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Aphyosemion (Mesoaphyosemion) etsamense (Cyprinodontiformes: Aplocheiloidei: Nothobranchiidae), a New Species from the Monts de Cristal, Northwestern Gabon[1]

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Abstract. *Aphyosemion* (*Mesoaphyosemion*) *etsamense* sp. nov., a species belonging to the *A. (M.) cameronense* group, is described from the Monts de Cristal in northwestern Gabon. It is actually known from a small number of localities in the Monts de Cristal, which is also the westernmost known distribution area of the *A. cameronense* species group in Gabon. The new species differs from the geographically close populations of other species by the male colouration. The distinct status is also supported by mtDNA data. This is the second endemic nothobranchiid species described from the Monts de Cristal.

Key words. *Aphyosemion cameronense* species group, biodiversity, Central Africa

1. INTRODUCTION

Gabon has, together with Cameroon, the highest diversity of cyprinodontiform fishes in Africa (data from HUBER 2000). The nothobranchiids comprise with almost 50 described species the largest group, many of them with small distribution areas and endemic to Gabon. Several descriptions of new species in recent years demonstrate the limited knowledge of their distribution and diversity (HUBER 1994, 1998a, b, 1999; LEGROS 1999). As large parts of this country are still inadequately known with regard to freshwater fish, the number will certainly grow in the future, and without doubt it is important for biodiversity and conservation considerations to have detailed knowledge on species numbers and distribution.

The Nothobranchiidae are the most abundant and specious group of cyprinodontiform fishes in Gabon (HUBER, 2000). From the Ivindo basin, one of the main Ogoue tributaries in the northern inland, up to eight cyprinodontiform species in syntopy are reported, seven of them nothobranchiids (BROSSET 2003). In the majority of the collection localities a member of the *Aphyosemion (Mesoaphyosemion) cameronense* species group is found. They inhabit a large area in the inland plateau of Cameroon, Equatorial Guinea and Gabon and probably also in the neighbouring areas of the Central African Republic and the Republic of Congo (AMIET 1987; DADANIAK et al. 1995; HUBER 2000). This group actually includes the following described species: *A. (M.) obscurum* (Ahl, 1924a), *A. (M.) amoenum* Radda & Pürzl, 1976, *A. (M.) haasi* Radda & Pürzl, 1976, *A. (M.) halleri* Radda & Pürzl, 1976, *A. (M.) maculatum* Radda & Pürzl, 1977, and *A. (M.) mimbon* Huber, 1977 with mostly small distribution areas in Cameroon and Gabon and the highly polymorphic *A. (M.) cameronense* (Boulenger, 1903) with a large distribution area in the countries mentioned above.

AMIET (1987) was the first who, during his study of the Cameroonian *Aphyosemion* and *Fundulopanchax* species, grouped populations of *A. (M.) cameronense* according to their differing male colour patterns into three 'phenotypes' which he suggested might have full species status. Later, some killifish hobbyists joined their knowledge, accumulated through own field trips, aquarium observations and several publications, about the *A. (M.) cameronense* group in Cameroon and Gabon and classified within *A. (M.) cameronense* six additional 'phenotypes' (DADANIAK et al. 1995). From a taxonomic point of view the status of all these populations, which are often restricted to small areas, still remains unclear. This is mostly due to a lack of clear cut diagnostic male colour patterns and generally an extremly conservative morphology.

The first published evidence of the species described here is given in a report of a collection in Gabon by HUBER (1977, 1980). The author identified this species tentatively as *A.* sp. aff. *obscurum*, because the single collected male shows a superficial similarity with *A. (M.) obscurum* from Cameroon (HUBER 1977, fig. 11). Subsequent collections revealed high variability in male colour patterns as described below (see also figs. on pp.

1 In Commemoration of Clas Michael Naumann zu Königsbrück (26.06.1939 – 15.02.2004)

29, 416, 421 in DADANIAK et al. 1995 and pp. 66-67 in SEEGERS 1997). Later the species was called *A. cameronense* phenotype 6 by DADANIAK et al. (1995), following the numbering of different phenotypes of the *A. (M.) cameronense* group in Cameroon by AMIET (1987).

Data presented here are mainly based on a collection from Gabon in 2002 where it was possible to find the new species and several other populations of the *A. (M.) cameronense* group, including the formally described species *A. (M.) mimbon* and *A. (M.) maculatum*. Based on material from Gabon and Cameroon collected by the authors and additional material from Equatorial Guinea provided by M. JUHL we also tested the taxonomic status of the new species with mtDNA data.

