



Aphanius farsicus, a replacement name for *A. persicus* (Jenkins, 1910) (Teleostei, Cyprinodontidae)

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Abstract

Gaudant (2011) has shown that *Brachylebias* Priem, 1908 is a junior synonym of *Aphanius* Nardo, 1827 and that therefore the new name for the Late Miocene species *Brachylebias persicus* Priem, 1908 is *Aphanius persicus* (Priem, 1908). In addition, he stated that a new name has to be assigned to the extant *A. persicus* (Jenkins, 1910). However, before a new species name can be assigned, it is necessary to demonstrate that the two species, currently named *A. persicus*, are different. Here we show that slight differences are present in the meristic characters between the fossil *A. persicus* (Priem, 1908) and the extant *A. persicus* (Jenkins, 1910), and that clear differences are present with regard to the size and morphology of the scales and also with regard to the shape of the jaw teeth. We demonstrate that the epithets *blanfordii* and *pluristriatus*, both introduced for *Aphanius* species by Jenkins (1910), do not represent alternative names, and we introduce *A. farsicus* as replacement name for *A. persicus* (Jenkins, 1910).

Key words: *Brachylebias*, tooth-carps, taxonomy, Maharlu Lake Basin

Introduction

Species of the genus *Aphanius* Nardo, 1827 (Cyprinodontidae, tooth-carps) inhabit coastal lagoons, marshes and salty rivers of the circum-Mediterranean area and the Arabian Peninsula as far as Iran and Pakistan; they are suggested to be descendants of the Tethys fauna (Villwock 1999). Two hot spots of the *Aphanius* diversity are known, i.e. Anatolia (Hrbek & Meyer 2003) and Iran (Coad 2000). In Iran, *Aphanius* is represented by *A. dispar* (Rüppell, 1829) which occurs in all coastal drainages of the Persian Gulf and Sea of Oman, and by further six endemic species, i.e. *A. sophiae* (Heckel, 1847) from the Kor River Basin, *A. persicus* (Jenkins, 1910) from the Maharlu Lake Basin, *A. ginaonis* (Holly, 1929) from a hot spring near the Persian Gulf, *A. vladykovi* Coad, 1988 from the upper reaches of the Karun River in the Zagros Mountains, *A. isfahanensis* Hrbek *et al.*, 2006 from the Zayandeh River Basin, and *A. mesopotamicus* Coad, 2009 from the Tigris–Euphrates Basin.

The fossil record of *Aphanius* is well known for the areas of the Western and Central Paratethys and Mediterranean Sea (Reichenbacher & Kowalke 2009), but poorly known for the Eastern Paratethys, Middle and Far East, from where only three fossil *Aphanius* species have been described (Vasilyan *et al.* 2009). A fourth fossil *Aphanius* species from that area was described by Gaudant (2011), who showed that *Brachylebias* Priem, 1908 is a junior synonym of *Aphanius* Nardo, 1827 and that therefore the fossil species *B. persicus* Priem, 1908 from the Late Miocene of NW Iran is now *A. persicus* (Priem, 1908). Gaudant (2011) also mentioned that (the extant) *A. persicus* (Jenkins, 1910) now becomes a homonym of *A. persicus* (Priem, 1908), calling for a replacement name.

However, before a new species name can be assigned, it is necessary to demonstrate that the two species, currently named *Aphanius persicus*, are different. The objectives of this study are (i) to show that clear differences are present between the fossil *A. persicus* (Priem, 1908) and the extant *A. persicus* (Jenkins, 1910), (ii) to demonstrate that the specific names *blanfordii* and *pluristriatus*, both introduced for *Aphanius* species by Jenkins (1910), are not alternative epithets, and (iii) to introduce *A. farsicus* as replacement name for *A. persicus* (Jenkins, 1910).

Material and methods

Localities, sampling. Six articulated fossil specimens of *Aphanius persicus* (Priem, 1908) were available from their type locality in the Tabriz Basin, NW Iran (Fig. 1) (material from Reichenbacher *et al.* 2011). A total of 47 specimens of *A. persicus* (Jenkins, 1910) were collected using hand net from the Maharlu Lake Basin (Fig. 1). The studied fossil specimens are kept in the Bavarian State Collection for Palaeontology and Geology (BSPG 2010 XXI-14 and -15), the extant specimens are deposited in the Collection of Biology Department of Shiraz University (ZM-CBSU), Iran.

