

***Lacustricola nitida*, a new species of lamprey
from the upper Lualaba drainage,
Democratic Republic of Congo
(Teleostei: Cyprinodontiformes: Procatopodidae)**

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Lacustricola nitida, a new species, is described from a small temporary stream in the Lufupa River system, a left bank tributary of the upper Lualaba drainage in Lualaba province in the Democratic Republic of Congo. It is identified as most similar to *L. matthesi*. Both species share the diagnostic characters of body colour pattern with brilliant blue spots at scale centres, forming longitudinal lines on the flank, and creating a reflective blue body colouration; as well as cephalic sensory system characterized by the combination of supraorbital canal with exposed neuromasts in zigzag shaped continuous groove, at preorbital level in open groove with exposed neuromasts, whereas postorbital and preopercular sensory systems tubular with pores. *Lacustricola nitida* is distinguished from *L. matthesi* by the following unique combination of characters in males: dorsal and anal fins hyaline and without markings (vs. yellow with irregularly curved dotted stripes); as well as in both sexes, a supraorbital sensory system with three exposed neuromasts (vs. four); and a series of morphometric differences, as well as the number of rays in the pectoral fin.

Une nouvelle espèce, *Lacustricola nitida*, est décrite d'un petit ruisseau temporaire dans le bassin de la rivière Lufupa, un affluent gauche du bassin supérieur de la rivière Lualaba, dans la province Lualaba en République Démocratique du Congo. Cette espèce est identifiée comme la plus proche de *L. matthesi*. Les deux espèces montrent les caractères diagnostiques de: coloration du corps avec des taches brillantes dans les centres d'écaillles, formant des lignes longitudinales sur le flanc et créant une coloration bleue réfléchissante du corps; ainsi que la structure du système sensoriel céphalique caractérisé par la combinaison du canal supraorbitaire avec des neuromastes exposés dans une rainure en forme de zigzag; au niveau préorbitaire dans une rainure ouverte avec des neuromastes exposés; tandis que les systèmes sensoriels au niveau postorbital et préoperculaire sont tubulaires avec des pores. *Lacustricola nitida* se distingue de *L. matthesi* par la combinaison unique des caractères suivants des mâles: nageoires dorsale et anale transparentes et sans marques de couleur (vs. jaune avec des rayures pointillées incurvées); ainsi que pour les deux sexes le système sensoriel céphalique au niveau supraorbitaire avec trois neuromastes exposés (vs. quatre); et une série de différences morphométriques, ainsi que le nombre de rayons de la nageoire pectorale.

