

Chromidotilapia bosumtwensis, a junior synonym of *C. g. guentheri* (Osteichthyes: Cichlidae)

Anton Lamboj *

Chromidotilapia bosumtwensis was given in the original description as an endemic species of Lake Bosumtwé in Ghana. The most remarkable feature to distinguish this species from *C. guentheri* was the form of the lower pharyngeal bone. A comparison of *C. bosumtwensis* and *C. g. guentheri*, however showed variability of this structure in both nominal species and a high similarity in all other morphological characters. In addition an identical breeding behavior was observed. As a result, *C. bosumtwensis* is considered a synonym of *C. g. guentheri*.

Introduction

Paulo (1979) described a new species of the genus *Chromidotilapia*, *C. bosumtwensis* endemic to Lake Bosumtwé (Ghana, Ashanti Region). The author assumed great similarity to *C. g. guentheri* (Sauvage, 1882) in life coloration and breeding behaviour. Subsequently living specimens were imported and this similarity was confirmed (Linke, 1989).

According to Paulo (1979) both species differ mainly in the morphology of the lower pharyngeal bone. Some authors (Teugels & Thys van den Audenaerde, 1992), however, doubted the validity of *C. bosumtwensis* as a distinct species. Moreover, contrary to Paulo's (1979) assumptions, *C. bosumtwensis* does not seem to be endemic to Lake Bosumtwé. Whyte (1975) collected *C. guentheri* in the creeks and estuaries around the lake and at some localities in the lake, but he did not

mention a second - but similar - species of the same genus, even when he gave a detailed documentation of all the other fish species of the lake.

Material and methods

External counts and measurements follow Lévêque et al. (1990) and Kullander (1980). All measurements were done with a slide caliper and a digital caliper with an accuracy of 0.03 mm. All counts and measurements were made on the left side of the fish. Spines in the fins are indicated in roman numbers, branched rays in arabic numbers. Clearing and staining follows Dingerkus & Uhler (1977).

Abbreviations used are: MRAC, Musée Royal de l'Afrique Centrale, Tervuren; NMW, Naturhistorisches Museum, Wien; SL, standard length; HL, head length.

* Institut für Zoologie der Universität Wien, Althanstraße 14, A-1090 Wien, Austria.

Table 1. Counts and measurements of 6 paratypes of *Chromidotilapia bosumtwensis* and 51 specimens of *C. g. guentheri*. SD, standard deviation.

	<i>C. g. guentheri</i>			<i>C. bosumtwensis</i>		
	\bar{x}	SD	range	\bar{x}	SD	range
In percents of standard length						
Body depth	36.5	2.27	30.8-40.3	36.5	1.21	35.0-38.8
Length of caudal peduncle	12.4	1.22	9.7-15.2	11.9	0.45	11.3-12.3
Depth of caudal peduncle	14.6	0.73	13.1-16.2	14.5	0.34	13.9-15.1
Head length	39.2	1.56	35.9-42.7	39.2	1.41	37.1-41.3
Length of dorsal-fin base	56.5	2.28	51.8-60.8	55.9	0.60	54.9-56.5
Length of anal-fin base	36.8	1.81	33.9-42.4	36.2	0.78	34.9-37.2
Distance snout - anal-fin origin	71.8	1.54	66.9-74.9	70.7	0.86	69.7-71.7
Distance snout - pectoral-fin origin	40.2	1.87	35.4-43.9	38.3	2.08	34.9-41.0
Distance snout - pelvic-fin origin	42.4	2.24	36.2-46.2	42.1	1.51	39.1-43.5
In percentage of head length						
Head depth	64.7	5.49	51.6-76.9	65.3	2.73	63.1-71.2
Interorbital distance	25.3	2.75	20.1-33.0	25.9	1.06	24.8-27.7
Snout length	36.9	3.96	27.4-46.4	41.3	2.30	37.9-44.8
Eye diameter	26.7	2.35	21.4-29.9	21.4	2.13	18.8-24.9
Meristics						
Dorsal fin			XV-XVII/9-11			XV-XVI/9-10
Anal fin			III-IV/6-7			III/6-7
Pelvic fin			I/5			I/5
Circumpeduncular scales			15-16			15-16
Scales in upper lateral-line series			18-22			19-21
Scales in lower lateral-line series			9-12			9-12