Methods. Meristic characters were counted using standard methods (Table 1). Scale morphology and jaw teeth shape were investigated under a stereoscope. The J scale length index ($= \text{scale length} / \text{standard length} * 100$) and the J scale width index ($\text{scale width} / \text{standard length} * 100$) (after Esmaili 2001) were calculated for the scales of the first and second row below the dorsal fin. To avoid ontogenetic effects, we examined scales and teeth from two fossil and two extant specimens of similar sizes; standard length (mm) was 26.0 and 31.0 for the fossil, and 27.0 and 32.0 for the extant specimens.

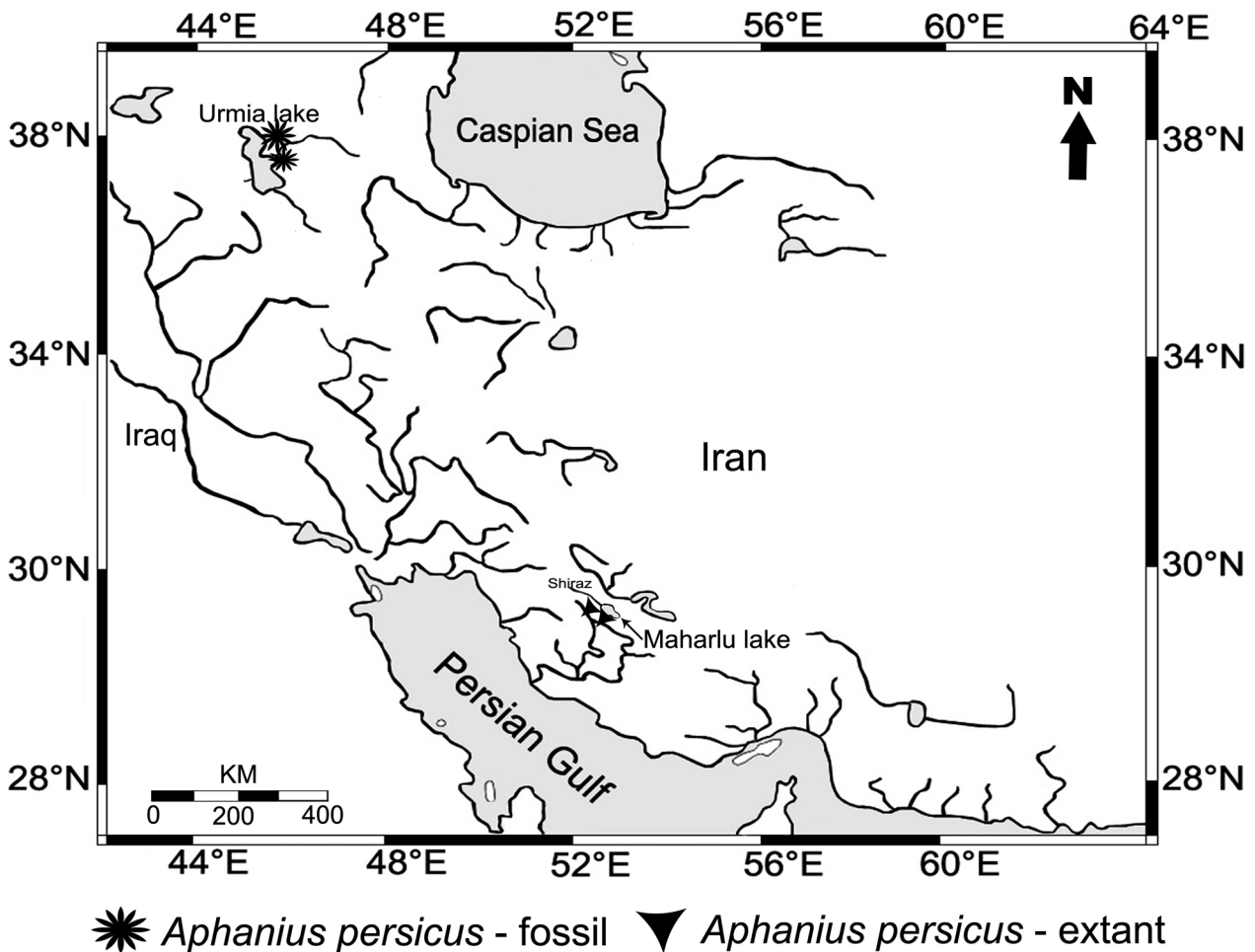


FIGURE 1. Geographic locations of the fossil *Aphanius persicus* (Priem, 1908) and of the extant *Aphanius persicus* (Jenkins, 1910).

Results

A comparison of the meristic characters reveals that the values obtained from the fossil *Aphanius persicus* (Priem, 1908) are similar to those obtained from the extant *A. persicus* (Jenkins, 1910), but that the mean numbers of dorsal-fin rays and pectoral fin rays are lower in the fossil (Table 1). In addition, differences are recognizable with regard to the scales (size and morphology) and teeth (sizes of lateral cusps).

TABLE 1. Meristic characters and J scale indices of the fossil and extant species currently named *Aphanius persicus*. Number of vertebrae for the extant species from Coad (2011).

	<i>A. persicus</i> (Priem, 1908) (n = 6)	<i>A. persicus</i> (Jenkins, 1910) (n = 47)
Abdominal vertebrae	11	9 – 13
Postabdominal vertebrae	14 – 15	12 – 16
Number of dorsal fin rays	9 – 11	11 – 14 (12.66 ± 0.73)
Number of anal fin rays	10 – 12	10 – 13 (11.70 ± 0.70)
Number of pectoral fin rays	12 – 13	14 – 18 (16.02 ± 0.82)
	Specimen with SL = 26 mm	Specimen with SL = 27 mm
J scale length index	2.6 – 2.8	4.0 – 4.2
J scale width index	2.4 – 2.6	3.4 – 4.0
	Specimen with SL = 31 mm	Specimen with SL = 32 mm
J scale length index	2.6 – 2.8	4.2 – 4.6
J scale width index	2.0 – 2.25	4.3 – 5.2

