

Brief communication

Threatened fishes of the world: *Aphanius iberus* (Cuvier & Valenciennes, 1846) (Cyprinodontidae)

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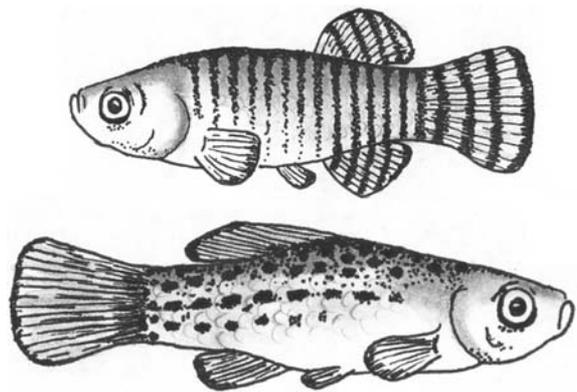
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Common names: Iberian toothcarp; Fartet (Spanish). **Conservation status:** DD (IUCN 2004); EN B1 + 2bcd in the Red List of freshwater fish from Spain (Doadrio 2002). **Identification:** Iberian endemism. Morphological analyses revealed the existence of different morphotypes (García-Berthou et al. 1989, Doadrio et al. 2002), however, the degree of differentiation is similar to that detected in closely related species. *A. iberus* differs from all other known species of *Aphanius* in the combination of 8–9 branched rays in the anal fin, 9–10 branched rays in the dorsal fin, short and high caudal peduncle, and greater preorbital length than *Aphanius baeticus* (the most similar species). *A. iberus* is sexually dimorphic. Adult males show a coloration pattern characterized by narrow silver transversal bars along the body side, which are continued on the caudal fin (3–4 bars). Females show numerous small dark spots on the body flanks which tend to form rows, one of them along the lateral line. Males (Total length_{max} ≤ 45 mm) are smaller overall than females (Total length_{max} ≤ 60 mm). Illustration by Ana I. Torres. **Distribution:** The distribution range of *A. iberus* is characterized by a high degree of isolation among its populations, the former continuous distribution having been fragmented into small isolated areas. It is restricted to the eastern Spanish coastline and into three biogeographical areas: Catalanian, Levantine and Murcian (*sensu* Doadrio et al. 1996). Traditional information of its distribution range included littoral areas of the Atlantic coast of the Southern Iberian Peninsula; however, it has been observed that Atlantic and Mediterranean populations are genetically and morphometrically different and a new species, *A. baeticus*, for the Atlantic area has been described (Doadrio et al. 2002). Due to fixed genetic differences, independent conservation units have been established (García-Marín et al. 1990, Fernández-Pedrosa et al. 1995, Doadrio et al. 1996, Perdices et al. 2001, Torralva & Oliva-Paterna 2002). **Abundance:** The species is locally abundant mainly in salt exploitation sites, but their populations are sparse and some of them are continuously decreasing in abundance. Indeed, no more than twenty wild populations exist. **Habitat and ecology:** *A. iberus* is an eurythermic and euryhaline cyprinodontid which mainly inhabits brackish water of salt marshes, coastal lagoons and river-mouths (Moreno-Amich et al. 1999, Oltra & Todolí 2000), although it also occurs in freshwater and/or low salinity creeks. The biology of the species is characterized by fast growth and reduced longevity (Age_{max} ≤ 2+) (García-Berthou & Moreno-Amich 1992, Vargas & De-Sostoa 1997, García-Berthou et al. 1999). *A. iberus* has not shown a wide trophic spectrum; it has an omnivorous diet with temporal variations. Preys are mainly crustaceans and insects only represented 15% of his diet (Vargas & De Sostoa 1999). **Reproduction:** *A. iberus* shows a reproductive strategy adapted to unstable environments, reaching maturity early (in the first few months of life) and showing a high reproductive effort. It is a multiple spawner that releases batches of eggs between May and August in the Ebro delta, although two moments appeared to stand out as most important (Vargas & De-Sostoa 1997). The spawning period is longer in its southern localities (Mar Menor coastal lagoon). **Threats:** *A. iberus* is threatened due to their limited and isolated distribution. During the last three decades there has been a progressive loss and alteration of its habitat especially as a result of an intensive agriculture and tourism development. Current threats to its habitats and its populations include the destruction of habitats, water pollution (e.g. nitrate input increment from golf resorts) and the introduction of exotic species, mainly *Gambusia holbrooki* (Agassiz, 1859) which appear to have displaced *A. iberus* from its habitat (Rincón et al. 2002). Inland populations are restricted to small creeks and are threatened by the depletion of water levels in local aquifers; its survival depends on strict control over the use of groundwater resources. The loss of traditional salt exploitation mines, as an important coastal habitat for the species, is another threat.



