence de cette coloration sur le front chez les adultes. La distinction entre *Cynotilapia* et *Microchromis*, et les liens de parenté avec le genre *Maylandia* à denture bicuspide, dont il est possible que *Microchromis* ne soit qu'une ramification spécialisée dans l'exploitation du plancton, sont discutés.

Key words. - Cichlidae - *Cynotilapia* - *Microchromis aurifrons* - *Maylandia* - Lake Malawi - New species.

The evolution of rock-dwelling Mbuna cichlids from Lake Malawi is so rapid and intricate that their taxonomy remains unstable and their nomenclature shelved despite numerous contributions during the last 30 years. Factors to be taken into consideration for this group were summarized by Kornfield and Smith (2000). Lake Malawi Cichlids have been subjected to numerous observations *in vivo*, in the natural habitat as well as in aquaria. Observations in the field constitute a good basis for use of chromatic, ethologic and ecologic characteristics in the taxonomy of these fishes (Ribbink *et al*., 1983; Konings, 1990, 2001, 2007; Spreinat, 1995).

The use of ethologic criteria and coloration patterns in Lake Malawi cichlid taxonomy is now well accepted, especially in non-Mbunas, often classified upon their melanic patterns (Eccles and Trewavas, 1989; Snoeks, 2004). In case of Mbunas, first attempts in this way were established by Trewavas (1984), who resumed some remarks from aquaristic publications, proposing an outline for classification of species from the *Pseudotropheus-Melanochromis* complex. This outline allowed the beginning of a revision of the group, but many points remained on hold. Current nomenclature is almost entirely based on the work by Ribbink *et al*. (1983), from whom taxonomic options, yet informal, were adopted. Though, even if this work demonstrated the species richness of the Mbuna species group, it lacked a re-examination of historical taxa. Such a re-examination was undertaken by several following taxonomic works, e.g., Lewis (1980, 1982); Bowers and Stauffer (1997); Stauffer *et al*. (1997); Konings-Dudin *et al*. (2009).

Apart from these attempts using colour pattern in Mbuna taxonomy, dentition is currently an important criterion for classification of Mbunas. Mbunas with conical teeth on external rows belong to genera *Cynotilapia*, *Labidochromis* and *Microchromis*. The first of these genera was defined by Regan (1922). The second was revised by Lewis (1982), and the third is often overlooked and rarely mentioned, with the exception of Ribbink *et al*. (1983), citing a personal communication of Lewis, for whom it is of doubtful validity, and Genner and Turner (2005). *Labidochromis*, as redefined by Lewis (1982), is clearly distinguished from other Mbunas by its acute mouth and procumbent anterior teeth, "usually visible when mouth is closed and often touching at their tips to form a forceps-like apparatus". For the remaining two genera, characterized by short conical teeth, no decisive criterion has been recently proposed. It is one aim of this paper

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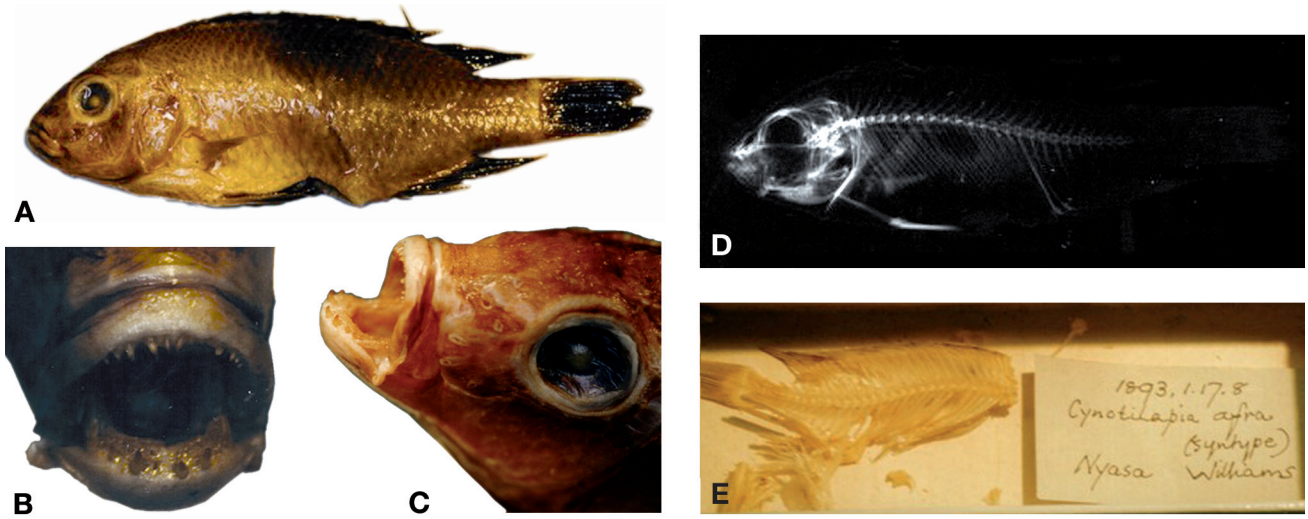