Specimens examined: *Chromidotilapia bosumtwensis*: MRAC 73-05-P-268-273, 3 males, 65.0-74.8 mm SL, 3 females, 71.7-81.2 mm SL; Ghana: Abono, Lake Bosumtwé; D. F. E. Thys van den Audenaerde, 1966. *C. g. guentheri*: MRAC 73-7-P-380-389, 4 males, 65.0-82.9 mm, 1 female, 71.8 mm SL; Ghana: Yeji; 1967. - MRAC 73-13-P-366-389, 4 males, 54.2-67.0 mm SL, 3 females 60.3-98.3 mm SL, 2 juveniles, 39.4-44.8 mm SL; Togo: Misahohe; de Vree & Vanderstraaten, 1969. - MRAC 86-13-P-138-153, 4 males, 63.4-110.9 mm SL, 2 females, 74.7-90.5 mm SL, 4 juveniles, 19.8-43.7 mm SL; Côte d'Ivoire: Riv. Blé, Dodo; G. Teugels, 1986. - MRAC 87-18-P-4782-805, 3 males, 78.8-106.0 mm SL, 7 juveniles, 24.8-52.0 mm SL; Côte d'Ivoire: Mankono; G. Teugels. - MRAC 87-18-P-4816-835, 3 males, 56.7-91.7 mm SL, 2 females, 80.9-96.7 mm SL, 5 juveniles, 34.3-41.8 mm SL; Ghana: Akenkro; Teugels, 1987. - NMW 7740, 1 female, 80.3 mm SL; Cameroon: Bakoko; K. H. Haberer, 1907. - NMW 91428, 2 females, 67.0-70.2 mm SL; Côte d'Ivoire: Assinie; A. Lamboj, 1988. - NMW 91429, 2 males, 100.0-102.0 mm SL, 1 female, 63.5 mm SL; Ghana: Kibi; A. Lamboj,

1991. - Private collection of the author: 1 male, 75.2 mm SL; Nigeria; O. Gartner. - 1 female, 81.4 mm SL; Côte d'Ivoire: Assinie; A. Lamboj, 1988 (cleared and stained). - 1 female, 68.4 mm SL; Ghana: Kibi; A. Lamboj, 1991 (cleared and stained). - 1 male, 79.6 mm SL; Nigeria; O. Gartner (cleared and stained).

Unfortunately it was not possible to examine the holotype and the five paratypes of *C. bosumtwensis* deposited in the Zoologische Staatssammlung München. According to M. Kottelat (pers. comm., 1991), the specimens have been on loan to J. Paulo who has not returned them since the original description appeared (1979) and several requests to return the loan remained unanswered. It should be noted, however, that the MRAC paratypes are topotypic with the holotype and the ZSM paratypes

Results

All of the measurements and counts in *C. bosumtwensis* are very similar or identical to those of

Table 2. Measurements of different populations of *Chromidotilapia g. guentheri*. SD, standard deviation

