# FISH SPECIES COMPOSITION AND ABUNDANCE IN THE ESTUARIES OF THE TRANSBOUNDARY RIVER STRYMON

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**Abstract**
In the period autumn 2007 – spring 2008 fish sampling was realised at three sampling stations in the estuarine system of the transboundary river Strymon, using a bag seine net (2 mm mesh size knot to knot). A total of 5066 specimens, weighting 4745.98 g were caught. The specimens belonged to 19 species, 5 from which were caught only in Amphipoli lagoon. *Atherina boyeri* dominated the catches in terms of number (40.91%) and weight (76%). Differences in the catch species composition were found between the two sampling periods.

**Introduction**
Strymon is a transboundary river and its basin is sheared by FYROM (9.5 %), Serbia (4%), Bulgaria (50 %) and Greece 36.5 %). It originates from Bulgaria and outflows to Strymonikos Gulf (northern Greece) (Fig. 1) after flowing of about 360 km, 122 of which are within the territory of Greece. The river is embanked to its lower part, and close to its mouth it forms the small lagoon of Amphipolis. Both the mouth of the river and the lagoon constitutes important nursery grounds for fish and they are also very significant for fisheries and tourism. The aim of the present study was to record the composition and abundance of the fish species that occur in the estuarine system of the transboundary river Strymon.

**Materials and methods**
During October 2007 (autumn) and April 2008 (spring) three stations (station 1 located in the area where the Strymon river outflows to the Strymonikos Gulf, station 2 in Amphipoli's fish-wharf and station 3 in Amphipoli's lagoon, Fig. 1) were sampled using a bag seine net (2 mm mesh size knot to knot) of 10 m length and 1 m height. At each period, sampling was contacted at the same time of the day, at depths of about 0.5- 1 m. Each haul covered an area of about 600 $m^2$. Fish samples were preserved in 6% formaldehyde solution and transferred to the laboratory, where they were identified to the species level, with the exception of Sparidae species that were identified to the genus level (*Diplodus* sp.), and measurements of total length (TL, cm±0.1) and total weight (W, g±0.1) were recorded.

**Fig. 1.** Map of the studied area, showing the three sampling stations (1: station 1- Strymon river mouth, 2: station 2- Amphipoli's fish-wharf, 3: station 3- in Amphipoli's lagoon) (from Koutrakis *et al.*, 2004 modified, http://earth.google.com/15/6/2008)

**Results and discussion**
A total of 5066 specimens, representing 19 species and 10 families were collected during the sampling period (Table 1). Seven of them (36.84%) (*Carassius gibelio, Chondrostoma vardarense, Lepomis gibbosus, Rhodeus amarus, Rutilus rutilus, Squalius cephalus, Vimba melanops*) were freshwater, while the rest 12 species (63.16%) were estuarine and near-shore marine species. Of all species caught only five species (*Atherina boyeri*, *Liza saliens*, *Pomatoschistus marmoratus*, *Solea solea* and *Syngnathus abaster* were presented in Amphipoli lagoon (station 3). The most abundant species, in terms of number in the total catches was *Atherina*

*boyeri* (40.91%) followed by *Diplodus* sp. (14.11%) and *Liza aurata* (13.30%). In terms of weight *Atherina boyeri* (76%) was dominated, followed by *Chelon labrosus* (3.86%) and *Diplodus* sp. (3.13%) (Fig. 2). *Carassius gibelio, Chondrostoma vardarense, Rhodeus amarus, Squalius cephalus* and *Lepomis gibbosus* were found only in small numbers (N<5).