Figure 1. - *Cynotilapia afra*, syntype. **A**: Lateral view; **B**: Facial view, showing dentition; **C**: Spread jaws. Note the four enlarged caniniform teeth (photos P. Tawil); **D**: X-Ray (photo P. Campbell, BMNH); **E**: Dissected skeleton of the second syntype (photo P. Tawil).

to re-examine the type species of both genera. Additionally a description of a new species with short conical teeth, belonging to the genus *Microchromis*, is given. Finally, remarks about ecological and ethological *versus* dental criteria are discussed.

MATERIAL AND METHODS

Counts and measurements follow Barel *et al*. (1977). All characteristics are taken from the left side, except in case of anomaly or bad condition. Length of fin rays in paired fins was always taken from longest ray of both fins. Scales counts in longitudinal series were taken by extending the lower lateral line to the operculum.

Measurements were taken with a digital caliper with an accuracy of +/- 0.02-0.03 mm.

Colour observations on species cited for comparison had been made on wild caught individuals imported for aquarium trade and on field photographs, taken by Spreinat (1995) and Konings (2007).

Abbreviations: USNM, National Museum of Natural History, Washington DC; BMNH: British Museum of Natural History, London; MNHN: Muséum national d'Histoire naturelle, Paris; SL: standard length; TL: total length.

RESULTS

Cynotilapia afra (Günther, 1893)

Hemichromis afer Günther, 1893: 626 ; *Paratilapia afra* Boulenger, 1915: 3-325; *Cynotilapia afra* Regan, 1922: 684; Trewavas, 1935: 77.

BMNH 1893.1.17.7 & BMNH 1893.1.17.8, 2 syntypes, 75.5 mm and undeterminable SL, as this specimen is reduced to a dismembered skeleton, both Lake Malawi (ex-Nyasa), coll. Rev. A.J. Williams, no date given. (Fig. 1)

Description

Measurements and meristics are given in table I. Morphology of generalized type, similar to that of a Mbuna of the *Pseudotropheus* complex (Trewavas, 1984); body moderately elongated and of medium depth. Dorsal profile of body rounded; frontal profile straight; jaws isognathous; due to evisceration, body depth likely to be altered. The first depth in the table is taken at the pelvics, while the second indicates the distance between the upper and lower tangents of the body, at the top of the back on one hand and at the anterior edge of the anal fin on the other. Branchiospines after Regan (14-15).

Caudal peduncle lowering caudad, narrower point near the base of caudal fin.

Dentition

Teeth of outer jaw rows regularly spaced, large and caniniform, decreasing abruptly from symphysis to corner of lower jaw, more progressively on upper jaw; on lower jaw, two teeth on each size of the symphysis distinctly larger than other teeth; teeth in posterior rows clearly smaller and spaced.

Coloration

Coloration and melanic pattern completely lost, due to conservation. According to Günther (1893), "body uniform, more or less dark brown, a spot on the end of the opercle and all the fins deep black."

