

## DISTRIBUTION PATTERN OF THE GENUS *BARBUS* (PISCES, CYPRINIDAE) IN THE FRESHWATERS OF GREECE

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Dans les eaux continentales grecques vivent 7 espèces du genre *Barbus*: *albanicus*, *graecus*, *barbus*, *peloponnesius*, *cyclolepis*, *euboicus* et *prespensis*. Les trois premières sont de grande taille (plus de 50 cm) et présentent un caractère plutôt fluviolacustre, tandis que les quatre autres, ayant une taille de 25—35 cm, sont habituellement rhéophiles.

The distribution and the systematic position of many freshwater fishes is still an open problem for Greece. The relief of the country and also the complexity and the geological history of its aquatic systems have produced enough special places, in which some of the most original species of the European freshwater fishes have found refuge. The list of true freshwater fishes of Greece includes 70 native species, 30 of which are endemic in the country and some also in the adjacent regions (Economidis, unpubl. data). Some of these endemic species are: *Eudontomyzon hellenicus*, *Silurus aristotelis*, *Scardinius graecus*, «*Phoxinellus*» *stymphalicus*, *Tropidophoxinellus spartiaticus*, *T. hellenicus*, *Cobitis trichonica*, «*Gobius*» *pygmaeus*, *Valencia leourneuxi*.

One of the interesting steps towards a better knowledge of the freshwater fish fauna of Greece is to give a more precise distribution of the species. This is important especially because there were found many errors on this matter in the past, and because a more complete zoogeographical classification also needs correct data. The distribution pattern of the genus *Barbus*, presented here, is one of the best examples of this point of view.

### Barbels in Greek waters

Greece is the richest country of Europe in species of the genus *Barbus*. According to Economidis (1973) Greek lakes and rivers are populated with 7 species of *Barbus*, while in other regions of Europe, like Iberia, where the speciation of this genus is also high, the species are 6 (Alm a ç a, 1984). Among the Greek barbels, *B. albanicus*, *B. graecus* and *B. euboicus* are endemic species with distribution limited to the country. Another species, *B. prespensis*, is also endemic in the system of Prespa Lakes in the Greco-Albano-Yugoslavian frontiers. Two more species, *B. peloponnesius* (= *B. me-*

*ridionalis* by authors from Greece) and *B. cyclolepis*, represented by a lot of endemic sub-species, the systematic position, the validity and the distribution of which are under investigation, are also found in Greece. Finally, *B. barbatus* is a European species which has penetrated from the Axios River valley down to Thessaly.

Ecologically speaking, we can recognize two main groups. The first one includes species capable of reaching sizes more than 50 cm. *B. albanicus*, *B. graecus* and *B. barbatus* fall into this category. These species present a rather fluvio-lacustrine character, frequenting mainly great rivers and lakes. The second group also encloses three species, *B. peloponnesius*, *B. cyclolepis* and *B. euboicus*. They stay almost permanently in rivers and streams, especially the smaller ones, and their tributaries, and rarely frequent lakes. These species are of small size, up to 23 cm. The species *B. prespensis* shows an intermediate character living both in the streams flowing into Prespa and in lakes.

The species of the two main groups, being competitive to each other, never coexist in the same aquatic system. However, in two cases it seems that we have a break of this rule. The first one concerns *B. albanicus* and *B. graecus* which, according to the literature (Steindachner, 1985; Koller, 1927; Stephanidis, 1939), live together in the Acheloos River system. Nevertheless, I have now much evidence (unpubl. data) that *B. graecus* exists neither in the Acheloos River nor in all aquatic systems of W. Greece.

The second case concerns the coexistence of *B. peloponnesius* and *B. cyclolepis* in the Axios River system. This is not a true coexistence because, according to Economidis & Voyadjis (1985), *B. cyclolepis* is limited to the left tributaries of the Axios River in Greek territories, especially the one coming from the Doirani Lake. On the other hand, *B. peloponnesius* is widely distributed in the Axios River (Vardar) in Yugoslavia (Grupce & Dimorski, 1973) and only in the right side tributaries of the river in Greece. According to Economidis and Voyadjis (op. cit.), the penetration of *B. cyclolepis* into the left side tributaries of the Axios River system has been effected through the Strymon River system to the Doirani Lake system and then to Axios. It seems that the species has not yet invaded the main bed of the Axios River, probably because the connexion of the left side tributaries with the Axios is not so easy.

#### Fluvio-lacustrine barbels

*Barbus albanicus* and *B. graecus* are among the oldest elements of the European fish fauna, living on the opposite slopes of Pindus mountains, while *B. barbatus* occupies the area of Thessaly and Macedonia (Fig. 1).

