

# Decline in abundance and distribution of *Limbochromis robertsi* (Teleostei: Cichlidae), an endangered cichlid fish endemic to Ghana, West Africa

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*Limbochromis robertsi* is an endangered freshwater cichlid fish species with a distribution limited to the upper tributaries of the Pra River in Eastern Ghana. The land cover in most parts of its range has undergone substantial changes. Deforestation and forest fragmentation in the Eastern Region of Ghana accelerated dramatically in the last 20 years, with the majority of the forest loss along the banks of rivers and creeks due to artisanal small-scale mining (primarily for gold) and agriculture. Field surveys showed a decrease in the total population of *L. robertsi* by more than 95 % from the early 1990s to 2021. A small population which has been found about 20 years ago in the Western Region of Ghana was not found again. Because of the great decline of the species a stronger conservation and conservation status for it are suggested, as well as breeding programs combining in-situ and ex-situ methods. Potential habitats for re-establishing populations of *L. robertsi* were also investigated.

## Introduction

The cichlid *Limbochromis robertsi* (Fig. 1) is endemic to Ghana, West Africa. It has been known to occur in a number of creeks in the Eastern Region between the villages of Kyebi (also referred to as Kibi) and Asiakwa, mainly within the region of the Atewa Forest (Lamboj, 2000).

Further research on this endangered species (EN, according to IUCN – Dankwa et al., 2020) started in the early 1990s, mainly dealing with the ethology, distribution and generic position of the species (Lamboj, 1993) and later, adding some more systematic and phylogenetic aspects (Lamboj, 1997). For these studies, populations of the Black Krensen Creek and Red Krensen Creek – both close to Kyebi – and one additional creek nearby the village of Sagymase have been used.

In 1998 another small population was discovered in the Draw River Forest and the Ankasa River in the west of Ghana by U. Schliewen from the Zoologische Staatssammlung Munich (ZSM) who deposited the specimens under the catalogue numbers ZSM 20890 and ZSM 20894.

For the following years, no further studies or explorations targeting *Limbochromis robertsi* were undertaken. Only very recently, in 2016 and also in 2018, some additional explorations focusing on the distribution of the species were undertaken, revealing large changes in habitat structure (see Fig. 2) and a strong decrease of all populations around Kyebi, which was probably caused by increasing deforestation, road building and illegal gold mining in the greater Kyebi area and a subsequent high increase of human population size in this area (Lamboj et al., 2020).

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“critically endangered” (facing an extremely high risk of extinction in the wild) to protect this species for the future immediate action is needed. More awareness of the Ghanaian government to protect this species is necessary. The species could be used as a flagship species or as a symbol species to protect Ghana’s tropical forests.

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### Literature cited

- Afum, B. O. & C. K. Owusu. 2016. Heavy metal pollution in the Birim River of Ghana. *International Journal of Environmental Monitoring and Analysis*, 4: 65-74.
- Berkman, H. E. & C. F. Rabeni. 1987. Effect of siltation on stream fish communities. *Environmental Biology of Fishes*, 18: 285-294.
- Boeuf, G. & P.-Y. Le Bail. 1999. Does light have an influence on fish growth? *Aquaculture*, 177: 129-152.
- Brito, I. D., J. R. E. Garcia, A. B. Salaroli, R. C. L. Figueira, C. D. Martins, A. C. Neto, P. K. Gusso-Choueri, R. B. Choueri, S. B. L. Araújo & C. A. D. Ribeiro. 2018. Embryo toxicity assay in the fish species *Rhamdia quelen* (Teleostei, Heptapteridae) to assess water quality in the Upper Iguaçu basin (Paraná, Brazil). *Chemosphere*, 208: 207-218.
- Casatti, L., C. P. Ferreira & F. R. Carvalho. 2009. Grass-dominated stream sites exhibit low fish species diversity and dominance by guppies: an assessment