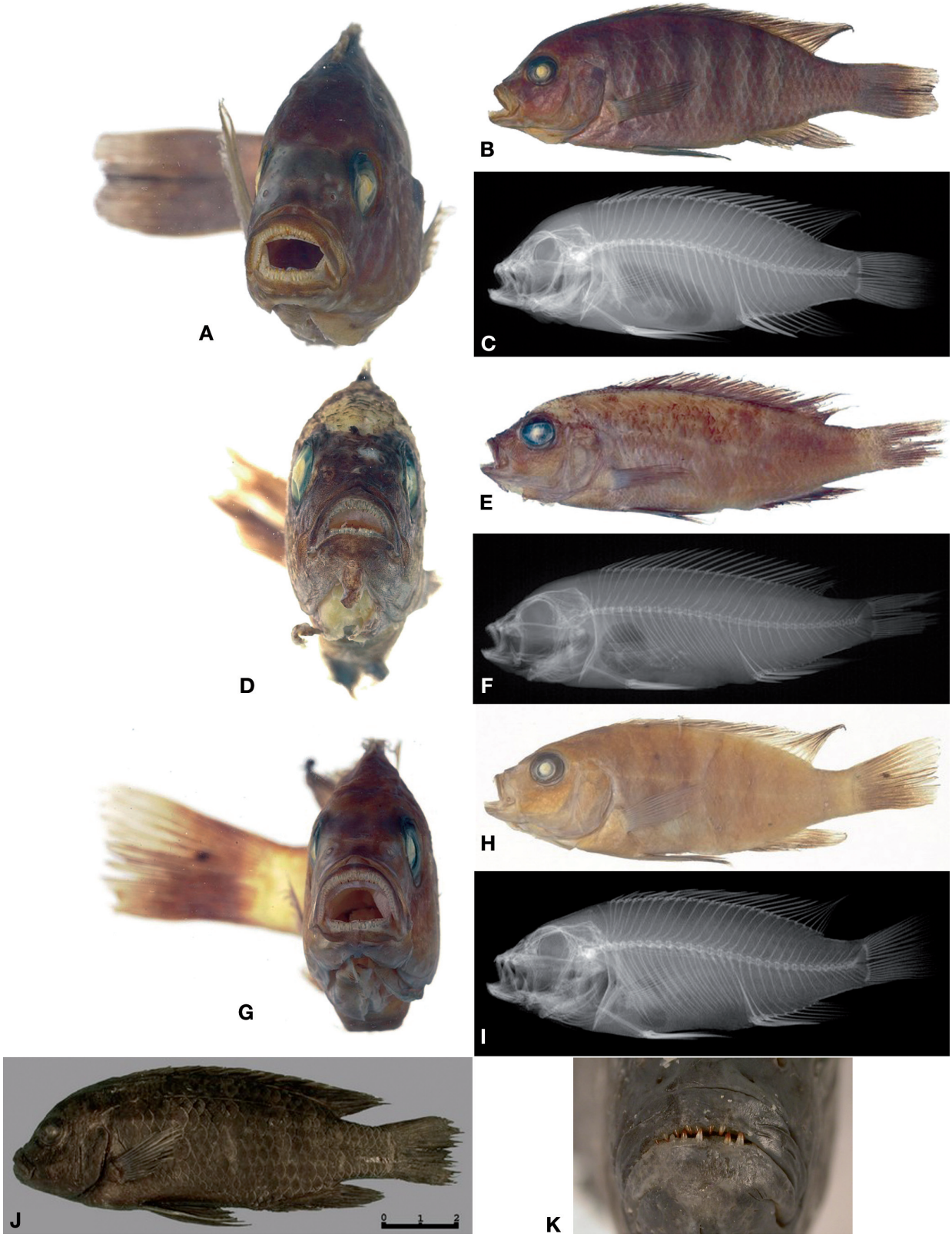

Figure 2. - *Microchromis zebroides*. Holotype (male): **A**: Frontal view; **B**: Lateral view; **C**: X-Ray. Supplementary specimen: **D**: Frontal view; **E**: Lateral view; **F**: X-Ray. Paratype (female): **G**: Frontal view; **H**: Lateral view. **I**: X-Ray (Photos S. Raredon, USNM). New specimen, USNM 373289, male: **J**: Lateral view; **K**: Dentition in frontal view (Photos Rémi Ksas, MNHN).

Table I. - Meristic data in *Cynotilapia afra* and *Microchromis zebroides*. (S) Syntypes of *Cynotilapia afra* (BMNH 1893.1.17.7); *Microchromis zebroides*: female paratype (fP) (USNM Z14171), non paratype specimen (nP) (USNM Z14170) and newly collected specimens (S1-S9) (MNHN 2003-0601 and USNM 373289). (NC = not counted.)

	Cynotilapia afra	*Microchromis zebroides*										
Specimens	S	fP	nP	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9
Morphometric measurements (mm)												
Standard length	75.5	61.3	46.8	93.3	80.9	80.5	80.4	80.1	74.6	68.3	67.2	68.9
Total length	94.1	77.4	55.6	117.8	99.7	100.7	96.3	94.3	83.9	82.7	82.4	84.3
Body height % SL	35.63 / 37.22	37.19	31.84	35.69	33.87	34.53	33.46	34.96	34.85	33.24	34.52	32.51
Head length %SL	31.66	33.77	30.13	30.76	31.15	31.06	31.72	32.33	32.17	32.21	33.33	31.06
Caudal peduncle length % SL	13.25	11.91	11.97	14.47	14.83	12.30	12.19	12.73	12.73	12.88	13.10	10.16
Caudal peduncle height %SL	12.32	11.75	10.04	13.72	12.36	12.55	13.43	12.86	12.73	12.01	12.20	11.47
Pectoral fin length % SL	19.60	24.14	20.09	22.51	22.50	23.60	23.38	20.35	19.57	24.45	23.66	22.21
Ventral fin length % SL	21.72	26.75	25.21	29.15	35.85	24.35	25.12	22.22	22.52	31.04	26.64	27.00
Head width % HL	48.12	46.38	46.10	55.05	53.97	56.00	54.51	56.37	54.58	51.36	50.89	50.00
Interorbital width % HL	29.29	30.43	29.79	34.84	34.13	34.00	33.73	32.05	34.58	31.82	31.25	29.44
Eye diameter % HL	30.96	27.05	25.53	28.92	28.57	30.00	29.41	29.34	30.42	30.00	30.80	28.04
Postocular length %HL	40.17	36.23	45.39	38.33	41.67	42.80	40.78	44.40	40.00	39.55	39.29	38.32
Preocular length %HL	33.89	30.92	26.95	36.24	36.11	36.00	35.69	35.91	35.00	32.73	35.71	35.51
Counts												
Branchiospines	14-15	17	16-17	15 + 5	16 + 4	16 + 4	15 + 4	16 + 3	15 + 4	15 + 4	13 + 3	15 + 3
Scale rows on cheek	4-5	4-5	NC	4-5	3-4	3-4	NC	4	4	NC	4	3-4
Scales in longitudinal line	29	29	NC	30	30	30	30	30	30	30	28	29
Scales in upper lateral line	21	21	NC	22	23	22	22	22	22	22	21	23
Scales in lower lateral line	11	11	9	11	11	11	12	12	9	10 - 11	8	8
Dorsal fin rays	XVII/8-9	XVII/8-9	XVIII/7-8	XVII/9	XVII/8-9	XVII/9-10	XVIII/8	XVII/8-9	XVII/8	XVII/8-9	XVII/8-9	XVII/8
Anal fin rays	III/6-7	III/6-7	III/6-7	III/7	III/7	III/7-8	III/9	III/7	III/7-8	III/8	III/7-8	III/7-8