In Figure 3, differences in fish species abundance between the two seasons are presented. In autumn, the most numerically abundant species were *Atherina boyeri* (52.15%), *Liza aurata* (14.55%) and *Liza ramada* (13.01%) (Fig. 3a), while in spring, the most abundant species were *Diplodus* sp. (40.60%), *Atherina boyeri* (19.82%) and *Liza saliens* (15.16%) (Fig. 3b). The species *Carassius gibelio, Chondrostoma vardarense, Rhodeus amarus, Squalius cephalus* and *Lepomis gibbosus,* were recorded only in autumn. Comparing the results of the biomass (Fig. 4) it can be seen that during both seasons *Atherina boyeri* was the species dominating the catches (79.27% in autumn (Fig. 4a) and 64.72% in spring (Fig. 4b)). In autumn, the second more abundant species in terms of weight was *Chelon labrosus* (4.99%) (Fig. 4a), whereas during spring *Diplodus* sp. (12.48%) and *Parablennius sanguinolentus* (8.07%) (Fig.4b).

**Table 1.** List of species with their taxonomic authority (Froese & Pauly, 2008), collected in the Strymon river estuarine system in autumn 2007 and spring 2008. TL: total length, min-max: the minimum and maximum recorded TL, N: number of specimens.

| *Family* | *Species* | *TL (cm) min- max* | *N* |
|---|---|---|---|
| Atherinidae | *Atherina boyeri* Risso, 1810 | 2,1 – 9,6 | 2073 |
| Blenniidae | *Parablennius sanguinolentus* (Pallas, 1814) | 9,5 – 13,7 | 6 |
| Centrarchidae | *Lepomis gibbosus* (Linnaeus, 1758) | 8,5 – 13,6 | 1 |
| Cyprinidae | *Carassius gibelio* (Bloch, 1782) | 12,7 | 1 |
| | *Chondrostoma vardarense* Karaman, 1928 | 7,6 – 7,8 | 2 |
| | *Rhodeus amarus* (Bloch, 1782) | 3,1 | 1 |
| | *Rutilus rutilus* (Linnaeus, 1758) | 9,5 | 1 |
| | *Squalius cephalus* (Linnaeus, 1758) | 1,2 | 1 |
| | *Vimba melanops* (Heckel, 1837) | 3,9 – 9,8 | 8 |
| Gobiidae | *Pomatoschistus marmoratus* (Risso, 1810) | 2,1 – 5,9 | 218 |
| Mugilidae | *Chelon labrosus* (Risso, 1827) | 1,9 – 10,0 | 62 |
| | *Liza aurata* (Risso, 1810) | 1,3 – 4,5 | 674 |
| | *Liza ramada* (Risso, 1810) | 2,0 – 2,8 | 521 |
| | *Liza saliens* (Risso, 1810) | 1,7 – 10,4 | 436 |
| | *Mugil cephalus* Linnaeus, 1758 | 2,1 – 6,1 | 172 |
| Scophthalmidae | *Lepidorhombus whiffiagonis* (Walbaum, 1792) | 3,2 – 4,2 | 13 |
| Soleidae | *Solea solea* (Linnaeus, 1758) | 1,9 – 5,3 | 62 |
| Sparidae | *Diplodus* sp. | 2,3 – 4,2 | 715 |
| Syngnathidae | *Syngnathus abaster* Linnaeus, 1758 | 3,9 – 11,4 | 98 |

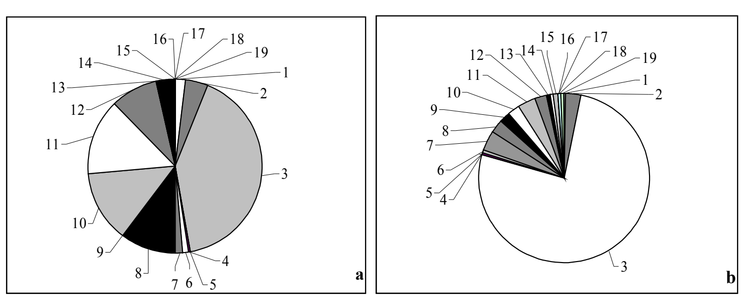

**Fig. 2.** Total catch species composition in terms of (a) number and (b) weight in the Strymon estuarine system, autumn 2007 - spring 2008. 1: *Syngnathus acus,* 2: *Pomatoschistus marmoratus,* 3: *Atherina boyeri,* 4: *Rutilus rutilus,* 5: *Lepidorhombus whiffiagonis,* 6: *Solea solea,* 7: *Chelon labrosus,* 8: *Liza ramada,* 9: *Parablennius sanguinolentus,* 10: *Liza aurata,* 11: *Diplodus* sp., 12: *Liza saliens,* 13: *Vimba*