Conservation action: *A. iberus* is included into the Annexes II and III of The Bern Convention (1979) and in the Annexe II of the European Council Directive (1992/43/EEC). At a national level, it is included in the Spanish National Catalogue of Threatened Species. In Spain, when a species is considered an endangered species, regional autonomous governments are obliged to develop a Recovery Plan. In this way, since 1994 conservation plans have been developed in their first phases by different autonomous environmental agencies. Recently, a LIFE-nature project (LIFE04 NAT/ES/000035) has begun exclusive efforts to increase the survival of two defined genetic units of *A. iberus* in the Murcian region. **Conservation recommendations:** Four criteria must be satisfied to ensure the species no longer needs the protection: (1) Present wild populations must be made secure by reducing existing and potential threats to the greatest extent possible, and population size must be considered stable or increasing; (2) viable wild populations have been re-established in the most natural habitats within the *native range* (*sensu* Hendrickson & Brooks 1991). No new population will be considered established until the population has persisted for a minimum of ten years; (3) protection and establishment of Refugium populations (Minckley & Deacon 1991); (4) correct conservation plans should recognize the established conservation units and should be managed separately, promoting the use of natural stocks as sources of genetic diversity (Perdices et al. 2001) and the use of wild stocks to initiate captive breeding programs (Schönhuth et al. 2002). **Remarks:** *A. iberus* recovery will depend on the coordination of social, economic and political actions in the Spanish Mediterranean area. The participation of conservationist organizations could be essential. Educational and information programs are strongly important, in this way it could be remarkable the edition of the Iberian Cyprinodontids Monography (Planelles 1999).