- of two tropical pasture river basins. *Hydrobiologia*, 632: 273–283.
- Conover, D. O. & B. E. Kynard. 1981. Environmental sex determination – interaction of temperature and genotype in a fish. *Science*, 213: 577–579.
- Damnyag, L., O. Saastamoinen, D. Blay, K. D. Francis, C. N. L. C. N. Anglaaere & A. Pappinen. 2013. Sustaining protected areas: identifying and controlling deforestation and forest degradation drivers in the Ankasa Conservation Area, Ghana. *Biological Conservation*, 165: 86–94.
- Dankwa, H., M. Entsua-Mensah & P. Lalèyè. 2020. *Limbochromis robertsi*. The IUCN red list of threatened species 2020: e.T182617A134821061.
- Dunz, A. R. & U. K. Schliwien. 2010. Description of a new species of *Tilapia* Smith, 1840 (Teleostei: Cichlidae) from Ghana. *Zootaxa*, 2548: 1–21.
- Fugere, V., D. Jacobsen, E. H. Finestone & L. J. Chapman. 2018. Ecosystem structure and function of Afrotropical streams with contrasting land use. *Freshwater Biology*, 63: 1498–1513.
- Ghana Statistical Survey. 2012. Population by region, district, age groups and sex, 2010. Accra, Ghana.
- Greenwood, P. H. 1987. The genera of pelmatochromine fishes (Teleostei, Cichlidae). A phylogenetic review. *Bulletin of the British Museum (Natural History) Zoology Series*, 53: 139–203.
- Guo, E. H., L. D. Chen, R. H. Sun & Z. M. Wang. 2015. Effects of riparian vegetation patterns on the distribution and potential loss of soil nutrients: a case study of the Wenyu River in Beijing. *Frontiers of Environmental Science and Engineering*, 9: 279–287.
- Helfman, G. S. 1983. Underwater methods. Pp. 349–369 in L. A. Nielsen & D. L. Johnson (eds.), *Fisheries techniques*, first edition. Bethesda, American Fisheries Society.
- Hilson, G. 2001. A contextual review of the Ghanaian small-scale mining industry. *Mining, Minerals and Sustainable Development*. 29 pp.
- Ilha, P., L. Schiesari, F. I. Yanagawa, K. Jankowski & C. A. Navas. 2018. Deforestation and stream warming affect body size of Amazonian fishes. *PLoS ONE* 13: e0196560: 1–20.
- Kusimi J. M. 2015. Characterizing land disturbance in Atewa Range Forest Reserve and Buffer Zone. *Land Use Policy*, 49: 471–482.
- Lamboj A. 1993. Vergleichende Untersuchung zur Systematik und Verwandtschaftsproblematis ausgewählter Arten der Gattungen *Limbochromis* und *Chromidotilapia* (Teleostei, Cichlidae). M.Sc. Thesis, Universität Wien.
- Lamboj A. 1997. Systematische Revision der Gattung *Chromidotilapia* (Teleostei; Cichlidae) unter vergleichender Betrachtung anderer Gattungen chromidotilapiiner Cichliden. Ph.D. Dissertation, Universität Wien.
- Lamboj, A. 2000. On the generic status of *Limbochromis cavalliensis* (Thys van den Audenaerde & Loisel, 1971), (Teleostei: Perciformes). *Annalen des Naturhistorischen Museums Wien*, 102 B: 63–74.
- Lamboj, A. 2004. The Cichlid fishes of Western Africa. Bornheim, Birgit-Schmettkamp-Verlag, 256 pp.
- Lamboj, A. 2006. *Limbochromis robertsi* (Thys van den Audenaerde & Loisel, 1971) – ein außergewöhnlicher Buntbarsch aus Ghana. Pp. 123–130 in: H. Greven & R. Riehl (eds.), *Biologie der Aquarienfische*. Tetra, Berlin-Velten.
- Lamboj A., O. Lucanus, P. O. Darko, J. P. Arroyo-Mora & M. Kalacska. 2020. Habitat loss in the restricted range of the endemic Ghanaian cichlid *Limbochromis robertsi*. *Biotropica*, 52: 896–912.
- Lucas M. C. & E. Barras. 2000. Methods for studying spatial behavior of freshwater fishes in the natural environment. *Fish and Fisheries*, 2000: 283–316.
- Mebane, C.A., N. S. Simon & T. R. Maret. 2014. Linking nutrient enrichment and streamflow to macrophytes in agricultural streams. *Hydrobiologia*, 722: 143–158.
- Meijer, J., P. Giesen, S. Shames & S. Scherr. 2018. Towards a living landscape: using scenarios and modelling in the Atewa-Densu landscape in Ghana. The Hague, Netherlands, 64 pp.
- Nóbrega, R. L. B., A. C. Guzha, G. Lamparter, R. S. S. Amorim, E. G. Couto, H. J. Hughes, H. F. Jungkunst & G. Gerold. 2018. Impacts of land-use and land-cover change on stream hydrochemistry in the Cerrado and Amazon biomes. *Science of the Total Environment*, 635: 259–274.
- Perkin, E. K., F. Holker, J. S. Richardson, J. P. Sadler, C. Wolter & K. Tockner. 2011. The influence of artificial light on stream and riparian ecosystems: questions, challenges, and perspectives. *Ecosphere*, 2: 1–16.
- Schwarzer J., A. Lamboj, K. Langen, B. Misof & U. K. Schliwien. 2014. Phylogeny and age of chromidotilapiini cichlids (Teleostei: Cichlidae). *Hydrobiologia*, 748: 185–199.
- Seccatore, J., M. Veiga, C. Origliasso, T. Marin & G. De Tomi. 2014. An estimation of the artisanal small-scale production of gold in the world. *Science of the Total Environment*, 496: 662–667.
- Thys van den Audenaerde D. F. E. & P. V. Loisel. 1971. Description of two new small African cichlids. *Revue de Zoologie et Botanique Africaines*, 83: 192–206.
- Villamizar, N., A. Garcia-Alcazar & F. J. Sanchez-Vazquez. 2009. Effect of light spectrum and photoperiod on the growth, development and survival of European sea bass (*Dicentrarchus labrax*) larvae. *Aquaculture*, 292: 80–86.
- Zongo, B., F. Zongo, A. Toguyeni & J. I. Boussim. 2017. Water quality in forest and village ponds in Burkina Faso (western Africa). *Journal of Forestry Research*, 28: 1039–1048.

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