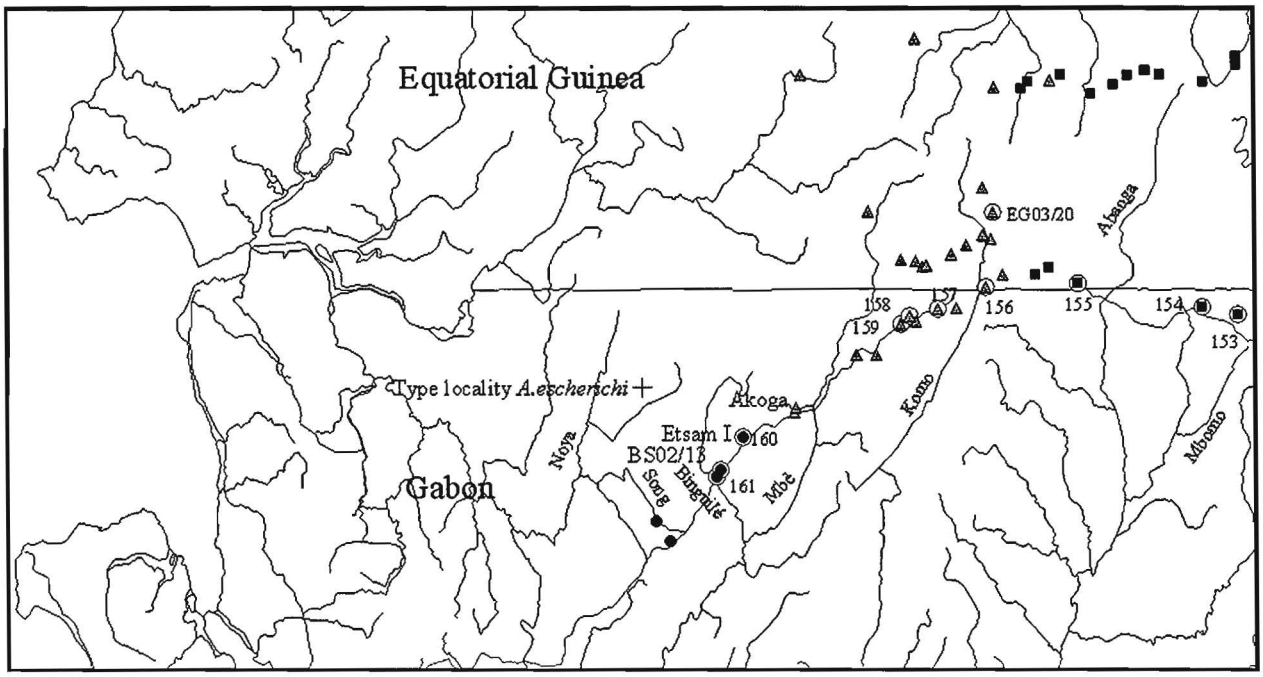
2. MATERIAL AND METHODS

The description is based on specimens collected by the authors during fieldtrips to Gabon 1999 (TB) and 2002 and deposited at the Zoologisches Forschungsinstitut und Museum Koenig, Bonn, Germany (ZFMK). A number of specimens of the type series will be sent to the Musée Royale de l'Afrique Centrale, Tervuren, Belgium (MRAC) and the Institute de Recherche en Ecologie Tropicale (IRET) in Libreville, Gabon.

All fishes were collected with a handnet, sacrified with MS222, preserved in 3,5% Formalin and later transferred to 70% Ethanol for storage. Specimens for DNA studies were stored directly in 96% Ethanol.

Measurements and counts follow AMIET (1987) with the addition of the caudal peduncle, measured from the posterior end of anal fin base to caudal end of peduncle. All measurements are presented as percentages of standard length (SL) and were made point to point with a digital calliper and corrected to the nearest 0.1 mm. Geographical coordinates of sample points visited by the first author are taken with a Garmin GPS 12, map date was WGS 84. The spelling of locality names was taken from the IGN map (Kango, NA-32-V, scale 1:200 000) of this area. The distribution point map is made with the program DIVA-GIS version 4.2 (HIJMANS et al. 2001), GIS files for rivers, roads and country borders are used from the Central African Regional Program for the Environment (CARPE) website (http://carpe.umd.edu/). Additional locality data are provided by M. JUHL, Denmark, U. KÄMPF, Germany (pers. comm. 2003) and from Killi-Data 2000 (HUBER 2000).

Definition and naming of the phenotypes 1-9 follows the definitions of AMIET (1987) and DADANIAK et al. (1995).



