

FISH FAUNA OF THE ALIAKMON RIVER
AND THE ADJACENT WATERS
(MACEDONIA, GREECE)

by

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ABSTRACT. - The Aliakmon fish fauna consists of 30 species, 26 of them are autochthonous while 4 species were introduced. This fish fauna, examined as a whole, is identical to that of Axios (Vardar) River. It is suggested that there is a notable particularity in the Aliakmon fish fauna, because several non rheophile species such as *Rutilus macedonicus*, *Alburnus alburnus macedonicus*, *Rhodeus sericeus amarus*, *Carassius auratus gibelio* and *Cobitis taenia* were found only in the lower part of the river (area of Thessaloniki plain). The lack of these species from the upper part of the river is attributed to ecological and paleogeographical conditions.

RÉSUMÉ. - L'ichthyofaune du bassin de l'Aliakmon comprend 30 espèces : 26 d'entre elles sont autochtones tandis que 4 ont été introduites. L'ichthyofaune est identique à celle du bassin voisin du fleuve Axios (Vardar), mais elle présente une particularité notable concernant la distribution discontinue de certaines espèces. Ainsi les espèces non rheophiles, comme *Rutilus macedonicus*, *Alburnus alburnus macedonicus*, *Rhodeus sericeus amarus*, *Carassius auratus gibelio* et *Cobitis taenia* n'apparaissent que dans la partie inférieure du fleuve. Les conditions écologiques et paléogéographiques sont considérées comme responsables de cette discontinuité.

The Aliakmon River, along with its whole system, is the only river in North Greece which flows exclusively on Greek ground, while simultaneously happens to be the longest river in the country. It springs from the north-eastern sides of Mount Grammos, near the Greek-Albanic boundaries and (after a 320 km course which has a V shape with its top looking south), flows into Thermaikos Bay, about 23 km southwest of the city of Thessaloniki. The Aliakmon system includes the lake of Kastoria and its tributaries of which the most important are Livadopotamos, Kore-Rema, Stravopotamos, Velas, Pramoritza and Venetikos. In its lower section it receives the waters of a peripheral draining ditch into the following small rivers flow : Edesseos and Tripotamos. The whole basin has a surface of 9210 km². The Aliakmon extends for a while presenting an incision couch and passes through two narrow passages, one between the Mountains Vourinos and Kamvounia and the other between Pieria and Vermio. At this second passage an hydroelectric dam has recently been built (1974) which has formed an artificial lake extending 74 km (Fig. 1).

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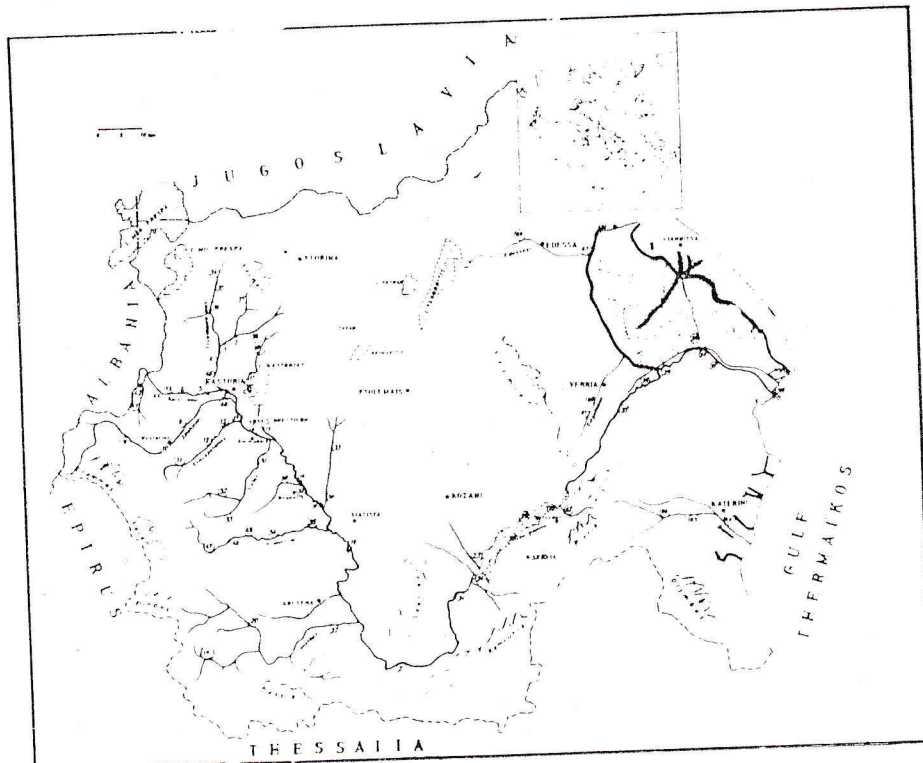


Fig. 1. — Area of the Aliakmon River system. Numbered circles show the location of sampling stations.