The scales are considerably smaller in the fossil than in the extant species (Table 1). In addition, the morphology of the scales differs as the radii of the fossil scales are separated from each other in the anterior part of the scale (Fig. 2 A2–3, C2), whereas the radii in the scales of the extant species lack this separation (Fig. 2 B1–2, D1–2). Moreover, the fossil scales have a lower number of circuli and radii in the anterior field than the scales of the recent species (Fig. 2 A2–3, B1–2, C2, D1–2).

The comparison of the tricuspid jaw teeth at the premaxillary and dentary reveals that the central cusp is of similar length in the fossil and the extant species, but that the lateral cusps are slightly longer (0.05 mm) in the fossil in comparison with the recent species (0.02–0.03 mm) (Fig. 3B–C).

Discussion

The different size and morphology of the scales and the differences in the jaw tooth morphology allow for a safe discrimination of the two species that are currently named *Aphanius persicus*. Based on the principle of priority of the International Code of Zoological Nomenclature (§23, International Commission on Zoological Nomenclature 1999), the name for the fossil species, i.e. *A. persicus* (Priem, 1908) has priority and therefore a new name is needed for *A. persicus* (Jenkins, 1910).

Jenkins (1910) has described from the area near Shiraz besides *Cyprinodon persicus* two further species, i.e. *C. blanfordii* (“East of Shiraz”) and *C. pluristriatus* (“East of Shiraz, near Fassa”). Wildekamp (1993) has indicated that all three species may be synonymous with *Aphanius sophiae* (Heckel in Russegger, 1846). Coad (2011) agrees with this interpretation only with regard to *A. blanfordii*, of which he found three syntypes to be identical with female *A. sophiae* based on the pigment pattern (i.e. spotted on the flank with a lozenge-shaped spot at the caudal-fin base). It has not up to date been ascertained whether *A. pluristriatus* too, is a synonym of *A. sophiae* or another previously described species. As a result, we refrained from using the epithet *blanfordii* (because it represents a younger synonym of *A. sophiae*), and we also refrained from using the name *pluristriatus* (because future studies may reveal that it represents a valid species). Consequently, *A. farsicus* is introduced here as a replacement name for *A. persicus* (Jenkins, 1910).