Map 1: Known distribution area of *A. (M.) mimbon* ▲, *A. (M.) etsamense* ● and *A. (M.) cameronense* ■ in northwestern Gabon and southern Equatorial Guinea. Type localities of *A. (M.) mimbon* (Akoga), *A. (M.) etsamense* (Etsam I) and *A. escherichi* are shown together with the localities of the DNA samples, which are enclosed in an open circle and numbered according to field locality number (see Table 1). Data from HUBER (2000), own data and M. JUHL, Denmark (pers. comm.).

Table 1: List of specimen used for DNA sequencing with GenBank accession number, voucher number and geographical coordinates of collection localities.

Sampleno.	Species	Collection locality	Country	Genbank accession	Latitude	Longitude
RS 639	*A. (M.) cameronense*	G 02/153	Gabon	AY748279	0°57'38,7"N	11°08'25,3"E
RS 931	*A. (M.) cameronense*	G 02/154	Gabon	AY748280	0°58'18,8"N	11°05'13,2"E
RS 638	*A. (M.) cameronense*	G 02/155	Gabon	AY748281	1°00'22,8"N	10°54'13,0"E
RS 262	*A. (M.) cameronense*	CMM 40	Cameroon	AY748282	2°48'56,1"N	10°40'35,0"E
RS 570	*A. (M.) mimbon*	G 02/158	Gabon	AY748283	0°57'29,7"N	10°39'01,2"E
RS 571	*A. (M.) mimbon*	G 02/159	Gabon	AY748284	0°56'46,0"N	10°38'14,2"E
RS 640	*A. (M.) mimbon*	G 02/157	Gabon	AY748285	0°58'06,3"N	10°41'33,5"E
RS 929	*A. (M.) mimbon*	G 02/156	Gabon	AY748286	1°00'06,0"N	10°45'50,9"E
RS 930	*A. (M.) mimbon*	G 02/159	Gabon	AY748287	0°56'46,0"N	10°38'14,2"E
RS 974	*A. (M.) mimbon*	EG 03/20	Equatorial Guinea	AY748288	1°06'47,2"N	10°46'31,1"E
RS 545	*A. (M.) etsamense*	G 02/160	Gabon	AY748289	0°46'34,1"N	10°24'03,0"E
RS 577	*A. (M.) etsamense*	BS 02/12	Gabon	AY748290	0°46'34,1"N	10°24'03,0"E
RS 604	*A. (M.) etsamense*	G 02/160	Gabon	AY748291	0°46'34,1"N	10°24'03,0"E
RS 633	*A. (M.) etsamense*	G 02/160	Gabon	AY748292	0°46'34,1"N	10°24'03,0"E
RS 923	*A. (M.) etsamense*	G 02/160	Gabon	AY748293	0°46'34,1"N	10°24'03,0"E
RS 924	*A. (M.) etsamense*	G 02/160	Gabon	AY748294	0°46'34,1"N	10°24'03,0"E
RS 925	*A. (M.) etsamense*	BS 02/13	Gabon	AY748295	0°43'36,9"N	10°21'58,1"E
RS 1355	*A. (M.) etsamense*	G 02/161	Gabon	AY748296	0°42'58,1"N	10°21'37,0"E

The specimens used in the DNA analysis are listed in Table 1 and were deposited in the tissue collection of the ZFMK. Map 1 shows the localities of the DNA samples. We sequenced a part of the mitochondrial cytochrome b gene, a detailed description of the method will be given in a subsequent paper.

The resulting sequences were aligned by eye in BioEdit 5.0.9 (HALL 1999) and uncorrected pair-wise sequence divergence calculated with MEGA 2.1 (KUMAR et al. 2001). The sequences were deposited in GenBank, accession numbers are listed in Table 1. Here we used the molecular data set only to get additional information on the distinctness of the species described here from its closest relatives and not to reconstruct a phylogeny of this complex species group.

As indicators for species status we use distinctness of colour pattern with respect to all surrounding populations of other related species and in addition the monophyletic cluster of mitochondrial haplotypes. This is seen as indirect evidence for different biospecies sensu MAYR.

3. RESULTS

***Aphyosemion (Mesoaphyosemion) etsamense*, new species** (Figs. 1-4)

Aphyosemion sp. aff. *obscurum* Huber, 1977:6 (in part, only locality 55), fig. 11, 1980:38 1996:333, 2000:480

Aphyosemion sp. aff. *cameronense* Phänotyp 6, Dadaniak et al., 1995:416-424 , figs. pp. 29, 416, 421

Aphyosemion sp. aff. *cameronense* [Pop. 6], Seegers, 1997:66-67, 3 figs.