We gathered our first information concerning the fish fauna of the system from Athanassopoulos (1922, 1934) and from Athanassopoulos & Pellegrin (1934); the former one mentions the presence of *Gobio gobio* in the lake of Kastoria, the latter the dispersion of *Tinca tinca* in the same lake from specimens from the Loudias River, Stephanidis (1950) reports the presence of 13 species from the system, while Kattoulas *et al.* (1973) examine the genus *Gobio*, and describe a new sub-species, *Gobio albipinnatus elimeius*. Finally, Karaman (1974) examines specimens of this sub-species which he later classifies as *Gobio persus elimeius* in contrast to Dimovski & Grupcé (1976) who talk about *Gobio uranoscopus elimeius*.

In this paper, the fish fauna of the system as it is formed today, is studied in its entirety. It also includes the fish fauna of the small river Itamos (Mavroneri) which flows into the sea about 30 km west of the Aliakmon. Although it is considered to be independant nowadays, it nevertheless bears a close kinship to the Aliakmon.

Collections were made at about 70 stations in the whole system and its sub-divisions between the years 1971-1979. Several means including the method of electrofishing were used in the collecting. These samples, preserved in alcohol 70° or formalin 4-5%, are kept in the Museum of the Zoology Laboratory of the University of Thessaloniki.

RESULTS

According to table I, 30 species were found in the Aliakmon River. From these, 26 are autochthonous, while 4 have recently been introduced (*Salmo gairdneri*, *Gambusia affinis*, *Lepomis gibbosus* and *Esox lucius*) (1). Among the autochthon there is only one endemic sub-species, *Gobio uranoscopus elimeius* which is found in neighbouring systems.

As far as the classification of the species in table I is concerned we would like to observe the following :

Leuciscus cephalus vardarensis (Karaman, 1928). The examination of specimens has shown that in the individuals of the sub-species *vardarensis* from the Aliakmon and the Axios the eye diameter is 18-21 % the length of the head, while in *L. cephalus albus* Bonap., 1838 from Peloponnisos it is 22-25 %, and in *L. cephalus macedonicus* Karaman, 1955 from the Strymon river it is 20-24 % (Economidis, 1974).

Chondrostoma nasus vardarensis Karaman, 1928. The diagnosis for the specimens of the Aliakmon River is : D III-8, A III-9(10), V II-8, gill-rakers 28-32. This diagnosis is in accordance with the data coming from Grupce & Dimovski (1977) with the *vardarensis* of the Axios.

Alburnoides bipunctatus thessalicus Stephanidis, 1950. According to Daget *et al.* (1977) the Aliakmon and the Axios populations belong to the sub-species *thessalicus* of the Pinios.

Barbus barbus macedonicus Karaman, 1928 and *Alburnus alburnus macedonicus* Karaman, 1928. The specimens from the Aliakmon system do not essentially differ from those of the Axios system. The *Alburnus a. macedonicus*, in particular presents in the Aliakmon D III-8, a III-14-16 and gill rakers 19-23 data found in agreement with those of Dimovski & Grupce (1971a, 1971b, 1975).

Gobio uranoscopus elimeius Kat., Steph. & Econ., 1973. The re-examination of specimens from the whole Aliakmon system and their comparison to specimens from the Pinios and the Axios (both Greek and Yugoslavic section) and from Roumania as well, has demonstrated that the *elimeius* sub-species belongs to the *uranoscopus* species. Dimovski & Grupce (1974, 1976) also agree on that. Karaman's (1974) interesting opinion, which considers *elimeius* as a sub-species of *persus* of the Eastern Transcaucasia, does not coincide with ours since we believe that the presence of scales on the neck of *G. uranoscopus* is not of real essentiality. Besides, we find it somewhat difficult to accept any relation of *elimeius* with the Transcaucasia populations and not with the Danube which kept supplying the rivers in the south-eastern Balkans with an excessive number of fish species.