*melanops,* 14: *Mugil cephalus,* 15: *Carassius gibelio,* 16: *Chondrostoma vardarense,* 17: *Rhodeus amarus,* 18: *Squalius cephalus,* 19: *Lepomis gibbosus.*

Conclusively, 19 fish species were recorded during the present study in the estuaries of Strymon river and in Amphipoli lagoon, 13 of which were estuarine or near-shore marine fishes while the rest 7 species were freshwater. This number of species is lower than this reported in previously studies (Koutrakis *et al.*, 2000; 2004), which however have used a monthly sampling scheme. The presence of *Lepidorhombus whiffiagonis, Carassius gibelio, Chondrostoma vardarense* and *Rutilus rutilus* is recorded for the first time in the area. The presence and abundance of the fish species hosted the Amphipoli lagoon represent the first published data for the system. Catch species composition differed between the two seasons in terms of number and weight. The species *Carassius gibelio, Chondrostoma vardarense, Rhodeus amarus, Squalius cephalus, Lepomis gibbosus* and *Pomatoschistus microps* were collected only in autumn, while the species *Rutilus rutilus, Lepidorhombus whiffiagonis* and *Solea solea* only in spring.

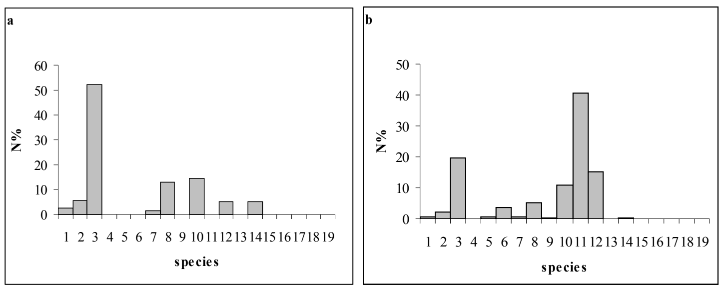


**Fig. 3.** Catch species composition in terms of number (N) in the Strymon estuarine system. (a) autumn 2007, (b) spring 2008. Abbreviations as in Fig. 2.

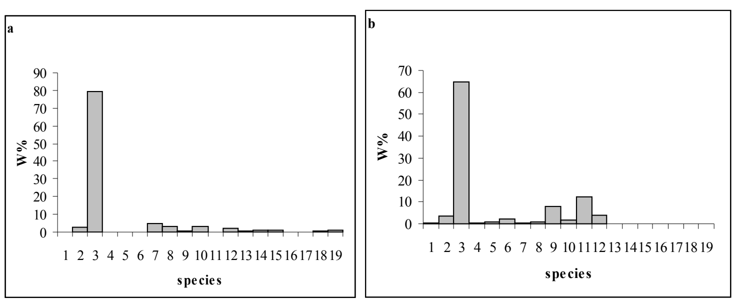


**Fig. 4.** Catch species composition in terms of weight (W) in the Strymon estuarine system. (a) autumn 2007, (b) spring 2008. Abbreviations as in Fig. 2.

The European Community, through the Water Framework Directive 2000/60/EC (European Community, 2000) gives special significance on the issue of the trounsboundary rivers and on the importance of the coordination of administrative arrangements within river basin districts. Consequently, member states are obliged to coordinate the establishment of programme of measures and river basin management plans with all adjacent countries. To this direction, the present results will be valuable for the protection and management of the fish fauna hosted the estuaries of the transboundary river Strymon.

**References**

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