Microchromis zebroides Johnson, 1975

Cynotilapia afra Fryer & Iles, 1972: 84-5, 218, 276, 492, 496, 525, 538-9; Burgess, 1976: 37; Ribbink *et al*., 1983: 265; Konings, 1990: 95, 350; 2007: 69, 192; Spreinat, 1995: 164; Genner & Turner, 2005: 26; Kassam *et al*., 2005: 1196, 1198, 1200 (Fig. 2).

Holotype. - Male 63 mm SL, USNM 214169 off Likoma Island, Lake Malawi. Collector: P. Davies.

Paratype. - Female 61.3 mm SL, USNM 214171, same data as holotype. Supplementary specimen, USNM 214170, juvenile, 46.8 mm SL, same data as holotype. New specimens, USNM 373289, 5 spms, 67.2-93.3 mm SL, Lake Malawi, Likoma Island, V. Smith, Mar. 2003; MNHN 2003-0601, 4 spms, 67-80 mm SL Lake Malawi, Likoma Island, V. Smith, Mar. 2003.

Measurements given in table I had been carried out on female paratype and USNM Z214170. Additional specimens, originating from the type locality (Likoma Island, collection V. Smith), had been used for description of live coloration. The holotype could not be examined, as it was not available for loan. Instead, good quality photographs were provided (reproduced here), on which the main morphological, meristic and chromatic (preserved pattern) are clearly recognizable and leave no doubt about its belonging to the same species as the paratype and additional specimens.

Description of genus *Microchromis*

A rather stocky-bodied Mbuna genus with blue-black colour pattern and concave, slightly prognathous mouth. Similar to *Pseudotropheus* (*Maylandia*) *zebra* species group (as defined by Stauffer *et al*. (1997) under genus *Metriaclima*), with which it shares the same overall coloration. Differs from these mainly by dentition: teeth on outer rows short and conical, regularly decreasing in size from sym-

physis to corner, *vs* bicuspid in *Pseudotropheus*.

Diagnosis of *Microchromis zebroides* Johnson, 1975

Species of *Microchromis,* characterized by a blue pattern with dark vertical bars on body, enhanced in dominant specimens, and usually extending onto the dorsal fin. Similar to *Pseudotropheus* (*Maylandia*) *zebra* and other species in the complex with which it shares the same overall coloration, namely blue ground colour with strengthening melanic pattern in dominant males, extending onto the head. Differs from these mainly by dentition (see genus). Differs from *M. aurifrons* n. sp. (described hereafter) by its less heavily black pattern and vertical stripes on head, joining on brow.

Description

Measurements and meristics are given in table I.

Small to medium sized Mbuna; body moderately deep; dorsal profile slightly rounded, ventral profile straight; dorsal fin high, in adults soft portion of this fin more pronounced in males than in females; caudal fin with two rounded lobes separated by a shallow notch; head rounded, slightly concave between eye and upper jaw, especially in big specimens; snout short, more prominent in adults, especially males; mouth slightly prognathous and upturned.

Teeth

2-3 rows in both jaws, curved inward, short and conical in most outer row, decreasing in size from symphysis to corner of mouth; teeth of inner rows more sparse, smaller in size than in most outer row.

Scales

Cycloid, 2-3 scale rows on cheek.

Live coloration

Dominant males: body intense light blue, usually 8-9 vertical dark stripes on sides of the body, with first immediately behind operculum, slightly sloping anteriorly; its top usually joining its counterpart on other side before first dorsal fin ray; six vertical bars under dorsal fin, decreasing in thickness posteriorly. 1-2 indistinct bars on caudal peduncle, fading almost completely; body stripes extending onto dorsal fin, joining to a black submarginal band in most specimens.

