THE EVOLUTION OF FRESHWATER FISH FEEDING GROUPS
IN DANUBE RIVER, BRAILA AREAS

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Résumé: L’ichtyofaune d’eau douce d’importance économique du Danube a été divisé, selon le critère de la nourriture, en quatre grand groupes écologiques : espèces planctonophages(P), espèces benthophages(B), espèces piscivores(C) et espèces euritrophiques(E). L’évolution du nombre total d’espèces capturées industriellement, d’espèces à l’importance économique, de captures totales et des groupes trophiques présentes dans la zone étendue entre Braila (le km 170) et Giurgeni (le km 232), est analysée à l’aide des différentes périodisations situées entre les années 1952-2007 pour pouvoir observer le sens et la magnitude dans lesquels la structure de la population piscicole s’est modifiée.

Abstract: The economically important valuable freshwater fish species from the Danube river were grouped according to the feeding criteria in four feeding groups: Planktonovorous species (P), Benthovorous species (B), Top carnivores species (C), Euritrophic species (E). The evolution of the total number of captured fish species, of valuable fish species, of feeding groups annual captures from the area situated between Braila (km 170 and Giurgeni (km 232) are analyzed in 1952 – 2007 period with the purpose of observing the manner and magnitude of the fish species changes.

INTRODUCTION

The Low Danube river had in 1967 65 fish species (Busnita Th. 1967) out of which over 75% were captured in industrial and sportive fishing activities. At present, the number of fish species from the Low Danube river are not the same, the changes have brought on the verge of extinction a number of species (Acipenser nuditvemris, Acipenser sturio, Leuciscus leuciscus, Chalcalburnus chalcoides mento, Stizostedion volgense), and on the other hand the changes is due to the introduction of several allochtonous fish species (Banarascu P, 1994). From all these fish species present in the Low Danube river, the most important from an economic point of view are the marine migratory species from the Black Sea. Even if, the freshwater fish species have a very important ecological and economic impact upon the ecosystems and socio-economical structure. The composition of freshwater fish populations is closely connected to the environmental conditions to be found in the Danube channel and the Danube floodplains.

MATERIALS AND METHODS

The investigated area is represented by the Danube river with its floodplain between Braila town (km170) and Giurgeni village (km 238). This area is at present protected at a national level as the Natural Park “Balta mica a Brailei”(L 5/200; HG 230/2003) and at an international level as a Ramsar site (15.06.2001). The total surface of this area is 21074 ha,
out of which the Danube channel and its arms, with a total length of 118 km, an area of 6160 ha, and the floodplain areas, represented by seven islands, covering 14914 ha.

In order to grasp the evolution of the trophic structure of the freshwater fish population in the area under study we analyzed the captures recorded from different bibliographic and statistic sources (Busnita Th., et. all., 1967, Florea Luiza, 1998, ANPA 2006-2007).

In the analyzed period (1952-2007), the environmental conditions in the Danube river were affected in different ways and at different levels by direct and indirect anthropic activity. Thus, the 1952-1962 period is considered as a reference period; in this period the aggressive human impact was insignificant. Instead, the 1972-1786 period is considered to have a highly aggressive human impact upon fish population due to increased direct (fishing) and indirect activities (impoundment, canalization, urbanization and industrialization, corp production and livestock, hydrotechnical works, transport) (Vadineanu A., et.al., 2003). At present, within the 2006-2007 period, there is a decrease of high aggressive human impact upon the fish population because of forbidden fishing activities in floodplain areas, and on the other hand due to the decrease of economic activities and a new legislative environmental frame. A positive effect was also a consequence of the high level and high debit of the Danube river in 2005 and 2006.

The freshwater fish species from the Low Danube river have different strategies to accomplish vital functions such as escaping predation, reproduction, finding adequate food (Leveque, 1995). The different studies show that specialization is much higher for the reproductive activities than the feeding activities, the most of the Danube freshwater fish species have a high plasticity of feeding activities. Assignment of fish species to feeding groups is difficult because of their feeding plasticity, their opportunism. According to the type of feed, the literature indicated different feeding groups for freshwater fish as: Piscivores, Inventivores, Omnivores, Herbivore, Filter feeder. (Grandmottet, 1983, Oberdorff, Guilbert & Lucchetta, 1993)

In this article the freshwater fish species from the Low Danube river are reclassified according to the place of feeding into four feeding groups: Planktonovorous species (P) which feed in the water column, Benthovorous species (B) which feed on the bottom, Top Carnivores species (C), which feed both in the water column and on the bottom, Euritrophic species (E), which feed both in the water column and on the bottom.(table1).

We attempt to describe and analyze the following indicators: (1) The total number of fish species captured by industrial fishing, (2) The number and the list of valuable fish species (species with relative biomass >1%), (3) The number, the list and the relative biomass of dominated fish species (species with relative biomass >10%), (4) The total annual captures of freshwater fish species and (5) The relative biomass of feeding groups.