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Literature cited

- Abell, R., M. L. Thieme, C. Revenga, M. Bryer, M. Kottelat, N. Bogutskaya, B. Coad, N. Mandrak, S. Contreras-Balderas, W. Bussing, M. L. J. Stiassny, P. Skelton, G. R. Allen, P. Unmack, A. Naseka, R. Ng, N. Sindorf, J. Robertson, E. Armijo, J. V. Higgins, T. J. Heibel, E. Wikramanayake, D. Olson, H. L. López, R. E. Reis, J. G. Lundberg, M. H. Sabaj-Pérez & P. Petry. 2008. Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. *BioScience*, 58: 403–414.
- Bragança, P. H. N. & W. J. E. M. Costa. 2019. Multigene fossil-calibrated analysis of the African lampeyes (Cyprinodontoidei: Procatopodidae) reveals an early Oligocene origin and Neogene diversification driven by palaeogeographic and palaeoclimatic events. *Organisms Diversity and Evolution*, 19: 303–320.
- Bragança, P. H. N., P. F. Amorim & W. J. E. M. Costa. 2018. Pantanodontidae (Teleostei, Cyprinodontiformes), the sister group to all other cyprinodontoid killifishes as inferred by molecular data. *Zoosystematics and Evolution*, 94: 137–145.
- Bragança, P. H. N., R. M. van Zeeventer, R. Bills, D. Tweddle & A. Chakona. 2020. Diversity of the southern Africa *Lacustricola* Myers, 1924 and redescription of *Lacustricola johnstoni* (Günther, 1894) and *Lacustricola myaposae* (Boulenger, 1908) (Cyprinodontiformes, Procatopodidae). *ZooKeys*, 923: 91–113.
- Clausen, H. S. 1967. Tropical old world cyprinodonts, reflections on the taxonomy of tropical old world cyprinodonts, with remarks on their biology and distribution. Akademisk Forlag, Copenhagen, 64 pp.
- Dytham C. 2011. Choosing and using statistics: a biologist's guide. Third edition. Wiley-Blackwell, Oxford, Chichester & Hoboken, 320 pp.
- Flügel, T. J., F. D. Eckardt & F. P. D. Cotterill. 2015. The present day drainage patterns of the Congo river system and their Neogene evolution. Pp. 315–337 in: M. J. de Wit et al. (eds.), Geology and resource potential of the Congo basin. Springer, Berlin.
- Flügel T. J., F. D. Eckardt & F. P. D. Cotterill. 2017. The geomorphology and river longitudinal profiles of the Congo-Kalahari Watershed. Pp. 31–52 in: J. Runge (ed.), The African Neogene – climate, environments and people. CRC Press, London.
- Ghedotti, M. J. 2000. Phylogenetic analysis and taxonomy of the poecilioid fishes (Teleostei: Cyprinodontiformes). *Zoological Journal of the Linnean Society*, 130: 1–53.
- Huber, J. H. 1981. A review of the cyprinodont fauna of the coastal plains in Rio Muni, Gabun, Congo, Cabinda and Zaïre, with taxonomic shifts in *Aphyosemion*, *Epiplatys* and west African procatopodins. British Killifish Association, London, 46 pp.
- Huber, J. H. 1999. Updates to the phylogeny and systematics of the African lampeye schooling cyprinodonts (Aplocheilichthyinae: Cyprinodontiformes). *Cybium*, 23: 53–77.
- Hughes, R. H. & J. S. Hughes. 1992. A directory of African wetlands. IUCN, Gland and Cambridge & UNEP, Nairobi, 820 pp.
- James, F. C. & C. E. McCulloch. 1990. Multivariate analysis in ecology and systematics: panacea or Pandora's box? *Annual Review of Ecology and Systematics*, 21: 129–166.
- Lazara, K. J. 2001. The killifishes. An annotated checklist, synonymy, and bibliography of recent oviparous cyprinodontiform fishes: the killifish master index. 4th edition. The American Killifish Association, Cincinnati, 624 pp.
- McDonald, J. H. 2008. *Handbook of biological statistics*. Sparky House, Baltimore, 287 pp.
- Minitab. 2010. [Statistical computer software]. Version 16.2.1. Minitab, Inc., State College.
- Nagy, B. 2014a. *Nothobranchius milvertzi*, a new species of killifish from the Lushiba Marsh in the Lake Mweru drainage, Zambia (Teleostei: Cyprinodontiformes: Nothobranchiidae). *Ichthyological Exploration of Freshwaters*, 24: 347–360.
- Nagy, B. 2014b. *Nothobranchius chochamandai*, a new species of annual killifish from the Luapula drainage, Democratic Republic of Congo (Cyprinodontiformes: Nothobranchiidae). *Ichthyological Exploration of Freshwaters*, 25: 167–183.
- Nagy, B. 2014c. *Nothobranchius flagrans*, a new species of annual killifish from the Lufira drainage, Democratic Republic of Congo (Cyprinodontiformes: Nothobranchiidae). *Ichthyological Exploration of Freshwaters*, 25: 259–276.
- Nagy, B. 2015. Collecting and breeding lampeyes from East Africa. *Killi-News, The Journal of the British Killifish Association*, 566: 58–69.
- Nagy, B. 2017. Collecting killies in the Democratic Republic of Congo. *Tropical Fish Hobbyist*, 65: 46–52.
- Nagy, B. 2018. *Nothobranchius ditte*, a new species of annual killifish from the Lake Mweru basin in the Democratic Republic of the Congo (Teleostei: Nothobranchiidae). *Ichthyological Exploration of Freshwaters*, 28: 115–134.
- Nagy, B., F. P. D. Cotterill & D. U. Bellstedt. 2016. *Nothobranchius sainthousei*, a new species of annual killifish from the Luapula River drainage in northern Zambia (Teleostei: Cyprinodontiformes). *Ichthyological Exploration of Freshwaters*, 27: 233–254.
- Nagy, B., B. R. Watters, P. D. W. van der Merwe, F. P. D. Cotterill & D. U. Bellstedt. 2017. *Nothobranchius cooperi* (Teleostei: Cyprinodontiformes) a new species of annual killifish from the Luapula River drainage, northern Zambia. *African Journal of Aquatic Science*, 42: 201–218.
- Nagy, B. & E. Vreven. 2018. *Micropanchax petnehazyi*, a new species of lampeye cyprinodontiform from the Lufira drainage, Democratic Republic of Congo (Cyprinodontiformes: Poeciliidae). *Ichthyological Exploration of Freshwaters*, 28: 157–169.