Fig. 1: *Aphyosemion (Mesoaphyosemion) etsamense* sp. nov., male, same locality as Type, not preserved.

Fig. 2: *Aphyosemion* (*Mesoaphyosemion*) *etsamense* sp. nov., female, same locality as Type, not preserved.

Holotype: ZFMK 39832, male, 32,4 mm SL; Gabon, western slopes of the Monts de Cristal, a small river at the village Etsam I, crossing the road N5 from Medoneu to Kougouleu (0°46'34,1" N, 10°24'03" E), collected 29. July 2002 by T. Blum, G. Fleck and R. Sonnenberg, collection locality G 02/160.

Fig. 3: *Aphyosemion (Mesoaphyosemion) etsamense* sp. nov., male from a locality north of Assok (BS 02/13), not preserved

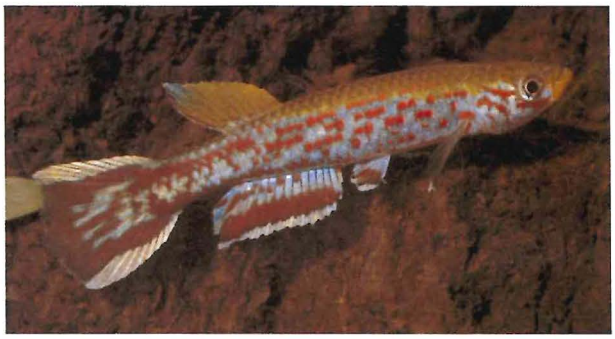


Fig. 4: *Aphyosemion (Mesoaphyosemion) etsamense* sp. nov., male from Assok, not preserved

Paratypes: MRAC A4-42-P-1-4, same data as holotype, ZFMK 39833 – 39842, same data as holotype, ZFMK 39843, male, Gabon, north of the village Assok, collected 11. September 2002 by T. Blum and P. Sewer, collection locality BS 02/13 (0°43'36,9" N, 10°21'58,1" E). ZFMK 39844 - 39846, collected by F. Bitter, T. Blum and P. Sewer in August 1999, same locality data as holotype, preserved after approximately 2 years in aquarium. IRET, Gabon, two specimens, one male and one female, same data as holotype.

Additional Material: Colour pictures of live specimens of the above and other populations of the *A. cameronense* group are used to compare colour patterns (AMIET 1987; DADANIAK et al. 1995; HUBER 1977; SEEGERS 1997).

Diagnosis: *Aphyosemion* (*Mesoaphyosemion*) *etsamense* is distinguished from other species of *Aphyosemion* by its unique combination of colouration characters in males. This distinctness is supported by a monophyletic lineage of mtDNA haplotypes.

Males of *A. (M.) etsamense* are distinguished from all other members of this species group by its nearly complete yellow dorsal fin with small irregular red dots only on basal and posterior egde of fin versus blue or pale yellow with more red dots or flames (compare *A. (M.) cameronense* Figs. 10-12). The only exceptions are *A. (M.) mimbon* (Figs. 5 and 6) and a population of *A. (M.)* cf. *cameronense* in the Ivindo basin between Makokou and Ovan (Fig. 16), which are distinguished by their different body, caudal, and anal fin colouration. *A. (M.) etsamense* is also distinguished from all species and phenotypes with a yellow caudal peduncle (*A. (M.) amoenum* (Fig. 8), *A.(M.) halleri*, *A.(M.)* sp. aff. *cameronense* phenotype 3, 4, 5 (Fig. 14) and 9) through its complete blue colouration of the sides in males versus blue or bluegreen with a yellow or orange peduncle. It is distinguished from *A. (M.) maculatum* (Fig. 9), *A. (M.) mimbon* (Figs. 5 and 6) and *A.(M.)* sp. aff. *maculatum* from Equatorial Guinea by the pattern of the red pigmentation on the males side. In *A. (M.) etsamense* the pigmentation is arranged in horizontal rows of dots which can fuse to closed or irregularly interrupted lines and in some specimens with red reticulation on the caudal peduncle versus more vertical distribution of red pigment clusters and horizontal rows of red dots only on anterior part of body and less extensive reticulated pattern (see Figs. 1, 3, 4, 5, 6, 10 for comparison). It differs from *A. (M.) obscurum* (Fig. 7) and *A. (M.)* sp. aff. *cameronense* phenotype 1 (Fig. 13) and 4 by the variability of the red colour pattern, which exceeds the observed variation in both species and the yellow dorsal and the sometimes yellow marginal bands in the caudal and anal fins in most specimens versus always white bands in the other three.