Etymology: *farsicus* is a noun (not declinable), which refers to the Fars Province, in which the type locality is located.

The proposed common names are Farsi tooth-carp and Kapour -e- dandandar-e-Farsi.

Type locality: Spring on the edge of Shiraz Lake (= Maharlu Lake), Fars Province, southern Iran.

Synonyms: *Cyprinodon persicus* Jenkins, 1910; *Aphanius persicus* (Jenkins, 1910).

Distribution: *Aphanius farsicus* has been recorded and collected only from the Maharlu Lake Basin, near Shiraz, Fars province, where it inhabits small freshwater spring-stream systems and pools of varying salinity. Due to the recent droughts in southern Iran, the species is in strong need of conservation.

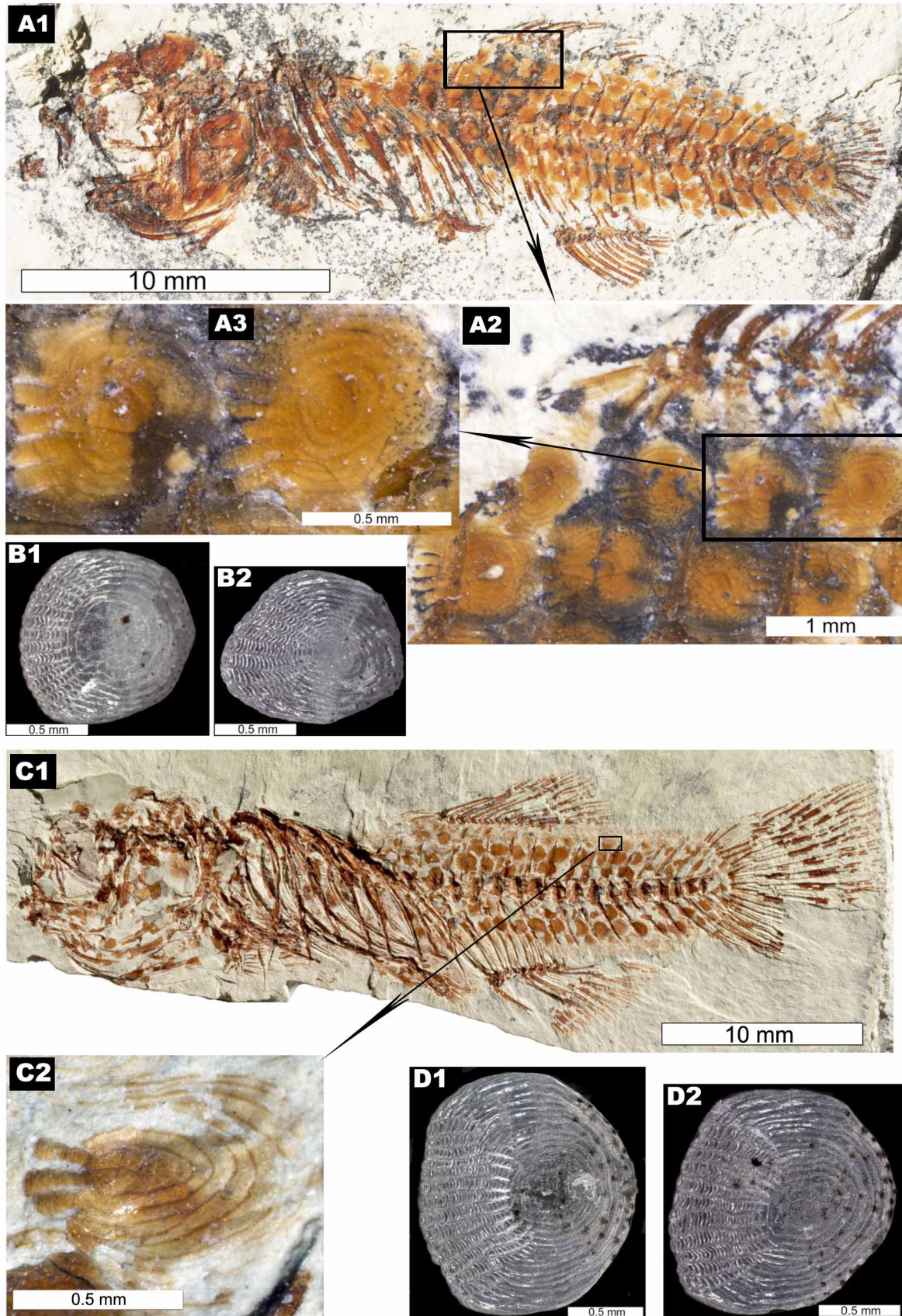


FIGURE 2. Fossil *Aphanius persicus* (Priem, 1908) (A1, C1) and details of scale morphology in the fossil species (A2–3, C2) and in the extant *A. persicus* (Jenkins, 1910) (B1–2, D1–2).