	MRAC 86-13-P-138-153 Côte d'Ivoire: Ble River n=10			MRAC 87-P-4782-805 Côte d'Ivoire: Bandama River n = 10			MRAC 73-7-P-380-389 Ghana: Daka River n = 5		
	\bar{x}	SD	range	\bar{x}	SD	range	\bar{x}	SD	range
In percents of standard length									
Body depth	38.1	1.87	32.6-40.1	35.2	1.62	32.7-37.9	36.6	1.06	36.0-39.4
Length of caudal peduncle	12.7	0.61	11.7-13.4	11.4	1.04	9.7-13.7	12.1	0.53	11.2-12.7
Depth of caudal peduncle	15.6	0.30	15.1-16.2	14.4	0.48	13.6-15.1	13.8	0.34	13.2-14.1
Head length	39.2	0.98	37.9-41.1	39.7	0.54	38.9-40.6	39.1	0.80	37.7-40.1
Length of dorsal-fin base	58.0	2.52	51.8-59.1	57.2	2.68	52.1-60.8	57.8	1.03	56.9-59.4
Length of anal-fin base	17.5	0.84	15.6-19.1	17.0	1.29	15.6-19.9	17.1	0.44	16.4-17.7
Distance snout - dorsal-fin origin	36.6	1.33	34.6-39.3	37.5	1.39	35.5-39.9	35.5	0.74	34.5-36.7
Distance snout - anal-fin origin	72.0	2.36	66.9-74.5	71.7	1.02	70.1-73.8	72.8	0.61	72.1-73.8
Distance snout - pectoral-fin origin	40.3	1.70	38.3-43.9	40.9	1.58	39.0-43.9	39.9	1.34	38.3-41.9
Distance snout - pelvic-fin origin	42.8	1.25	41.1-45.1	43.2	2.55	39.7-48.1	43.3	0.84	41.9-43.5
In percents of head length									
Head depth	67.0	3.48	61.2-72.5	59.1	3.80	51.6-63.5	66.9	1.73	63.7-68.6
Interorbital distance	25.7	1.57	22.1-27.8	23.2	2.22	20.1-26.6	24.1	0.82	23.7-25.7
Snout length	36.5	3.77	31.1-41.2	36.1	2.79	31.8-40.1	35.6	0.60	35.0-36.7
Eye diameter	25.9	1.99	23.5-29.3	27.7	2.43	23.7-29.9	26.2	0.82	24.7-27.0
	MRAC 87-18-P-4816-835 Ghana: Pra River n = 10			NMW 914129 Ghana: Birim River n = 3			MRAC 73-13-P-66-389 Togo: Mono River n = 9		
	\bar{x}	SD	range				\bar{x}	SD	range
In percents of standard length									
Body depth	36.1	2.66	30.8-39.5	39.5	39.1	40.3	35.1	1.54	32.8-38.7
Length of caudal peduncle	12.4	1.05	11.0-14.2	12.7	12.3	12.2	13.7	1.30	10.6-15.2
Depth of caudal peduncle	14.7	0.35	14.2-15.3	14.6	14.8	14.7	13.7	0.50	13.1-15.0
Head length	40.4	1.21	39.0-42.7	38.1	37.0	37.2	37.4	1.40	35.9-40.7
Length of dorsal-fin base	55.4	1.93	51.1-57.6	59.9	57.7	54.8	55.4	1.24	53.7-57.1
Length of anal-fin base	17.0	1.10	14.7-18.5	17.3	16.5	16.4	17.0	0.78	15.9-18.1
Distance snout - dorsal-fin origin	37.5	2.08	35.2-42.4	38.4	36.6	35.8	36.0	1.44	33.9-38.6
Distance snout - anal-fin origin	72.2	1.29	69.6-74.0	70.2	70.8	71.4	71.7	0.71	70.3-72.6
Distance snout - pectoral-fin origin	41.1	1.00	39.2-42.8	39.7	41.4	40.7	38.2	1.45	36.0-40.9
Distance snout - pelvic-fin origin	43.3	1.25	41.5-44.6	37.3	37.0	36.2	41.4	0.78	40.4-42.7
In percents of head length									
Head depth	62.4	4.81	52.8-71.0	65.6	72.5	75.3	67.4	4.23	58.8-73.6
Interorbital distance	25.3	2.85	21.2-30.7	29.4	30.3	33.0	25.6	2.06	20.6-28.5
Snout length	38.5	5.50	31.7-46.4	37.1	41.0	40.8	37.2	3.14	32.8-44.0
Eye diameter	27.2	3.04	24.0-30.5	25.4	23.1	24.1	26.9	1.84	23.4-29.4