Fig. 5: *Aphyosemion (Mesoaphyosemion) mimbon* from locality BBS 99/23, same as G 02/157

Fig. 6: *Aphyosemion (Mesoaphyosemion) mimbon* from locality GEB 94/25, same as G 02/158

It differs from *A. (M.)* sp. aff. *cameronense* phenotype 8 (Fig. 15) by a different colour pattern on the fins and more red markings on the sides, where phenotype 8 has less markings and more red dots in the dorsal and finer red markings in the caudal fin.

Description: See Figs. 1 – 4 for general appearance and Table 2 for morphometric data of the type series. A slender and elongate medium sized *Mesoaphyosemion* species. Snout is rounded, mouth directed upwards, posterior end of mouth at same level as center of the eye. Dorsal profile straight. Shows, like most cyprinodontiform fishes, a strong sexual dimorphism. Adult males more colourful and larger than females. Dorsal and anal fin in males slightly pointed, caudal fin trapezoid with slightly rounded posterior end, no filamentous extensions like in the *A. calliurum* group for example. Fins in females in general smaller and rounded. Dorsal fin origin behind origin of anal fin (D/A = +7 – +8) and behind mid length of body. Dorsal fin with 11 – 13 rays; anal fin with 15 – 16 rays, scales on mid-longitudinal series 31 – 33 + 2 – 3 on caudal fin base. Transverse rows of scales above pelvic fin 8 – 10, circumpeduncular scale row 13 - 14.

Table 2: Morphometrics of *Aphyosemion etsamense*. All measurements in percents of standard length (SL), except standard length in mm. TL= total length, PD= predorsal fin distance, HL= length of head, pPD= prepelvic fin distance, pAD= preanal fin distance, HB= greatest body height, HC= height of caudal peduncle, CL= length of caudal peduncle, BD= base of dorsal fin, BA= base of anal fin, D= dorsal fin rays, A= anal fin rays, D/A= dorsal / anal fin position, E= eye diameter, I= interorbital width, LLS= lateral line scales, TS= transverse row of scales, CS= scales around caudal peduncle, SD= standard deviation.

	TL	SL	PD	HL	pPD	pAD	HB	HC	CL	BD	BA	D	A	D/A	E	I	LLS	TS	CS	CL/HC
Holotype	125,4	32,4	65,4	28,1	43,7	58,5	20,3	12,1	23,6	14,4	19,5	12,0	16,0	8,0	7,4	11,5	32 + 3	9,0	13,0	2,0
Paratypes mean (♀)	124,7	30,4	67,9	26,2	45,8	60,5	18,4	10,4	22,5	13,7	20,1	12,3	15,5	8,0	7,6	11,3	32 + 2	8,8	13,8	2,2
Paratypes mean (♂)	125,7	29,2	68,6	27,3	47,1	59,6	18,8	10,9	22,2	14,5	21,2	12,3	15,6	7,8	7,8	11,6	32,3 + 2,7	8,8	13,7	2,0
all types mean	125,3	29,8	68,2	26,9	46,4	59,9	18,7	10,8	22,4	14,2	20,7	12,3	15,6	7,9	7,7	11,5	32,1 + 2,4	8,8	13,7	2,1
all types SD	2,6	5,4	2,6	1,4	3,0	2,2	1,1	0,6	1,1	0,9	1,3	0,6	0,5	0,3	0,6	0,6	0,7 + 0,5	0,5	0,5	0,1

Fig. 7: *Aphyosemion (Mesoaphyosemion) obscurum*, near Matomb, Cameroon.

Fig. 8: *Aphyosemion (Mesoaphyosemion) amoenum*, Cameroon.

Coloration: Living males (Figs. 1, 3, 4): snout yellow, dorsal part of body from mouth to dorsal fin base brown to yellow, beneath eye a red sub-ocular line, on operculum three oblique bands of fused red dots, the upper in some specimens overlayed by yellow colouration of the back; sides light blue, with brilliant hue, but not as metallic as in other species; on sides posterior to operculum rows of red dots, forming up to four more or less continuous rows; in some specimen additional short rows, one starting below dorsal fin to caudal and one ventral behind pectoral fin which can fuse with ventral red band which is seen in most *A. (M.) cameronense* group fishes. The red colouration can also be irregularly interupted or fuse to red bands or blotches on caudal body sides, where it often forms a reticulated pattern on the caudal peduncle.