*Barbus albanicus* Steindachner, 1870 is distributed in Peloponnisos (Pinios River only), and in all the large aquatic systems of W. Greece, from the Mornos River to Kalamas, with the exception of the Aheron River. It seems that the northern extension of the distribution of the species is limited to Greece, not exceeding the Kalamas River system. According to

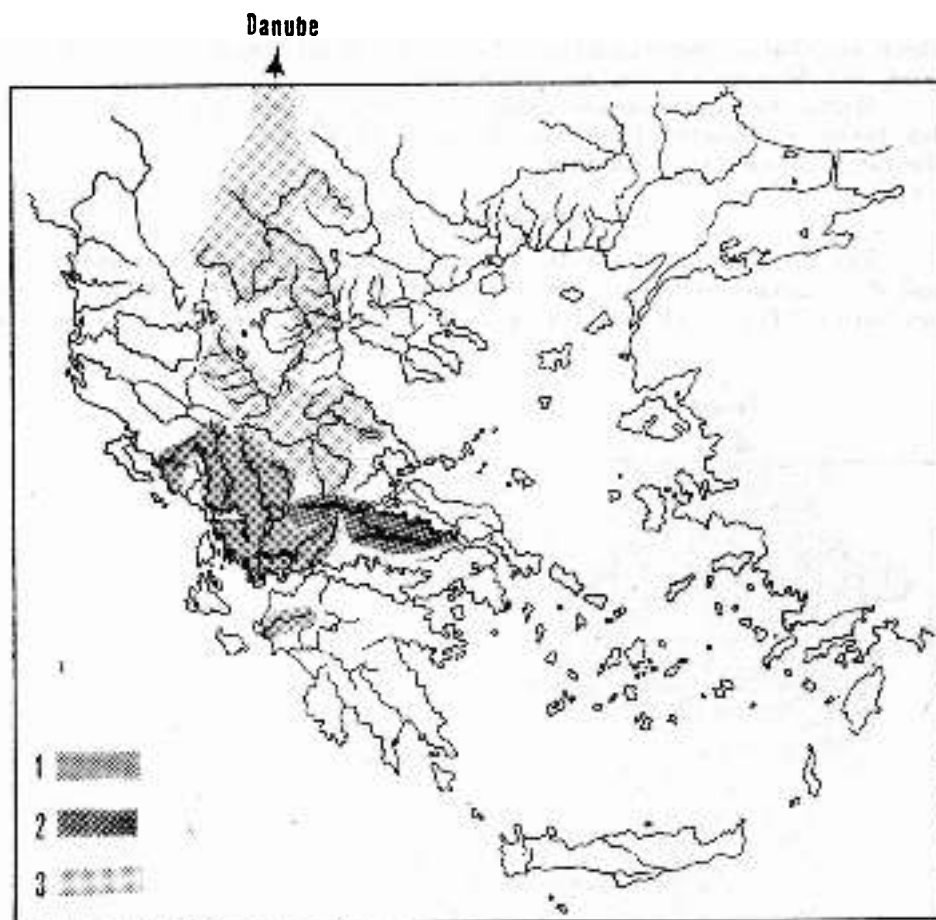


Fig. 1 — Distribution of fluvio-lacustrine *Barbus* in Greece: 1, *B. albanicus* Steind.; 2, *B. graecus* Steind.; 3, *B. barbus* (L.).

the available bibliography from Albania (Valdykov & Petit, 1930; Poljakov et al., 1958; Oliva, 1961) *B. albanicus*, in spite of its name, does not live in this country.

*Barbus graecus* Steindachner, 1895 has a more restricted distribution and it is found only in the south — eastern part of Continental Greece, i.e. in Beotia (Yliki and Paralimni Lakes and Kifissos River) and in the Sperchios River. The presence of the species in this river will be considered as important from the zoogeographical point of view because there is a mixed fish fauna. This fauna includes some species, like *Alburnoides bipunctatus*, *Barbus cyclolepis*, *Leuciscus cephalus* and *Pungitius hellenicus* with obvious relationships to fish fauna coming from the North and East. On the other hand,

the species *Barbus graecus* and "*Phoxinellus*" *symphalicus marathonicus*, which are characteristic elements of the old and original fish fauna of Southern and Western Greece, are also encountered in the above area.

*Barbus barbatus* (Linnaeus, 1758) is a typical species of Central Europe's fish fauna, distributed from Macedonia to Thessaly and frequenting only the large rivers Axios, Aliakmon and Pinios.