(1) This species was scattered in the lake of Kastoria in 1936. It was formerly to be found in the Axios estuaries (Athanasopoulos, 1921) and in Thessalia (Apostolidis, 1892, 1907; Stephanidis, 1950) where it seems to have been extinct.

Gobio kessleri banarescui Dimovski & Grupce, 1974. This sub-species was spotted both in the Aliakmon and the Greek section of the Axios and the Pinos of the Thessalia.

Table I has also shown that the Cyprinidae family is the most dominant one with 17 species. The Cobitidae and Salmonidae families follow with 2 species each, while the rest, that is Esocidae, Siluridae, Anguillidae, Gasterosteidae, Poeciliidae, Percidae, Centrarchidae, Blenniidae and Gobiidae have one species each.

DISCUSSION

Table I indicates the way the distribution of the species within the system pictures itself. Of the 26 autochthonous species only 13 colonize the whole system, both in its lower and upper section. Out of the 13 ones that are left, the *Salmo trutta macrostigma* lives, as expected, exclusively in the upper section, whereas 12 species are found only in the lower part of the system. This means that half of them (46 %) are limited to the lower part and have not managed to move forward into the middle and upper Aliakmon where the existence of proper biotopes would have allowed them to install themselves. Among the missing ones non rheophile species are mainly included, such as : *Rutilus macedonicus*, *Alburnus alburnus macedonicus*, *Rhodeus sericeus amarus*, *Carassius auratus gibelio*, and *Cobitis taenia* ; *Tinca tinca* and *Perca fluviatilis* as well owe their presence in the upper section of the system (Kastoria lake) which as far as is known, never existed there before. Another category of species which couldn't move forward includes the following : *Gasterosteus aculeatus* and *Knipowitschia caucasica*, a fact already expected for these species ; *Blennius fluviatilis* which has a remarkably rheophile character and which has indulged in an attempt to move upward nearly to the entrance of the narrow passages of Pieria-Vermio. Finally there are also two more species, *Phoxinus phoxinus* and *Sabanejewia aurata*, which were supposed to have been moved up into the upper Aliakmon, but have, nevertheless, not been located, not even in its lower section ; they are found, however, in its system (Edesseos).

This distribution of the fish fauna along the river bears a characteristic dissimilarity which cannot be simply and only explained by that dissimilarity of the biotopes in combination with the ecological demands of the species. This is accounted for by the fact that the river bed does not generally have a steep inclination which is a reason why it does not have a powerful flow, at least nowadays. As a result, in almost all of the middle part of the river near the areas where it is intense, there are positions where the water is calmer and deeper. Consequently, it would be expected that these places offer a fine shelter to some of the species previously mentioned. Here are the most important reasons why this doesn't happen.

First we must not forget to say that the Aliakmon fish fauna is rather new because it has no old forms. On the whole it appears to be closely related to the species-rich fish fauna of the Axios river. Out of the 26 autochthonous species and sub-species of the Aliakmon system, 25 are actually found in the Axios too, where only *Gasterosteus aculeatus* has not been located yet. The contribution of the