Dorsal fin mainly yellow, with blue only on basal and posterior part, with red dots or flames basal and posterior distal. Anal fin colour ranging from light blue to almost completely yellow with small basal blue part, several specimens with red dots or flames on basal part; submarginal red band of varying size, marginal band white, blueish or yellow, in some specimens white with partially yellow. Caudal fin colour pattern also variable; center light blue with horizontal red flames or dots; red on anterior, posterior and submarginal parts often fused which encloses the blue central part; upper and lower marginal band white, bluish grey or yellow, as in anal fin often yellow and white combined. Pectoral fins transparent with marginal blue, pelvic fins blue, with submarginal red band and white or blue marginal similar to anal.

Living females (Fig. 2): body brown, dorsally darker than ventrally; red dot at end of scales, fusing to a reticulated pattern on caudal peduncle, traces of red subocular line and three oblique red lines on operculum.

Fig. 9: *Aphyosemion (Mesoaphyosemion) maculatum,* near Matora, collection loc. G 02/125, Gabon

Fig. 10: *Aphyosemion (Mesoaphyosemion) cameronense*, collected in Gabon at Olong II near the border to Equatorial Guinea, G 02/149

Fig. 11: *Aphyosemion (Mesoaphyosemion) cameronense* from Cameroon, between Akom II and Ebolowa, collecting loc. CMM 40

Fig. 12: *Aphyosemion (Mesoaphyosemion) cameronense* from the IRET Research Center near Makokou, G 02/126

Fig. 13: *Aphyosemion (Mesoaphyosemion)* sp. aff. *cameronense* phenotype 1, near Mvilé, Cameroon

Fig. 14: *Aphyosemion (Mesoaphyosemion)* sp. aff. *cameronense* phenotype 5, near Koumaméyong, Gabon

Fig. 15: *Aphyosemion (Mesoaphyosemion)* sp. aff. *cameronense* phenotype 8, West Mitzic, Gabon

Fig. 16: *Aphyosemion (Mesoaphyosemion)* cf. *cameronense* BSW 99/11, between Makokou and Ovan at Minkwala.

Fig. 17: *A. escherichi*, aquarium raised male from northern Gabon

Fig. 18: *A. striatum,* aquarium raised male from Cap Esterias, Gabon

Fig. 19: Type locality of *Aphyosemion (Mesoaphyosemion) etsamense* at Etsam I, Gabon

All unpaired fins and pelvic fins transparent with interradial red flames; anal and pelvic fins with traces of a small blueish marginal band, pectoral fins transparent with small whitish marginal band.

Preserved in Ethanol: Males: body brown, upper part darker than lower, belly light brown, dark pigment on scales forming a reticulated pattern posterior to operculum; fins pale grey, dorsal distal and posterior part with dark brown interradial flames, on caudal and anal fin whitish marginal bands, submarginal dark brown bands, posterior end of caudal dark brown, interradial dark brown flames; pelvic and pectoral fins pale grey, with submarginal dark brown and small whitish marginal band.

Females: body brown, upper and dorsal part dark brown, belly light brown, dark pigment on scales forming a reticulated pattern posterior to operculum; all fins pale grey with dark brown interradial flames on all except pectorals.

DNA data: The alignment contains 800bp for a set of 18 specimens in total, 8 *A. (M.) etsamense* from 3 different localities, 6 *A. (M.) mimbon* from 5 localities and 4 *A. (M.) cameronense* from 4 localities.

115 positions are variable, 89 might be phylogenetically informative. There are ten unambiguous potential synapomorphic positions in the sequences of *A. (M.) etsamense.* 14 positions are ambiguous in having whithin one *A. (M.) etsamense* (specimen RS 925) a character state also found in the outgroup (9) or one outgroup specimen having a state like in *A. (M.) etsamense* (5).

The amount of uncorrected pair-wise sequence divergence between *A. (M.) etsamense* and *A. (M.) mimbon* is 4,25 - 6,63 % and between *A. (M.) etsamense* and the other specimens tentatively identified as *A. (M.) cameronense* 6,25 - 8,37 %. The divergence between *A. (M.) mimbon* and *A. (M.) cameronense* is 5,62 - 6,88 %. Within *A. (M.) etsamense* sequence divergence is up to 2,25 % and, in comparison, within *A. (M.) mimbon* up to 3,13 %. We want to state that we use the distinctiveness of haplotypes with their potential apomorphic character states and not the genetic distance value as additional indicator for species status together with the colouration characters which unite the groups of populations from the different species.

Etymology: This species is named after the village Etsam I, Gabon, at the type locality (Fig. 19).

