

Phylogenetic position and tentative generic placement for *Cyprinodon martae* Steindachner, 1875 (Teleostei: Cyprinodontiformes), a killifish from northern Colombia

WILSON J.E.M. COSTA

Laboratory of Systematics and Evolution of Teleost Fishes, Institute of Biology, Federal University of Rio de Janeiro, Caixa Postal 68049, CEP 21944-970, Rio de Janeiro, Brasil; wcosta(at)acd.ufrj.br

Accepted 19.ii.2015.

Published online at www.senckenberg.de/vertebrate-zoology on 4.v.2015.

Abstract

Examination of photographs and a radiograph of the holotype of *Cyprinodon martae*, a rare killifish from coastal northern Colombia, revealed that it is not a rivulid by not exhibiting any diagnostic apomorphic condition of the Rivulidae, as well as the character states diagnosing the suborder Aplocheiloidei are not present. On the other hand, besides possessing many characters common among cyprinodontoids but not found among aplocheiloids, it has diagnostic features of the suborder Cyprinodontoidei, such as neural and hemal spines of the preural vertebrae 3 distinctively wider than those spines of the anterior vertebrae. These characters associated to the jaw dentition morphology unambiguously support its inclusion among the Cyprinodontidae, whereas the presence of an enlarged supraoccipital crest strongly suggests that it is a member of the Caribbean killifish genus *Cubanichthys*.

Key words

Caribbean sea, Biodiversity, Osteology, Taxonomy, Systematics.

Introduction

Cyprinodon martae STEINDACHNER, 1875 was first described on the basis of material collected in Santa Marta, northern coast of Colombia (STEINDACHNER, 1875), the only type specimen being deposited in the Naturhistorisches Museum, Wien (NMW 76519). Curiously, this peculiar killifish species, with long dorsal and anal fins never found among species of *Cyprinodon* LACEPÈDE, 1803 (Cyprinodontidae, Cyprinodontoidei) as today delimited, was not collected again. However, some controversy about the possible correct group placement of this species has sporadically appeared in the literature, besides unpublished rumours that it is not even a cyprinodontiform fish (WILDEKAMP, 1995).

GARMAN (1895) kept *C. martae* in *Cyprinodon*, but warning for the shape of the body most similar to *Lebias* (= *Aphanius* NARDO, 1897, Cyprinodontidae, Cyprin-

odontoidae) or *Jenynsia* GÜNTHER, 1866 (Anablepidae, Cyprinodontoidei). FOWLER (1939), considered *C. martae* possibly related to *Cyprinodon jamaicensis* FOWLER, 1939 (= *Cyprinodon riverendi* (POEY, 1860) without justification, whereas WILDEKAMP (1995) listed *Cyprinodon martae* as a *nomen dubium* in the synonymy of *Cyprinodon dearborni* MEEK, 1909 from coastal Venezuela and adjacent Caribbean islands, based only on geographical proximity, but not considering the different characters exhibited by the two species, including among others the short dorsal and anal fins of *C. dearborni*.

HUBER (2000) after examining a photograph and a radiograph of the holotype, showed that it could not be assigned to *Cyprinodon*. Subsequently and more unexpectedly, HUBER (2004) considered it as possibly being an annual rivulid (Rivulidae, Aplocheiloidei) of a new