Table 1. The feeding groups of freshwater fish species from the Danube River, Braila area

<table>
<thead>
<tr>
<th>Feeding groups</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Place of feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planktonovorous species (P)</td>
<td>Hypophthalmichthys molitrix</td>
<td>Silver carp</td>
<td>Water column</td>
</tr>
<tr>
<td></td>
<td>Aristichthys nobilis</td>
<td>Bighead carp</td>
<td>Phytoplankton, zooplankton</td>
</tr>
<tr>
<td></td>
<td>Pelecus cultratus</td>
<td>Ziege</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alburnus alburnus</td>
<td>Oble - Bleak</td>
<td></td>
</tr>
<tr>
<td>Benthovorous species (B)</td>
<td>Cyprinus carpio</td>
<td>Common carp</td>
<td>Bottom</td>
</tr>
<tr>
<td></td>
<td>Abramis brama</td>
<td>Common bream</td>
<td>Benthic invertebrates, submerged vegetation, epiphyton, detritus</td>
</tr>
<tr>
<td></td>
<td>Blicca bjorkna</td>
<td>White bream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abramis sapa</td>
<td>White-eye</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aspro streber</td>
<td>Danube streber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acerina schraetser</td>
<td>Schraetzer</td>
<td></td>
</tr>
</tbody>
</table>
**RESULTS AND DISCUSSIONS**

The total number of fish species captured by industrial fishing (1) – is an indicator of fish biodiversity, that decreased to 78% in the 1972-1986 period in comparison with the reference period, due to environment degradation (figure 1). In the present period, even if the number of total fish species captured by industrial fishing is still low, there is a higher number of species (10 species) well represented (B>10%) in total capture.

![Fig.1. The evolution of total number of captured fish species and the number of economic valuable species from Danube river, Braila areas](image)

The number and the list of valuable fish species (species with relative biomass >1%) (2) and of dominated fish species (species with relative biomass >10%) (3) is a good indicator of biodiversity for economically important fish. Table 2, where the fish species are arranged in the decreasing order of their relative biomass, shows a fundamental change in the species list, thus in the second period the wels catfish was replaced by two euritrophic species as goldfish and Roach. In the present period a recovery of top carnivores species is observed, i.e. the wels catfish and northern pike.
Table 1. The evolution of the number of valuable fish species, number of dominated fish species in the Danube River, Braila areas

<table>
<thead>
<tr>
<th>Periods</th>
<th>Number of valuable fish species (Relative Biomass &gt; 1%)</th>
<th>Number of dominated fish species (Relative Biomass &gt; 10%)</th>
<th>Species list in decreasing order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952-1962</td>
<td>14</td>
<td>2</td>
<td>Common carp (B), Wels catfish (C), Common bream (B), White bream (B), Pike-perch (C), Barbel (B), Roach (E), Ide (E), Northern pike (C), Ziege (P), Sterlet (B), Asp (E), Bleak (P), Ruffe (C)</td>
</tr>
<tr>
<td>1972-1989</td>
<td>7</td>
<td>2</td>
<td>Goldfish (E), Common carp (B), Roach (E), Wels catfish (C), White bream (B), Bleak (P), Common bream (B),</td>
</tr>
<tr>
<td>2006-2007</td>
<td>10</td>
<td>3</td>
<td>Goldfish (E), Common carp (B), Wels catfish (C), Bighead carp (P), Northern pike (C), Barbel (B), Common bream (B), Pike-perch (C), Vimba (B), Silver carp (P)</td>
</tr>
</tbody>
</table>

The evolution of the relative biomass of dominated fish species (species with a relative biomass >10%) and presented in figure 2 shows, during the initial period (1952-1962), a well-balanced structure of fish communities dominated by one benthovorous specie (common carp) and by one top carnivores species (wels catfish). For the second period the structure of fish communities is deeply unbalanced, the dominated species is the goldfish, an opportunistic fish with a very high capacity to access different types of food, with a high capacity to resist to environmental changes. This euritrophic species developed a high biomass, with a multiannual average of up to 60%. In the third period the fish communities structure appears to be balanced, the first three species are the common carp, goldfish and wels catfish; alongside these one top carnivores species (northern pike) is well-represented, as well as a new allochtonous species (silver carp).

![Fig.2. The evolution of relative biomass of dominated fish species from Danube river, Braila areas](image)

The total annual captures of freshwater fish species presented in figure 3 illustrates the differences in the total amount of fish captured during the two periods with a different fishing effort. Thus, the 1972-1986 period was characterized by a high level of administrative fishing institution, that is intensive fishing activities were placed in the Danube channel and also in the adjacent floodplain areas. During the present period, 2006-2007, it became a protected area and for this reason the industrial fishing activities are placed only in the
Danube channel. Figure 3 shows a high variability of total annual captures, that is one or two years with high fish captures following one or more years with low fish captures.

Figure 3 confirms Grigore Antipa’s theory, that is, in this area for a 15 years’ period, from the fish capture point of view there is one year with poor fish capture, two years with mediocre fish capture, five years with good fish capture and seven years with very good fish capture. Figure 3 is very close to this theory, i.e. during the 1972-1986 period (16 years): one year with poor fish capture (1974), three years with mediocre fish capture (1972, 1983, 1984), six years with good fish capture (1973, 1975, 1976, 1977, 1980, 1982) and five years with very good fish capture (1978, 1979, 1982, 1985, 1986).

![Fig.3. The evolution of the total annual captures of freshwater fish species from Danube river, Braila areas](image)

The annual evolution of relative biomass of feeding groups (5) show a type of fish community structure, in a comparative manner for the three periods (figure 4a) and in detail for the second period (figure 4b). The significant presence of euritrophic species during the second period confirms the un-balanced structure of the fish community. In the present period the euritrophic species are going down, the fish community structure is close to the first reference period.
CONCLUSIONS

The data on fish captures recorded in the Danube during the 1952-1962 period represent an extremely valuable point of reference for the comparative study of the direction and intensity of fish community changes. These changes are evidenced in the second period, 1972-1986, not as much quantitatively, the total volume of captures observing the theory elaborated by Antipa, as qualitatively. The structure of the fish community is deeply unbalanced, dominated by one species (goldfish 60%), and the weight of the euritrophic species was over 67%. During the third period, even if the captured quantities were lower, because of legislative limitations, a rebalancing of the fish community structure may be observed, which is dominated by five species, and the weight of euritrophic species has gone down to 20%.

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