One black bar on head strongly sloping anteriorly, joining on brow with its counterpart, and two horizontal interorbital bars, all included in a black cephalic mask in dominant males, so head appears mainly black with two interorbital blue bars. Upper blue "inter-bar" extending behind eye. Posterior edge of opercle with brilliant blue-green spot.

Fins

Overall coloration of dorsal fin blue, with yellowish orange band above black submarginal band and whitish lappets; soft dorsal fin parts speckled with ocelli-like yellow spots, smaller than anal fin ocelli; anal fin blue, with black marking at base of the spinous portion; 3-6 anal ocelli of yellow coloration, surrounded by transparent area, well delimitated, increasing in number with size and age, usually extending from soft parts to third spine of this fin; pelvic fin black, with a thin blue-white marginal stripe; caudal fin blue, with thin black stripes along rays and along upper and lower edges of this fin.

Female coloration

Main colour brown, tinted by a blue hue in some specimens, with a melanic pattern more pale than in males; yellow coloration of dorsal fin as in males; a yellow tinge also present on caudal and anal fin; melanic marking same as in males, but weaker, sometimes not visible; anal ocelli present, but smaller as in males.

Melanic pattern strengthens in most dominant males, with some individual variation. Intermediate males or dominant females with less visible stripes. In females, melanic pattern follows same variation according to aggressivity as in males, more visible in dominant females. Subordinate males are uniformly pale blue, subordinate females and juveniles are pale, without black markings.

Distribution

According to Ribbink *et al*. (1983) and Konings (2001, 2007 as *Cynotilapia afra*), the species has a circum-lacustrine distribution, inhabiting all rocky habitats of Lake Malawi.

***Microchromis aurifrons*, n. sp.**

Cynotilapia "Mbamba" Ribbink *et al*., 1983: 236 ; *Cynotilapia* sp. "Mbamba", Konings, 1990: 99, 2007: 69 ; *Cynotilapia* "Mbamba" Spreinat, 1995: 163-4; *Cynotilapia* "Mbamba" Genner & Turner, 2005: 3, 5.

MNHN 2011-0232, holotype, male 70.7 mm SL, Lake Malawi, Mphanga Rocks, V. Smith, May 2004. (Fig. 3); MNHN 2011-0233, paratypes, 5 males, 2 females 62.7-73.2 mm SL, same as holotype (Fig. 3).

Diagnosis

Species of *Microchromis,* characterized by a blue-white pattern with dark vertical bars on body, enhanced in dominant specimens, where these bars almost hide the underlying colour; bars sometimes slightly extending onto dorsal fin; similar to *Pseudotropheus* (*Maylandia*) *zebra* species group (as defined by Stauffer *et al*. (1997) under genus *Metriaclima*), with which they share the same overall coloration; differs from these mainly by dentition: teeth on outer rows short and conical, regularly decreasing in size from symph-

Figure 3. - *Microchromis zebroides*. **A**: Wild male; **B**: Female in aquarium (Likoma Island).
Figure 4. - *Microchromis aurifrons*. Holotype just after death (Mphanga Rocks).
Figure 5. - *Microchromis aurifrons*. **A**: Living holotype (male); **B**: Living paratype (female).
Figure 6. - *Maylandia emmiltos*, wild specimen in aquarium (Eccles Reef).
Figure 7. - *Microchromis aurifrons*. **A**: Wild male in aquarium with blue hue on forehead (Nkhata Bay); **B**: Wild female (Nkhata Bay).

ysis to corner, *vs* bicuspid in *Pseudotropheus*; differs from *M. zebroides* by its heavily black pattern and melanic pattern not extending onto brow, which shows a brilliant blue to yellow hue, according to the locality (yellow in the type locality); dorsal fin yellow, with black submarginal band and whitish marginal band.

Description

Measurements and meristics are given in table II. Small to medium sized Mbuna; body compact, moderately deep; dorsal profile slightly rounded, ventral profile straight; dorsal fin high in both sexes, soft portion more pronounced in adult males than in females; caudal fin with two rounded

Table II. - Meristic data in holotype (H) and paratypes (P1-P8) of *Microchromis aurifrons* n. sp.