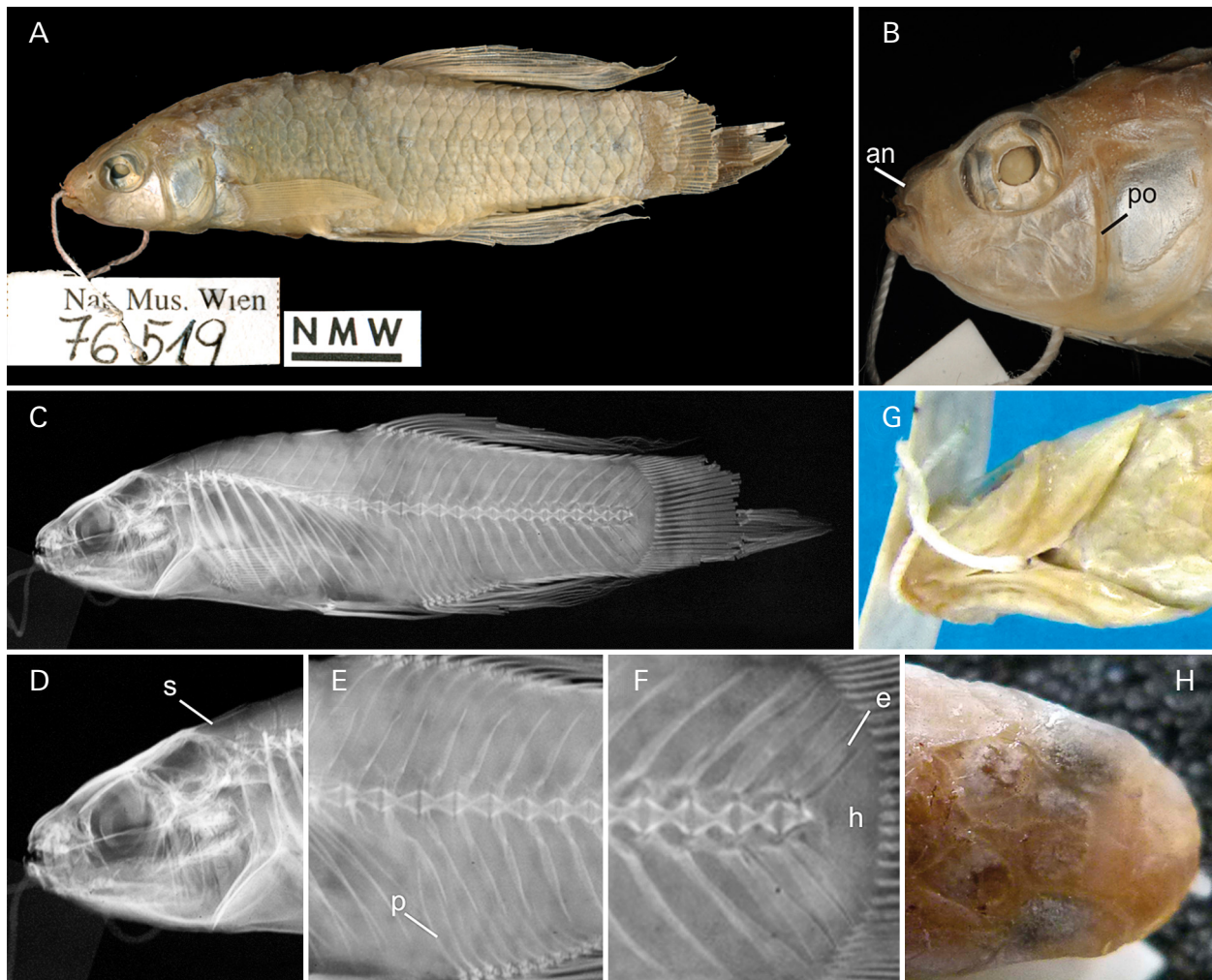


Fig. 1. *Cyprinodon marta*e, NMW 76519, holotype, male, 55 mm SL: Colombia: Santa Marta. A, general left lateral view; B, head, left lateral view; C, radiograph of the entire specimen, left lateral view; D, radiograph of head, left lateral view; E, radiograph of middle portion of trunk, left lateral view; F, radiograph of the caudal skeleton, left lateral view; G, head, ventral view; H, head, dorsal view. Abbreviations: an, anterior nostril; e, epural; h, hypural plate; p, first proximal radial; po, preopercular channel; s, supraoccipital crest.

distinctive genus. More recently, it has been reported in aquarium and ichthyological websites that HUBER (2012, not seen) described a new genus for *C. marta*e in his private journal, placing it close to *Terranatos* TAPHORN & THOMERSON, 1995 (Rivulidae, Aplocheiloidei) (e.g., <http://www.killi-data.org/zz-martaCyprin.php>). Since characters provided in the original description of *C. marta*e are highly conflicting with its placement among rivulids according to our present knowledge about morphology of cyprinodontiforms, photographs in different views and a radiograph image of the type were requested for study, resulting in the present paper.