C. g. guentheri (Tab. 1), the intraspecific variation of measurements corresponds with that observed between populations of *C. g. guentheri* (Tab. 2). Four lower pharyngeal bones of *C. bosumtwensis* and six of *C. g. guentheri* were measured and no remarkable difference in the width/length ratio was found: 0.91-1.16 in *C. g. guentheri*, 0.91-1.00

in *C. bosumtwensis*. It should be noted that one of the specimens of *C. bosumtwensis* and one of *C. g. guentheri* had only 15 scale rows around the caudal peduncle (vs. 16 reported in all members of the genus except *C. g. loennbergi* which has 14 scale rows; Thys van den Audenaerde, 1968). Measurements of *C. g. guentheri* correspond with

the descriptions of the species made by Boulenger (1915), Thys van den Audenaerde (1968), Paulo (1979), Greenwood (1987), Teugels & Thys van den Audenaerde (1992). The life coloration of *C. bosumtwensis* (see Linke, 1989) is the same as in *C. g. guentheri* (see Baerends et al., 1986); the same applies to the coloration of preserved specimens.

The breeding behavior - a significant characteristic within the chromidotilapia cichlids and in the genus *Chromidotilapia* (Staack, 1979, 1982) - is identical in both species (male ovophilic mouth-breeding). For *C. g. guentheri*, it has been described in detail by Myrberg (1965); for *C. bosumtwensis*, it has been documented by Linke (1989) and Freyhof (pers. comm., 1991).

Discussion

Paulo (1979) described *C. bosumtwensis* as a distinct species mainly because of morphological differences in the lower pharyngeal bones, when compared to *C. guentheri*. Paulo stated that it is more elongated in *C. bosumtwensis* than in *C. g. guentheri* and *C. g. loennbergi* (Trewavas, 1962) (see also Trewavas, 1974). All other features are similar or identical in both nominal species. Contrary to Paulo (1979), the present study revealed no difference in the lower pharyngeal bones of *C. g. guentheri* and *C. bosumtwensis*. Therefore it is not possible to separate the species on this feature.

Paulo also mentioned that the head length of *C. bosumtwensis* is shorter than in both *C. guentheri* subspecies, and this too could not be confirmed in the present study.

Teugels & Thys van den Audenaerde (1992) also doubted that *C. bosumtwensis* is a distinct species. My results demonstrate that all measurements and counts of the two species correspond in such a way that it is impossible to separate them. The differences are so small that they are of no value for the differentiation of species. As *C. g. guentheri* shows only slight variability (Tab.1), an anatomical and morphological differentiation of ecotypes or geographic varieties in this subspecies is not possible. Differences between populations of *C. g. guentheri* and *C. bosumtwensis* are similar to interpopulation differences within *C. g. guentheri*, which is a very stable species with low variability, despite the fact that it has a larger distribution than any other species of the ge-

nus. It is known from the St. John River in Liberia to the Cross River in Nigeria and Cameroon as well as from the Niger and Bénoué systems (Teugels & Thys van den Audenaerde, 1992).

Concerning behaviour and life coloration, the original description of *C. bosumtwensis* is somewhat curious because Paulo (1979) explicitly stated that he had not seen living specimens for his work; nevertheless he gave a description of the life coloration for both sexes (obviously deduced from the coloration of *C. g. guentheri*). He also stated a very great similarity of the coloration for both species. Additionally, Paulo had no informations about breeding behaviour of the new species, but he assumed similarity with *C. guentheri* and gave a description of the breeding behaviour of *C. g. guentheri*.

There is apparently another problem in Paulo's account of the natural habitat of *C. bosumtwensis*. Whyte (1974) reported that *C. g. guentheri* is not very common in Lake Bosumtwi itself, but is more abundant in the lower parts and estuaries of the small streams and creeks around the lake, where it occurs together with other widespread Ghanaian species, like *Amphilius atesensis* Boulenger, 1904 or *Barbus ablakes* (Bleeker, 1863) and *Barbus walkeri* Boulenger, 1904, which are not present in the lake (most of the species of the rivers are not found in the lake, which has a water chemistry different from other Ghanaian waters). Additionally, the people of Abono, a village on the lake shore, told me that in the lake the species is mainly found in the estuaries of the rivers and only occasionally (especially after big rainfalls) in other parts of the lake as well. Therefore it is not correct to define the *Chromidotilapia* species of Lake Bosumtwi basin as a species typical for the lake.

In conclusion it is impossible to recognize *C. bosumtwensis* as distinct from *C. g. guentheri*.

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