Specimens	H	P1	P2	P3	P4	P5	P6	P7
Morphometric measurements (mm)								
Standard length	70.75	73.2	69.1	63.3	69.5	72.8	65.1	62.7
Total length	89.3	92.6	85.3	79.4	86.8	90.5	83.9	78.6
Body height % SL	34.63	35.25	33.72	34.28	35.54	32.69	32.72	33.49
Head length %SL	32.93	31.97	33.00	33.02	31.22	30.91	30.57	31.10
Caudal peduncle length % SL	13.99	12.84	13.60	12.95	12.95	14.70	15.82	14.19
Caudal peduncle height %SL	13.57	13.80	12.30	12.95	12.95	12.91	13.06	13.08
Pectoral fin length % SL	26.86	26.91	27.50	26.22	26.47	28.71	28.11	29.82
Ventral fin length % SL	29.12	32.92	23.88	27.65	32.09	28.43	30.41	29.19
Head width % HL	49.36	52.14	46.05	46.89	50.69	50.22	53.27	49.74
Interorbital width % HL	31.33	34.19	27.19	30.14	32.26	30.22	30.15	28.72
Eye diameter % HL	27.04	30.34	28.51	30.14	30.41	30.67	29.15	30.26
Postocular length %HL	42.06	41.03	40.35	40.67	41.47	40.00	43.22	40.51
Preocular length %HL	34.33	32.91	37.72	35.89	39.17	38.67	43.22	36.92
Counts								
Branchiospines	4 + 14	3 + 14	5 + 16	4+14	4+15	5+14	4+14	3+15
Scale rows on cheek								
Scales in longitudinal line	29	30	30	28	30	28	28	30
Scales in upper lateral line	22	22	23	23	21	23	22	23
Scales in lower lateral line	9	11	13	8	10	12	9	9
Dorsal fin rays	XVII/9	XVI/9	XV/10	XVI/9	XVI/9	XVI/8	XVII/9	XVI/10
Anal fin rays	III/7	III/7	III/7	III/7	III/7	III/8	III/8	III/8

lobes separated by a shallow notch; head rounded, slightly concave between eye and upper jaw, especially in big specimens; snout short, more prominent in adults, especially males; mouth slightly prognathous and upturned.

Teeth

2-3 rows of conical teeth in both jaws, curved inward and short in most outer row, decreasing in size from symphysis to corner of mouth; teeth of inner rows more sparse and smaller in size.

Scales

Cycloid, 2-3 rows on cheek.

Coloration

Dominant males: main coloration of body brown-black to entirely black, with some shining remains of blue coloration between melanic marks; 8-9 vertical dark bars on sides of body (visible in neutral males too), with first immediately behind operculum and slightly sloping anteriorly, never joining its counterpart of the other side dorsally, due to the presence of an enlightened brow; six vertical bars under dorsal fin, with thickness decreasing posteriorly; body stripes not or only slightly extending onto dorsal fin.

One black bar on head sloping anteriorly and irregularly interrupted on the brow; cephalic mask almost entirely black, with two interorbital yellow and blue bars; upper blue "inter-bar" extending thinly behind the eye; posterior edge of opercle black with brilliant blue spot.

Fins

Overall coloration of dorsal fin light blue at base, with a lemon-yellow band, lappets whitish; soft dorsal fin parts dark, speckled with ocelli-like yellow spots, smaller than anal fin ocelli; anal fin dark, with whitish edge; 3-6 yellow anal-fin ocelli well delimitated, usually extending from soft fin parts to third spin; pelvic fin black, especially for anterior part, except for a thin blue-white marginal stripe; caudal fin blue, with thin black stripes along rays and along upper and lower edges.

Female coloration

Overall coloration brown, melanic pattern brownish in dominant females; a greenish hue often present, especially on inter-orbital bars; yellow markings of dorsal and caudal fins and brow as in males; anal ocelli present as in males, but smaller.

Melanic pattern strengthens with most dominant males, with some individual variations; intermediate males or dominant females with less visible stripes; in females, melanic pattern follows the same variation according to aggressiveness as in males, more visible in dominant females; subordi-

nate males uniformly dark brown, subordinate females and juveniles without black marking and dark brown, but more pale than males.

Despite the fact that dominant males appear dark with faint light vertical barring, the fish is to be considered as light with heavy dark barring, since these dark bars are homologous to those, thinner, of other *zebra*-like Mbunas such as *M. zebroides*.

Distribution

According to Ribbink *et al*. (1983) and Konings (2001, 2007), the species is widely distributed in Lake Malawi, with main localities around Likoma Island and a great part of the west coast. Sparse in Tanzania.

Type locality is Mphanga Rocks on the north-west coast of the Lake, where this species is sympatric with *Maylandia emmiltos*. Also sympatric with *M. zebroides* at most localities, but occupying deeper habitats (Ribbink *et al*., 1983; Konings, 2007).

Etymology

From Latin *auri* = gold and *frons* = brow, in reference to frontal coloration in males. This name is preferred to the widely used "Mbamba" – given as an informal name by Ribbink *et al*. (1983) –, because it refers to Mbamba Islet, near Likoma Island on the central eastern coast, far from that of the type material, which comes from the northwestern coast. Specimens from Mbamba Islet may prove later to represent a different subspecies, then the name "Mbamba" would remain available.