Material and methods

The specimen studied is deposited in Naturhistorisches Museum, Wien (NMW 76519). Comparative material is

listed in COSTA (2012). Osteological nomenclature follows COSTA (2006).

Results and Discussion

The examination of photographs and a radiograph image of the holotype (Fig. 1) associated to characters described in the original description indicate that *C. marta*e:

—
1) is a cyprinodontiform, by having a single blade-like epural and a well-developed neural spine of the preural vertebra 2, making the dorsal and ventral portions of the caudal skeleton strongly symmetrical (Figs. 1B, F), which together comprise a morphological complex of derived character states that unambiguously diagnoses the Cyprinodontiformes (ROSEN, 1964; PARENTI, 1981; COSTA, 2012);

2) is not a rivulid, by not having a tubular anterior naris (Fig. 1B), which is a synapomorphy of the Aplocheiloidei (PARENTI, 1981; COSTA, 1998), a well-developed pre-opercular channel (Fig. 1B), instead of a rudimentary channel, restricted to a short shallow segment on the dorsal portion of the pre-opercle, which is a synapomorphy of the Rivulidae (PARENTI, 1981; COSTA, 1998), the branchiostegal membrane free of the isthmus (Fig. 1G), instead of continuous, which is a synapomorphy of the Rivulidae (PARENTI, 1981; COSTA, 1998), besides having an intense silver colouration on the opercle and trunk (Figs. 1A–B) and a distinctively long anterior proximal radial of the anal fin (Fig. 1E), which are conditions common among cyprinodontoids and other atherinomorphs, but not occurring in aplocheiloids;

3) is a cyprinodontoid, by having the neural and hemal spines of the preural vertebrae 3 distinctively wider than those spines of the anterior vertebrae (Fig. 1F), which is a synapomorphy of the Cyprinodontoidei (COSTA, 2012: character state 9.1), hypurals completely fused, forming a single broad plate, with dorsal and ventral margins forming an angle of about 90° (vs. about 70° or less), a condition uniquely found among the Cyprinodontoidei;

4) is a cyprinodontid, by having tricuspidate teeth on jaws (STEINDACHNER, 1875), which is synapomorphic both for the Anablepidae (PARENTI, 1981; COSTA, 1998; GHEDOTTI, 1998) and to the Cyprinodontidae (PARENTI, 1981; COSTA, 2011), and by possessing a single row of teeth on jaws, since the Cyprinodontidae differs from all other cyprinodontiforms by having a single tooth row, often followed by an internal irregular row of a few, smaller teeth (COSTA, 2011);

5) probably is a member of the genus *Cubanichthys* HUBBS, 1926 (Cyprinodontidae, Cyprinodontoidei), by having an enlarged supraoccipital crest (Fig. 1D), which is a synapomorphy of *Cubanichthys*, the only genus of the Cubanichthyinae (PARENTI, 1981). In addition, the relative position of dorsal and anal fins, with the dorsal-fin origin placed anteriorly to the anal-fin origin, which is posterior to the mid-length between snout and caudal-fin base (Figs. 1A, C); vs. anterior when dorsal-fin origin is anterior to the anal-fin origin) is a condition common among cyprinodontids, but never found in rivulids; the presence of a rounded snout with a sub-dorsal mouth opening (Fig. 1B, D); vs. dorsal mouth opening is a condition found in *Cubanichthys*, but never in rivulids. Since frontal scales are missing in the holotype (Fig. 1H), it is not possible to check the presence of a large central E-scale, which is a synapomorphy of *Cubanichthys* (COSTA, 1997).