Distribution and habitat: Only known from some populations found in rivulets along the road N5 between Medouneu and Kougouleu: localities near the villages Etsam I, Assok and Song (Map 1). The closest known locality of *A. (M.) mimbon* is the village Ntom (DADANIAK et al. 1995), ca. 2 km south of Akoga, which is the type locality of this species (HUBER 1977) and approximately 15 km north of Etsam I. According to the official map (Kango, NA-32-V, scale 1:200 000) all localities of *A. (M.) mimbon* in Gabon are found in tributaries of the Komo and the Mbè, those of *A. (M.) etsamense* except at Song seem to belong to the Binguilé which is also a tributary of the Mbè below the Barrage de Tchimbélé. The rivulets around the village Song empty into the Song river, a tributary of the Noya. The closest localities east of Medouneu are populated by fishes identified as *A. (M.) cameronense* s.s. (DADANIAK et al. 1995) and are found in tributaries of the Mvo and Abanga rivers.

Habitats are small rainforest creeks and rivers with slow flowing water. The type locality (Fig.19) is a larger,

slow flowing river, about 3-4 m wide and up to 0,8 m deep. This is a rather unusual habitat for species of the *A. (M.) cameronense* group which are usually found in rivulets not that deep. The fishes are all found between the terrestrial vegetation which hangs into the water, in addition they are also found in smaller rivulets emptying into the main river. The other known localities are small rainforest creeks between 0,5 and 2,0 m wide and usually not deeper than 0,4-0,5 m.

Remarks: Because *A. (M.) etsamense* could be found near Song (HUBER 1977, locality JH 55) within rivulets emptying into the Song river, which itself is a tributary to the Noya river (Nduya river according to WILDEKAMP 1993 and SEEGERS 1987, 1988, Nga river according to AHL 1924b) it is necessary to discriminate between *A. (M.) etsamense* and *A. escherichi* (AHL 1924b) as the type locality of the latter is at 'Attogondema, Nga-Zuflüsse, Kamerun' (AHL 1924b).

In this area the two species *A. escherichi* and *A. striatum* (Boulenger, 1911) are often found in syntopy and both species have a very similar colour pattern (Figs 13 and 14).

Whereas SEEGERS (1988) and WILDEKAMP (1993) list *A. escherichi* as a valid species with the junior synonyms *A. microphtalmum* Lambert & Gery, 1967 and *A. simulans* Radda & Huber, 1976, HUBER (1998c, 2000) is of the opinion that it represents a junior synonym of *A. striatum* (Boulenger, 1911). As *A. (M.) etsamense* occurs in the same river system like the former two species, we have to show that the new species is not conspecific with *A. escherichi.*

HUBER (1998c) based his opinion on small morphological differences, mainly dorsal and anal fin ray and vertebrae counts, although the species have a nearly complete overlap in these morphological values (Table 3). The vertebrae counts given by HUBER (1998c) for *A. striatum* and *A. microphtalmum* (mean 27,50 and 27,70 respectively) are closer to each other than to the type series of *A. escherichi* (mean 29,55), so if they had a discriminatory value, then *A. striatum* and *A. microphtalmum* were closer together than to *A. escherichi* and the latter might represent a distinct species. Because of the large overlap, the previously listed morphological features have no discriminatory value in this case, and for a statistical significant distinction the number of specimens and samples had to be considerably larger.

Table 3: Comparison of morphometric data from *A. escherichi, A. microphtalmum, A. striatum* (from HUBER, 1998c) and *A. (M.) etsamense*

	A. striatum (n = 8)	*A. microphtalmum* (n = 3)	*A. escherichi* (n = 11)	*A. (M.) etsamense* (n = 21)
Dorsal fin rays	10-11	10-11	11-12	11-13
Mean	10.75	10.33	11.18	12.29
Anal fin rays	14-16	16-17	13-15	15-16
Mean	14.88	16.33	13.91	15.57
D/A deviation	+5 - +7	+7 - +8	+5 - +6	+7 - +8
Mean	6.00	7.67	5.82	7.90

On the other hand, according to SEEGERS (1988) and WILDEKAMP (1993) and own observations, the major differences between *A. striatum* versus *A. escherichi* and *A. (M.) etsamense* are the obviously different colour patterns of the fins, especially the dorsal fin (Fig. 1, 3, 4, 17, 18). This character seems to be stable throughout the distribution area of the species. In addition the different relation between caudal peduncle length and height is a diagnostic character. These characters are also mentioned in the first descriptions by AHL (1924b) and HOLLY (1930), who restudied AHL'S type series, for *A. escherichi* (caudal peduncle nearly 2 x height in length) and by BOULENGER (1911) for *A. striatum* (caudal peduncle about 1,33 x height in length).