DISCUSSION

While describing recently a new Mbuna species (*Cynotilapia pulpican* Tawil, 2002), choosing a significant generic name turned out problematic. First, Mbunas of *zebra*-like type – similar to the best known species, *Maylandia zebra*, namely with only vertical barring and concave frontal profile – were historically divided into two groups, one of them (the smaller) with only conical teeth on the jaws, while the bulk of the remaining ones show a variable amount of uni-, bi- or even tricuspid teeth on the same fish. Generic limits based solely on dentition were common at the beginning of the 20th century, but later works on African great lakes cichlids (Liem, 1981) prove that dentition is more variable than previously admitted and easily submitted to convergences, especially since selective pressure is high upon trophic-related features. Hence, since exclusively conical dentitions were likely to arise independently more than once inside this large and diverse *zebra*-like group, the older generic name in both these categories was retained as best defining the whole flock.

Second, when reexamining the definition of the older generic name, *Cynotilapia*, the mentions in the original description of the type species, *Hemichromis afer* were found as not corresponding to the fish which was later identified to it, at least since Fryer (1959). No underwater observations were then performed, and species and genera richness was widely underestimated, especially with regard to coloration, which was supposed to reflect polymorphism. Besides, another taxon, described later (Johnson, 1975) but widely overlooked and nearly never cited in any publication dealing with Malawi cichlids since then, appeared to closely correspond to the fish known under *Cynotilapia afra*. In the description of *Cynotilapia pulpican* (Tawil, 2002), the conservative name *Cynotilapia* was thus retained pending a reexamination of the types; this is done in the current paper.

Examination of the *Hemichromis afer* syntypes, though one of them reduced to a skeleton, reveals that this taxon does not correspond to the fish widely known under *Cynotilapia afra* in the scientific as well as aquaristic literature. This confusion is mainly due to the fact that *Cynotilapia* as well as *Microchromis* have conical teeth in the external row of both jaws. Yet, conical teeth are to find in other Mbunas too, as in *Labidochromis*, where teeth are more projecting and jaws are more acute (Lewis, 1982).

Although only one complete specimen of *Cynotilapia afra* is available yet, notes from previous authors prior to dissection of the second syntype are valuable for both specimens, especially for dentition: Günther's diagnosis of *Hemichromis afer* provides the following indications: "Teeth conical, eighteen on each side of the outer series of the upper jaw", then, further, "Snout short and obtuse, shorter than the postorbital region of the head, the lower jaw not projecting beyond the upper". These indications confirm my observations on the remaining specimen, indicating that *Cynotilapia* has no prognathous snout, contrary to *Microchromis*.

Günther's diagnosis is conserved by Boulenger (1915), who transferred *Hemichromis afer* to the genus *Paratilapia*. Later, Regan (1922) erected the monotypic genus *Cynotilapia* with the following diagnosis: "Near *Pseudotropheus*, but teeth conical in a few series, outer large, in lower jaw forming distinct canines anteriorly". Additionally, Regan (1922) mentioned the peculiar massive lower teeth of *Cynotilapia*: "lower jaw with four strong anterior canines".

The strength of these teeth is still clearly visible on the undestroyed syntype (Fig. 1). These four caniniform teeth in the lower jaw are also mentioned in Regan's determination key, as well as in Trewavas (1935), who probably dissected the second syntype for vertebral counting (as vertebral count appears for the first time there). So, there is a clear difference in the size and shape of the external teeth between *Cynotilapia afra* and *Microchromis zebroides*.

Apart from *Cynotilapia,* conical teeth on the outer rows of the jaws are to be found in three Mbuna genera: *Gephy-*

rochromis Boulenger, *Labidochromis* Trewavas and *Microchromis* Johnson. In *Labidochromis* and *Gephyrochromis*, the conical teeth are elongate, thin and curved, vs. short and massive in *Cynotilapia*. In *Microchromis*, conical teeth are distinctly smaller, thinner and closer, from equal importance in lower and upper jaws, regularly decreasing in size from symphysis to corners.

Coloration pattern of *Cynotilapia afra* as mentioned by Günther is very different from that of *Microchromis zebroides* and *M. aurifrons*, as melanic patterns on flanks are absent or at least weak, vs. present in *Microchromis*. The melanic marks were still visible in Günther's original specimens, as attested by Günther's mention of black fins, differing from the dark brown body.

Living coloration of *Cynotilapia afra* is recently unknown, as specimens pictured in current literature (e.g., Ribbink *et al*., 1983; Konings 1990, 2001, 2007; Spreinat, 1995) are clearly presenting *Microchromis zebroides*, regarding to overall shape and coloration patterns.

Therefore it is only possible to conjecture about the true identity of *Cynotilapia afra,* as a concrete locality is not given (the original publication from Günther only mentions "Nyasa Lake", without geographical or ecological data). Yet, its rediscovery is essential for sorting out the generic situation in these Mbunas, and it would be desirable that further field researcher focus their efforts on this species. It may correspond to one or another undescribed Mbuna already presented by some authors such as Konings (2007), but may also come from habitat unexplored by scuba divers, for example if it lives above sandy habitats, which harbor poorly coloured species, not wanted by aquarium traders.