#### Rheophilic barbels

The distribution of the two main rheophilic species, *B. peloponnesius* and *B. cyclolepis* in Greece, covers almost all the country with the exception of its SE part (Fig. 2). As a general rule, *B. peloponnesius* extended

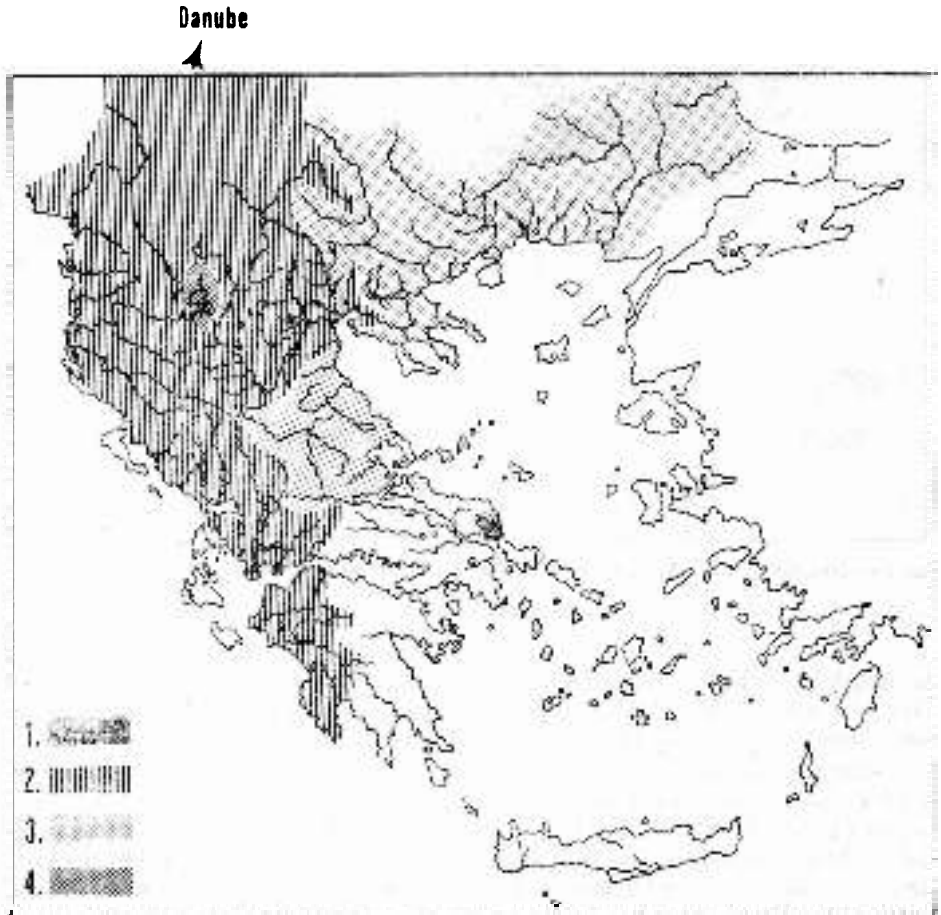


Fig. 2 — Distribution of rheophilic *Barbus* in Greece: 1, *B. euboicus* Steph.; 2, *B. peloponnesius* Valenci.; 3, *B. cyclolepis* Heck.; 4, *B. prespensis* Kar.

in western Greece, while *B. cyclolepis* in eastern. However, one characteristic complexity in the distribution appeared in the rivers and streams flowing in the northern coasts of the Thermaikos gulf, where *B. peloponnesius* seems to have penetrated into the region of *B. cyclolepis*.

*Barbus peloponnesius* Valenciennes, 1842 has been described on the basis of specimens fished in the Alphios River (Karytaena), in Peloponnisos. For many years the species was classified as a synonym of *B. meridionalis* Risso, 1826 of Southern France and NW Italy. According to Karaman (1971) and my personal observations (unpubl. data), *B. peloponnesius* must be considered as a valid species which differs from *B. meridionalis*, especially in the form of the head and the snout. In Greece, *B. peloponnesius* is extended in all Western part from Peloponnisos to Epirus, presenting a regular distribution pattern. It is also found in Albania and SW Yugoslavia. Between the Aaos River, which springs in NW Greece and crosses a great part of Albania before flowing into the South Adriatic Sea, and the Aliakmon River, flowing into the Aegean Sea, there appears a kind of bridge and the species passes to the opposite slopes. In the area of Central and Western Macedonia, *B. peloponnesius* is present in the following streams and rivers: Itamos or Mavroneri, springing from Mount Olympos, Aliakmon, Tripotamos, Edesseos (Economidis et al., 1981) and also Loudias, Axios: only in its right tributaries, Gallikos and Anthemous. The species is also found in the system of the lake Vegoritis.