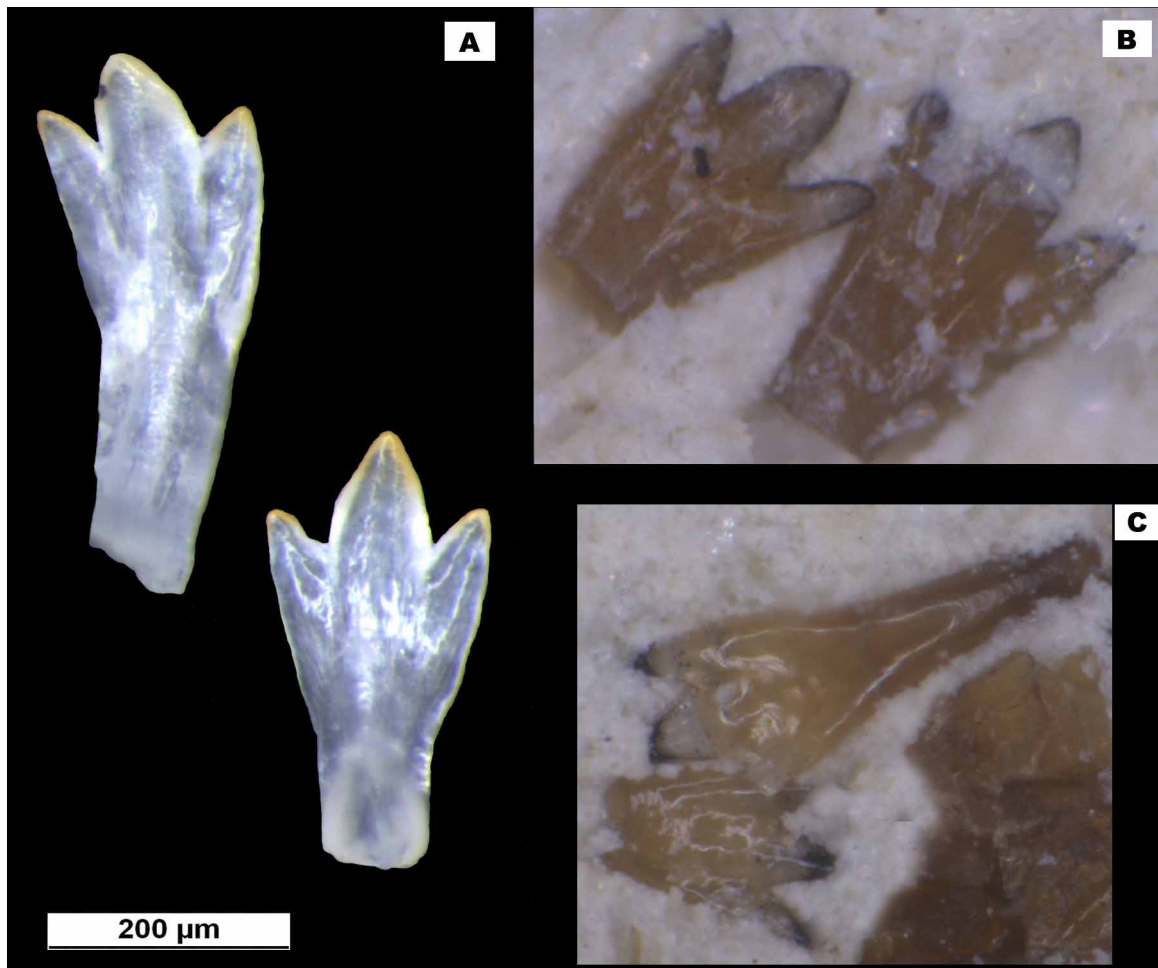


FIGURE 3. Jaw teeth from the extant *Aphanius persicus* (Jenkins, 1910) (A) and from the fossil *A. persicus* (Priem, 1908) (B–C).

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References

- Coad, B.W. (2000) Distribution of *Aphanius* species in Iran. *Journal American Killifish Association*, 33, 183–191.
- Coad, B.W. (2011) Freshwater fishes of Iran. <http://www.briancoad.com>. (accessed 17 July 2011).
- Esmaeili, H.R. (2001) *Biology of an exotic fish, silver carp, Hypophthalmichthys molitrix, from Gobindsagar reservoir, India*. Punjab University, India, PhD thesis.
- Gaudant, J. (2011) *Aphanius persicus* (Priem, 1908) (Pisces, Teleostei, Cyprinodontidae): une nouvelle combinaison pour *Brachylebias persicus* Priem, 1908, du Miocène supérieur des environs de Tabriz (Iran). *Geodiversitas*, 33, 347–356.
- Hrbek, T. & Meyer, A. (2003) Closing of the Tethys Sea and the phylogeny of Eurasian killifishes (Cyprinodontiformes: Cyprinodontidae). *Journal Evolutionary Biology*, 16, 17–36.
- International Commission on Zoological Nomenclature (1999) *International Code of Zoological Nomenclature*. International Trust for Zoological Nomenclature, London, xxix + 306 pp.

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- Jenkins, J.T. (1910) Notes on fish from India and Persia, with descriptions of new species. 1. On a collection of fishes made by W. T. Blanford in 1872 in Persia and Baluchistan. *Records of the Indian Museum*, 5, 123–128.