Dentition of *Cynotilapia afra*, as for *Microchromis*, is possibly linked to a plankton-based diet. However, the reason why four of these teeth, moreover only in the lower jaw, are distinctly larger, remains unclear.

Generic distinction of *Microchromis* and *Cynotilapia*

Since its description by Johnson (1975), *Microchromis* was widely overlooked by later authors. The most significant mention comes from Ribbink *et al*. (1983), where it was suggested as "of doubtful validity" after a personal communication of Lewis. Since then, *Microchromis zebroides* has seemingly never been cited by any further author and was often tacitly considered as a junior synonym of *Cynotilapia afra*. Nevertheless, this short second-hand mention of Ribbink *et al*. (1983) inside an ecological, not systematic work cannot be taken as a taxonomic option. Thus, at least as long as we do not know more about the living appearance of *Cynotilapia afra*, the question of the merging of these genera remains open, and the available data which are exposed in the current work do not plead for their fusion,

Considering dental similarities and the low amount of usable characteristics in type specimens of *Cynotilapia afra*, the synonymy between *Cynotilapia* and *Microchromis* may be considered, since morphomeristic features of *Cynotilapia* are hardly visible on the only remaining specimen, as it is eviscerated and dehydrated by alcohol conservation. Additionally, proportions and meristics do not differ greatly from those of a majority of Mbunas, so with this neither affinities nor differences can be stated between *Cynotilapia* and *Microchromis*. Nevertheless, *Cynotilapia* and *Microchromis* differ in some important features: the unique shape of dentition in *Cynotilapia*, with its enlarged four inferior "canines", the convex profile of the snout – concave in *Microchromis* and zebra-like species – and the melanic pattern.

The snout concavity is not always easy do determine, since it only becomes more and more distinct while specimens grow, but it was chosen as a generic diagnostic feature by Stauffer *et al*. (1977) and Konings and Stauffer (2006) for *Maylandia* (under *Metriaclima*). Since the remaining type of *Hemichromis afer* is already well grown and markedly larger than the holotype of *Microchromis zebroides* (75.5 mm SL *vs* 63 mm SL), growth uncertainties may be considered as removed. Considering the melanic pattern, it is now lost in the remaining specimen of *Cynotilapia*, but according to the "fresh" observations of Günther (1893), it differs from that of *Microchromis* species by the lack of vertical bars on the brown flanks, whereas the fins are deep black. These deep black fins exclude the possibility that the melanic pattern could had faded or be that of an immature individual at the moment of Günther's original observations.

On the other hand, the melanic pattern as well as the frontal profile of *Microchromis* is closely similar to what is found in members of the *Maylandia zebra* species group, which comprises several species with blue ground coloration with black barred melanic pattern, with even frequent occurrences of yellow-orange dorsal fins, as in *Microchromis zebroides*, as for example *Maylandia emmiltos* (Fig. 4). The main difference between both genera relies on shape of the tooth in the outer rows, which is related to a specialized plankton-eating died. As this diet is performed by many Mbunas during periods of abundance (Ribbink *et al*., 1983), it is likely that such a specialized dentition occurred independently at several occasions. Thus, *Microchromis* is possibly a plankton-eating specialized offshoot of the *Maylandia zebra* species group, a very successful one among Mbunas (Ribbink *et al*., 1983), and then the inclusion of both in the same genus is conceivable, in which case, *Microchromis* would have priority.

Specific distinction between *Microchromis zebroides* and *M. aurifrons*

The meristics of *M. zebroides* and *M. aurifrons* widely overlap, and we were not able to find significant differences between specimens from both type localities, though Spreinat (1995) mentions that *M. aurifrons* could be on aver-

age higher backed. Nevertheless, the specific distinction is unquestionable considering that both species occur sympatrically wherever *M. aurifrons* is present (Ribbink *et al*., 1983; Konings, 2007). As transects given by Ribbink *et al*. (1983) reveal, they seem to occur at the same depths, though *M. zebroides* is more numerous than *M. aurifrons*, which is more patchily distributed, for example around Likoma Island where, according to the location, only *M. zebroides* may be present.

The situation where two or more species are distinguishable by no mean but their coloration and not their morphological characteristics is common in Mbunas (van Oppen *et al*., 1998). Thus, as already observed with different Mbunas, reproductive isolation between *M. zebroides* and *M. aurifrons* is obviously achieved by mean of coloration, at least in males (van Oppen *et al*., 1998). Despite the fact that both species share the same basic dominant pattern, i.e., blue with enhanced melanistic marks, *M. aurifrons* males are always recognizable by the greater extension of these marks, which give them their darker overall appearance, upon which the light blue or yellow frontal hue stands out. It is useful to note that sexual segregation between closely related sympatric species from genus *Diplotaxodon*, from Lake Malawi, is also achieved through frontal coloration (Genner *et al*., 2007).

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