Despite the absence of significant differences in the caudal peduncle between *A. escherichi* and *A. (M.) etsamense* (2,0 - 2,2 x times height in length, Table 2), the male colouration allows the identification of both species (see Figs. 1, 3, 4, 17) and also the discrimination between *A. (M.) etsamense* and *A. striatum* (Figs. 1, 3, 4, 18). The dorsal fin in *A. (M.) etsamense* shows little blue or red pigmentation on the posterior or basal part versus little yellow with lots of red pigmentation in *A. escherichi* (dots and flames). *A. striatum* shows two parallel horizontal bands on blue or yellow background, the caudal peduncle height about 1,33 times in length. The often very regular horizontal rows of red dots on body sides in males in *A. escherichi* and *A. striatum* are clearly an unrealiable discriminatory character to the irregular red pigmentation in *A. (M.) etsamense*, because on one hand we found several *A. (M.) etsamense* males which also show a more or less regular pattern of horizontal red dots, on the other hand we found especially in the area of the Monts de Cristal populations of *A. striatum* with a very irregular pigmentation similar to the former species.

4. DISCUSSION

In general it is difficult to find diagnostic characters to discriminate other species against the heterogenous assemblage of populations which is summed up in the taxon *A. (M.) cameronense*. However, the discrimination between *A. (M.) etsamense* and its genetically and geographically closest relative, *A. (M.) mimbon* is easy due to the different colour patterns (see Figs. 5, 6). Also the distinction to the geographically close populations we collected between Sam and Medouneu in the tributaries of the Mvo and Abanga rivers and most other populations, which are identified as *A. cameronense* (Figs 10-12) (DADANIAK et al. 1995; HUBER 2000), is possible because of their differing phenotype with little red pigmentation on the sides of males.

Mesoaphyosemion: The taxon *Mesoaphyosemion* was erected by RADDA (1977) as a subgenus of *Aphyosemion*. As type species he chose *A. cameronense* (BOULENGER, 1903). However, RADDA also included in his newly erected subgenus all those species groups which show a superficial similarity in morphology and therefore turned this group into a taxonomic 'wastebasket'. Actual research by MURPHY & COLLIER (1999) based on DNA sequences confirm that *Mesoaphyosemion* is not a monophyletic group. In this paper we suggest to restrict the taxon name *Mesoaphyosemion* Radda, 1977 to the *A. (M.) cameronense* species group and exclude all other species which then makes *Mesoaphyosemion* a monophyletic or natural group. This group now contains the following described species: *A. (M.) cameronense* (Boulenger, 1903), *A. (M.) obscurum* (Ahl, 1924a), *A.(M.) amoenum* Radda & Pürzl, 1976, *A. (M.) haasi*, Radda & Pürzl, 1976, *A. (M.) halleri* Radda & Pürzl, 1976, *A. (M.) maculatum* Radda & Pürzl, 1977, *A. (M.) mimbon* Huber, 1977 and *A. (M.) etsamense*. It includes also the undescribed, but recognizable groups of populations defined by AMIET (1987) and DADANIAK et al. (1995) with their different male colour patterns, which might, like *A. (M.) etsamense*, be regarded as distinct species.

This is the second described endemic species of nothobranchiid fishes in the Monts de Cristal besides *A. (M.) mimbon*. For the nothobranchiids it is a species poor area, as only one other species group of *Aphyosemion* and very rarely a species of *Episemion* could be found in syntopy with a *Mesoaphyosemion* species (HUBER 1977, 2000; own data). For comparison, whithin the Ivindo basin the highest number is seven species of different species groups (Brosset 2003) and for the coastal plain up to five or six species of different groups in syntopy (own observations). Further collections might reveal a higher diversity, as only a small part of this area is known with regard to cyprinodontiform fishes.

Résumé. *Aphosemion (Mesoaphosemion) etsamense* sp. nov., une espèce du groupe *A. (M.) cameronense*, est décrite des Monts de Cristal du nord-est du Gabon. Cette espèce n'est connue que d'un petit nombre de localités situées dans les Monts de Cristal ce qui en fait l'espèce du groupe cameronense à la distribution la plus occidentale. Cette espèce nouvelle se différencie des populations des autres espèces géographiquement proche par la coloration du mâle. Son statut d'espèce à part entière est également supporté par l'analyse d'ADN mitochondrial. Elle représente la deuxième espèce endémique de nothobranchiid des Monts de Cristal.

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