- Priem, F. (1908) Poissons fossiles de Perse (Mission de Morgan). In: Morgan, J. de (Ed.). *Délégation scientifique en Perse*. Annales d'Histoire naturelle, 1, Paris, pp. 1–25.
- Reichenbacher, B. & Kowalke, T. (2009) Neogene and present-day zoogeography of killifishes (*Aphanius* and *Aphanolebias*) in the Mediterranean and Paratethys areas. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 281, 43–56.
- Reichenbacher, B., Alimohammadian, H., Sabouri, J., Haghfarshi, E., Faridi, M., Abbasi, S., Matzke-Karasz, R., Fellin, M.G., Carnevale, G., Schiller, W., Vasilyan D. & Scharrer, S. (2011) Late Miocene stratigraphy, palaeoecology and palaeogeography of the Tabriz Basin (NW Iran, Eastern Paratethys). *Palaeogeography, Palaeoclimatology, Palaeoecology*. 311, 1–18.
- Vasilyan, D., Reichenbacher, B. & Carnevale G. (2009) A new fossil *Aphanius* species from the Upper Miocene of Armenia (Eastern Paratethys). *Paläontologische Zeitschrift*, 83, 511–519.
- Villwock, W. (1999) Biogeography of the Cyprinodontiform fishes (Teleostei: Cyprinodontidae) of the Mediterranean region. In: Planelles-Gomis, M. (Ed.). *Peces Ciprinodóntidos Ibéricos Fartet y Samaruc Monografía*. Generalitat Valenciana, València, pp. 13–31.
- Wildekamp, R.H. (1993) *A world of killies*. *Atlas of the Oviparous Cyprinodontiform fishes of the World*, Vol. 1, American Killifish Association, Mishawaka, 311 pp.