Table I, Fish fauna of the Aliakmon river system and his annexes

Species	Aliakmon		Edesseos	Tripotamos	Itamos
	U	L			
Salmonidae					
1. <i>Salmo trutta macrostigma</i> (Dum.)	+	-	-	+	-
2. <i>Salmo gairdneri</i> Richardson	*	*	*	*	*
Esocidae					
3. <i>Esox lucius</i> Linnaeus	*	-	-	-	-
Cyprinidae					
4. <i>Rutilus rutilus</i> (Linnaeus)	+	+	+	-	-
5. <i>Rutilus macedonicus</i> (Steind.)	-	+	+	-	+
6. <i>Leuciscus cephalus vardarensis</i> (Karam.)	+	+	+	+	+
7. <i>Phoxinus phoxinus</i> (Linnaeus)	-	-	+	-	-
8. <i>Tinca tinca</i> Linnaeus	*	+	+	-	-
9. <i>Chondrostoma nasus vardarensis</i> Karaman	+	+	+	-	-
10. <i>Gobio gobio bulgaricus</i> Drensky	+	+	+	-	-
11. <i>Gobio uranoscopus elimeius</i> Kat., Steph., Ec.	+	+	+	-	-
12. <i>Gobio kessleri banarescui</i> Dimovski, Grupce	+	+	+	-	-
13. <i>Barbus barbus macedonicus</i> Karaman	+	+	+	-	-
14. <i>Barbus meridionalis petenyi</i> Heckel	+	+	+	+	+
15. <i>Alburnoides bipunctatus thessalicus</i> Steph.	+	+	+	-	+
16. <i>Alburnus alburnus macedonicus</i> Karaman	-	+	+	-	-
17. <i>Vimba melanops</i> (Heckel)	+	+	+	-	-
18. <i>Rhodeus sericeus amarus</i> (Bloch)	-	+	+	-	+
19. <i>Carassius auratus gibelio</i> (Bloch)	-	+	+	-	-
20. <i>Cyprinus carpio</i> Linnaeus	+	+	+	-	*
Cobitidae					
21. <i>Cobitis taenia</i> Linnaeus	-	+	+	-	+
22. <i>Sabanejewia aurata</i> (Filippi)	-	-	+	-	+
Siluridae					
23. <i>Silurus glanis</i> Linnaeus	+	+	+	-	-
Anguillidae					
24. <i>Anguilla anguilla</i> (Linnaeus)	+	+	+	+	+
Gasterosteidae					
25. <i>Gasterosteus aculeatus</i> Linnaeus	-	+	?	-	?
Poeciliidae					
26. <i>Gambusia affinis</i> Girard	*	*	*	*	*
Percidae					
27. <i>Perca fluviatilis</i> Linnaeus	*	+	+	-	-
Centrarchidae					
28. <i>Lepomis gibbosus</i> (Linnaeus)	-	*	*	-	-
Blenniidae					
29. <i>Blennius fluviatilis</i> Asso	-	+	?	-	-
Gobiidae					
30. <i>Knipowitschia caucasica</i> (Kawrajsky)	-	+	?	-	+
+	presence		*	dispersion	
-	absence		?	probable presence	
			L	Lower Aliakmon (up to St Barbara village)	
			U	Upper Aliakmon	

Axios in providing the Aliakmon with species is most important and it is still evident today. There are no other possible ways of colonization for these species.

We tend to believe that this colonization of the Aliakmon by species from the East (Axios) is not old : it took place during the last Glacial period and it did not have a long duration. The starting point of the colonization must be set at right after the opening of an outlet towards the Aegean by the waters of the older, according to Brunn (1956), lake system in the middle and upper Aliakmon. When the Aliakmon found its way towards the Aegean it came into contact with the Axios and became its tributary just like the Pinios of Thessalia, since the estuary of the Axios was then much more southern than it is today.

The passing of the species from the Axios to the Aliakmon must have been halted by the intense flow that the waters of the latter would have had on account of the inclination of its bed. Therefore only the rheophile species such as *Salmo trutta*, *Barbus meridionalis*, *Chondrostoma nasus*, *Alburnoides bipunctatus*, *Gobio uranoscopus*, managed to swim up the river. The case of *Sabanejewia aurata* appears quite interesting : while passing from the Axios to the Pinios where it is to be found today, it was not able to swim up and into the Aliakmon at that time along with the other species. Later, during the post-Glacial period, the transgression of the sea reduced the speed of the flow of the Aliakmon waters, a fact that helped other less rheophile species like *Barbus barbus*, *Leuciscus cephalus*, *Vimba melanops*, *Silurus glanis* to swim upward. The transgression of the sea didn't cease and there was finally a stop in communication between the Aliakmon and the Axios, and subsequently the colonization of the former from the latter. Ultimately the sea extended down the plain of Thessaloniki which is known to have been a bay in the historical era. Later alluvium turned the bay into a lake (Yannitsa lake). This lake, or its draining and irrigating system which took its place after the lake had been drained, facilitates the present species to move forward (*Sabanejewia aurata*, *Phoxinus phoxinus*).

Itamos was especially involved in interrupting the spreading of *Barbus meridionalis petenyi* towards the south ; it therefore plays a limiting rôle to this expansion.

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