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- Doadrio, I. 2002. Atlas y Libro Rojo de los Peces Continentales de España. CSIC y Ministerio de Medio Ambiente, Madrid. 374 pp. (in Spanish).
- Doadrio, I., A. Perdices & A. Machordom. 1996. Allozymic variation of the endangered killifish *Aphanius iberus* and its application to conservation. *Env. Biol. Fish.* 45: 259–271.
- Doadrio, I., J.A. Carmona & C. Fernández-Delgado. 2002. Morphometric study of the Iberian *Aphanius* (Actinopterygii, Cyprinodontiformes), with description of a new species. *Folia Zool.* 51(1):67–79.
- Fernández-Pedrosa, V., A. González, M. Planelles & A. Moya. 1995. Mitochondrial DNA variability in three Mediterranean populations of *Aphanius iberus*. *Biol. Conserv.* 72: 251–256.
- García-Berthou, E., R. Moreno-Amich, J.L. García-Marín, A. Vila & C. Plá. 1989. Caracterización biométrica y genética de *Aphanius iberus* (Pisces, Cyprinodontidae) en Catalogne. *Bull. Soc. Zool. de France* 114(3):158–159.
- García-Berthou, E. & R. Moreno-Amich. 1992. Age and growth of an Iberian cyprinodont, *Aphanius iberus* (Cuv. & Val.), in its most northerly population. *J. Fish Biol.* 40: 929–937.
- García-Berthou, E., C. Fernández-Delgado, Q. Pou, D. Boix & R. Moreno-Amich. 1999. Edad y Crecimiento del Fartet, *Lebias iberica* Valenciennes, 1846: Comparación entre las poblaciones del Ampurdán (Cataluña) y del Río Guadalquivir (Andalucía). pp. 235–251. *In: Peces Ciprinodontidos Ibéricos: Fartet y Samarc. Monografía. Conselleria de Medio Ambiente. Generalitat Valenciana. Valencia. Spain* (in Spanish).
- García-Marín, J.L., A. Vila & C. Plá. 1990. Genetic variation in the Iberian toothcarp, *Aphanius iberus* (Cuvier & Valenciennes). *J. Fish Biol.* 37: 233–234.
- Hendrickson, D.A. & J.E. Brooks. 1991. Trasplanting short-lived fishes in North American Deserts: Review, Assessment and Recommendations. pp. 283–298. *In: W.L. Minckley & J.E. Deacon, (eds), Battle Against Extinction: Native Fish Management in the American West, The University of Arizona Press, Arizona, USA.*
- Minckley, W.L. & Deacon, J.E. (eds.). 1991. *Battle Against Extinction: Native Fish Management in the American West. The University of Arizona Press, Arizona, USA.*
- Moreno-Amich, R., M. Planelles, C. Fernández-Delgado & E. García-Berthou. 1999. Distribución Geográfica de los ciprinodontiformes en la Península ibérica. pp. 33–57. *In: M. Planelles (ed.), Peces Ciprinodontidos Ibéricos: Fartet y Samarc. Monografía. Generalitat Valenciana, Valencia, Spain* (in Spanish).
- Oltra, R. & R. Todolí. 2000. Reproduction of the endangered killifish *Aphanius iberus* at different salinities. *Env. Biol. Fish.* 57: 113–115.
- Perdices, A., J.A. Carmona, C. Fernández-Delgado & I. Doadrio. 2001. Nuclear and mitochondrial data reveal high genetic divergence among Atlantic and Mediterranean populations of the Iberian Killifish *Aphanius iberus* (Teleostei: Cyprinodontidae). *Heredity* 87: 314–324.
- Planelles, M. (ed.). 1999. *Peces Ciprinodontidos Ibéricos: Fartet y Samarc. Monografía. Conselleria de Medio Ambiente. Generalitat Valenciana, Valencia, Spain* (in Spanish).
- Rincón, P.A., A.M. Correas, F. Morcillo, P. Risueño & J. Lobón-Cerviá. 2002. Interaction between the introduced eastern mosquitofish and two autochthonous Spanish toothcarps. *J. Fish Biol.* 61: 1560–1585.
- Schönhuth, S., G. Luikart & I. Doadrio. 2002. Effects of a founder event and supplementary introductions on genetic variation in a captive breeding population of the endangered Spanish killifish. *J. Fish Biol.* 63: 1538–1551.

- Torralva, M. & F.J. Oliva-Paterna. 2002. Problemática de los Ciprinodóntidos en el Sureste Peninsular: Criterios y Estrategia de Recuperación. pp. 313–320. *In: Atlas y Libro Rojo de los Peces Continentales de España*. CSIC y Ministerio de Medio Ambiente (eds). Madrid (in Spanish).
- Vargas, M.J. & A. De Sostoa. 1997. Life-history pattern of the Iberian toothcarp *Aphanius iberus* (Pisces, Cyprinodontidae) from a Mediterranean estuary, the Ebro delta (Spain). *Neth. J. Zool.* 2: 143–160.
- Vargas, M.J. & A. De Sostoa. 1999. Ecología Trófica del Fartet, *Lebias iberica*, en el Delta del Ebro. pp. 133–150. *In: Peces Ciprinodóntidos Ibéricos: Fartet y Samaruc*. Monografía. Edita: Generalitat Valenciana. Coord: M. Planelles. 357 pp. (in Spanish).