Cubanichthys, a generic name not available at the time of the original description of *C. martae*, presently comprises two species from the Caribbean islands, *C. cubensis* (Eigenmann, 1903) from Cuba and *C. pengelleyi* (Fowler, 1939) from Jamaica. Thus it would not be sur-

prising *C. martae* from the Caribbean area of Colombia being a member of *Cubanichthys*, but its definitive generic allocation should be conducted only after confirmation is made through the study of additional specimens.

Acknowledgements

Thanks are due to Palandacic Anja and Aleksander Naseka for providing the photographs and the radiograph of the holotype. This study was funded by CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico - Ministério de Ciência e Tecnologia).

References

- COSTA, W.J.E.M. (1997): Phylogeny and classification of the Cyprinodontidae revisited (Teleostei: Cyprinodontiformes): are Andean and Anatolian killifishes sister taxa? – *Journal of Comparative Biology*, **2**: 1–17.
- COSTA, W.J.E.M. (1998): Phylogeny and classification of the Cyprinodontiformes (Teleostei: Atherinomorpha): A reappraisal, pp. 537–560, in: MALABARBA, L.R., REIS, R.E., VARI, R.P., LUCENA, Z.M. & LUCENA, C.A.S. (Eds.): *Phylogeny and Classification of Neotropical Fishes*. – Edipucers, Porto Alegre, 606 pp.
- COSTA, W.J.E.M. (2006): Descriptive morphology and phylogenetic relationships among species of the Neotropical annual killifish genera *Nematolebias* and *Simpsonichthys* (Cyprinodontiformes: Aplocheiloidei: Rivulidae). – *Neotropical Ichthyology*, **4**: 1–26.
- COSTA, W.J.E.M. (2011): Redescription and phylogenetic position of the fossil killifish †*Carrionellus diumortuus* White from the Lower Miocene of Ecuador (Teleostei: Cyprinodontiformes). – *Cybio*, **35**: 181–187.
- COSTA, W.J.E.M. (2012): The caudal skeleton of extant and fossil cyprinodontiform fishes (Teleostei: Atherinomorpha): comparative morphology and delimitation of phylogenetic characters. – *Vertebrate Zoology*, **62**: 161–180.
- FOWLER, H.W. (1939): Notes on fishes from Jamaica, with descriptions of three new species. – *Notulae Naturae*, **35**: 1–16.
- GARMAN, S. (1895): The cyprinodonts. – *Memoirs of the Museum of Comparative Zoology*, **19**: 1–179.
- GHEDOTTI, M.J. (1998): Phylogeny and classification of the Anablepidae (Teleostei: Cyprinodontiformes), pp. 561–582, in: MALABARBA, L.R., REIS, R.E., VARI, R.P., LUCENA, Z.M. & LUCENA, C.A.S. (Eds.): *Phylogeny and Classification of Neotropical Fishes*. – Edipucers, Porto Alegre, 606 pp.
- HUBER, J.H. (2000): On *nomina oblita* among cyprinodont species. – *Journal of the American Killifish Association*, **33**: 43–51.
- HUBER, J.H. (2004): What are today's biggest challenges for a better knowledge of killifish (oviparous Cyprinodontiformes)? Part One. – *Killi-News*, **469**: 104–108.
- HUBER, J.H. (2012): Description of *Ysssolebias*, nov. gen., a new monotypic fish genus for an old and phantom species of Colombia. – *Killi-Data Series*, **2012**: 26–31.

- PARENTI, L.R. (1981): A phylogenetic and biogeographic analysis of cyprinodontiform fishes (Teleostei, Atherinomorpha). – *Bulletin of the American Museum of Natural History*, **168**: 335–557.
- ROSEN, D.E. (1964): The relationships and taxonomic position of the halfbeaks, killifishes, silversides, and their relatives. – *Bulletin of the American Museum of Natural History*, **127**: 217–268.
- STEINDACHNER, F. (1875): Ichthyologische Beiträge 4. – *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe*, **72**: 551–616+13 pl.
- WILDEKAMP, R.H. (1995): A world of killies, atlas of the oviparous cyprinodontiform fishes of the world, volume 2. – American Killifish Association, Mishawaka, 384 pp.