- Parenti, M. 1981. A phylogenetic and biogeographic analysis of cyprinodontiform fishes (Teleostei: Atherinomorpha). *Bulletin of the American Museum of Natural History*, 168: 335–557.
- Poll, M. 1938. Poissons du Katanga (bassin du Congo), récoltés par le professeur Paul Brien. *Revue de Zoologie et de Botanique Africaines*, 30: 389–423.
- Poll, M. 1963. Zoogéographie ichtyologique du cours supérieur du Lualaba. Colloque sur les problèmes biogéographiques du Parc National de l'Upemba. *Publications de l'Université d'Elisabethville*, 6: 95–104.
- Poll, M. 1976. Exploration du Parc National de l'Upemba. Mission G. F. de Witte en collaboration avec W. Adam, A. Janssens, L. Van Meel et R. Verheyen (1946–1949). Fascicule 73, Poissons. Fondation pour Favoriser les Recherches Scientifiques en Afrique, Brussels, 127 pp.
- Quinn, G. P. & M. J. Keough. 2002. Experimental design and data analysis for biologists. University Press, Cambridge, 553 pp.
- Rice, W. R. 1989. Analyzing tables of statistical tests. *Evolution*, 43: 223–225.
- Seegers, L. 1996. The fishes of the Lake Rukwa drainage. *Annales Musée Royal de l'Afrique Centrale, Sciences Zoologiques*, Volume 278, 407 pp.
- Seegers, L. 1997. Aqualog: killifishes of the world: old world killis I. A. C. S., Mörfelden-Walldorf, 160 pp.
- Skelton, P. H. 2001. A complete guide to the freshwater fishes of Southern Africa. Struik Publishers, Cape Town, xiv + 395 pp.
- Sokal, R. R. & F. J. Rohlf. 1995. Biometry: the principles and practice of statistics in biological research. Third edition. Freeman, New York, 880 pp.
- Sokal, R. R. & F. J. Rohlf. 2009. Introduction to biostatistics. Second edition. Dover Publications, Mineola, 382 pp.
- Tait, C. C. 1965. Notes on the species *Nothobranchius brieni* Poll (Cyprinodontidae). *The Puku, Occasional Papers of the Department of Game and Fisheries, Zambia*, 3: 125–131.
- Thieme, M. L., R. Abell, M. L. J. Stiassny, P. H. Skelton, B. Lehner, G. G. Teugels, E. Dinerstein, A. Kamdem-Toham, N. D. Burgess & D. Olson. 2005. Freshwater ecoregions of Africa and Madagascar: a conservation assessment. Island Press, Washington, Covelo & London, 483 pp.
- Watters, B. R. 2015. Notes on some interesting lampreys. *Journal of the American Killifish Association*, 48: 61–64.
- Watters, B. R. 2017. Notes on some interesting lampreys – part 2. *Journal of the American Killifish Association*, 50: 118–125.
- Wildekamp, R. H. 1978. Redescription of *Nothobranchius brieni* Poll, 1938 and the description of three new *Nothobranchius* species (Pisces, Cyprinodontidae) from the province of Shaba, Zaire. *Revue de Zoologie Africaine*, 92: 3454.
- Wildekamp, R. H. 1995. A world of killies: atlas of the oviparous cyprinodontiform fishes of the world. Volume II. American Killifish Association, Mishawaka, 384 pp.
- Zar, J. H. 2010. Biostatistical analysis. Fifth edition. Pearson/Prentice-Hall, Upper Saddle River, xii + 944 pp.
- Zuur, A. F., E. N. Ieno & G. M. Smith. 2007. Analysing ecological data (statistics for biology and health). Springer, New York, xxvi + 672 pp.

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