*Barbus cyclolepis* Heckel, 1840 originates from the Evros (Mariza) River. The type material comes from Filippoupolis (Bulgaria) (Heckel, 1840). The species has a wide distribution in all the rivers and streams of Thrace and Eastern Macedonia up to Halkidiki; it was also found in a small stream at Athos peninsula and two others of Sithonia peninsula. In the Koronia and Volvi aquatic system, *B. cyclolepis* lives in all streams, including Rentina, and rarely in the lakes. According to Economidis & Sinis (1982), all specimens collected from this system have been identified as *B. cyclolepis* (with denticles in the 4th unbranched ray of the dorsal fin). The extension of the species westwards is broken off by the competitive species *B. peloponnesius* and the gulf of Thermaikos. Nevertheless, *B. cyclolepis* reappeared in the Platamonas stream, Pinios River in Thessaly, Holorema stream, Sperchios River and a small stream in the North of Evoia Island. This distribution has been confirmed by literature (Stephanidis, 1971; Economidis & Sinis, op. cit.) and many personal investigations and collections.

*Barbus euboicus* Stephanidis, 1943 is a rheophilic species isolated in a stream of Central Evoia Island flowing directly into the Aegean Sea. Its particular characters are the weak ossification of the 4th ray of the dorsal fin and the lower number of scales in lateral line. Based on its characters and isolation, I incline to believe that *B. euboicus* is a good species.

*Barbus prespensis* Karaman, 1924 is an endemic species of lake Prespa's aquatic system, characterized (Karaman, op. cit.) also by the weak ossification of the 4th ray of the dorsal fin. The species presents a remarkable lacustrine character, living also in lakes and reaching a body length of 30 to 35 cm, which is greater than in the other related species.

*B. euboicus* and *B. prespensis* are apparently close to *B. cyclolepis*, both belonging to the same evolutionary line. However, it is better to keep them as separated species, because of their particular features and isolation. The area occupied by this species is far from the regular and nearly homogeneous distribution of *B. cyclolepis* and its sub-species. It seems very probable that the progress of the ancestors of the form *cyclolepis* was made in different waves and times in the past, and the forms *prespensis* and *euboicus* — and perhaps some others — are between the older ones.

#### Sympatric and allopatric barbels

Another particular character of the distribution pattern of *Barbus* in Greece is that two rheophilic or two fluvio-lacustrine species have never coexisted in the same aquatic system. This means that the competitive behaviour has excluded the sympatric distribution of similar species. On the other hand, in many cases we have observed the coexistence of a lacustrine with a rheophilic species, but both species keep different ecological zones in the rivers. Under these conditions, *B. albanicus* and *B. peloponnesius* are sympatric in the majority of rivers of Western Greece, while *B. graecus* lives with *B. cyclolepis* only in the Sperchios River.

*B. barbatus* coexists with *B. peloponnesius* in the rivers Axios, Aliakmon and with *B. cyclolepis* in the river Pinios. A lacustrine *Barbus* rarely lives alone, with the exception of *B. graecus* in Boetia, while the rheophilic ones may populate a system or an area, as for instance *B. cyclolepis* in Thrace, Eastern Macedonia and Halkidiki, *B. peloponnesius* in many streams and rivers of Western Greece and Macedonia, and also, *B. prespensis* and *B. euboicus*.

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#### TIPURI DE RĂSPÎNDIRE ALE GENULUI *BARBUS* (PISCES, CYPRINIDAE) ÎN APELE DULCI ALE GRECIEI

#### REZUMAT

În apele continentale grecești trăiesc 7 specii ale genului *Barbus*: *albanicus*, *graecus*, *barbus*, *peloponnesius*, *cyclolepis*, *euboicus* și *prespensis*. Primele trei specii sînt de talie mare (mai mult de 50 cm), prezentînd mai mult caractere fluvio-lacustre, în timp ce celelalte patru specii, avînd talia de 25—35 cm, sînt în general reofile.

Două specii reofile sau două specii fluvio-lacustre nu coexistă în același sistem acvatic. *Barbus euboicus* și *B. prespensis* prezentînd afinități cu *B. cyclolepis*, au o arie de răspîndire restrînsă, în timp ce celelalte specii prezintă o răspîndire extensivă și continuă.

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