

# INVESTIGATION OF COMPOSITION OF THE FISH POPULATION IN BACKWATERS BELONGING TO THE AREA OF WATER-BASIN II OF THE TISZA

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## Abstract

It is planned in our country that a water-basin connected with the river barrage at Kisköre will be formed in the Tisza from 1973. The inundation, touching a living-water sector of about 41 river-kms, makes several dead channels (backwaters) cease to continue. Taking into consideration the biological effects of the transformation, it is necessary to investigate the present states. That is important also for preparing the fishing plans of the area. In this paper the backwater results of this investigations are published. In the course of the work, the author has examined 4010 fish-baskets and 6928 fish exemplars, representing 22 species. Five of them are of outstanding significance as they were giving 70.83 per cent of the exemplars investigated. Further eight species appeared to be frequent, four species to be common, and five ones to be rare.

## Introduction

Commissioned by the Station for Piscicultural Research at Szarvas, in June 1970 we began dealing with investigating the Tisza sector belonging to the area of water-basin II of the Tisza. Our work had begun in the living part of the Tisza; we were feeling, however, already in the first months that we can only imagine even approximately the original fish population of the water-basin if our work includes the backwaters, as well. We had chiefly two reasons for deciding so:

1. The ichthyological research works of the Tisza backwaters have produced so far but few results, we have hardly any literature in this relation.

2. After evaluating the catching data of the "May 1" Fishing Co-operative for 1968 and 1969, it manifested itself that 54.1 per cent of the marketable fish amount came from the backwaters. This fact proves the fishing and biological importance of the backwaters, and justifies in itself the amplification of the matter of research.

## Place and time of investigations

The backwaters investigated take place in a geographically well-separate unit of the Middle Tisza Region, along the right and left banks of the river. On the side from the Nagyunság the Backwater of Örvény and the Backwater of Füred (under its local name: the Little Tisza at Füred) are lying while on the open flood-area side from Heves-Borsod the Small-Backwater and Large-Backwater take place.

The structural-morphological largeform of the area is a river inundation plain, the form-group of its relief being a low inundation area. Its surface formations are the present river deposits: silt, clay, and sand. In its configurations of the terrain, the alluvial cones from the Holocene and the backwaters, meanders are predominating. The anthropogenic forms of the surface are the outer and inner flood dams and dykes fringing the area, water conduits and railway-embankments.

There are characteristics of the climate: the frequent foehn character of the atmospheric motion, the comparatively few clouds (50 p.c.), plenty of sunshine (2000 hrs/year), manifestation of a comparatively dry character (annual precipitation: 550 mm, annual water-evaporation: 525 mm, annual water deficiency: 150 mm), a daily and annual fluctuation of temperature on a rather wide scale. The unrelieved surface is connected with the uniformity of climate, being deficient in micro- and mezzoclimates (BULLA 1962).

The water-systematic axis of the area of investigation is the Tisza. The water-level of backwaters is in correlation with the water currents in the Tisza. From the two annual inundations that are characteristic of the Tisza that following the thawing of the snow in Spring in the decisive one for the water supply of backwaters. The river, flooding at that time, fills in and refreshes the stagnant water of mortlakes. The second inundation wave, appearing at the precipitation maximum in the early summer, has only an importance if owing to a late thawing of the snow the two inundations are composed and, in that case, the area is covered by continuous water for long months (e.g. in 1970). The inundation that seldom presents itself in the Upper Tisza Region, owing to a Submediterranean influence, has no importance for the water supply of backwaters. At the time of the periods of little water, reflecting a continental effect (late summer, early autumn) also the water of backwaters decreases considerably. While in the Large-Backwater and in that of Füred there remains a considerable water quantity at that time, too, the Small-Backwater and that of Örvény frequently becomes a marsh if the inundation failed to come about that year, resp. they may even dry up if they don't get the water supply for several years.

The time of our investigations was determined by the possibilities of fishing. The fisher helping our work laid the fish-baskets, corresponding to the water level of the river either in the Tisza or in the backwaters. In 1971 there was low water in the Tisza frequently and for a long time what was more favourable to angling and the fish-baskets were used by the fisher in the backwater. In this way, the data of a comparatively long period are available for us. Our work was done between May 18th and September 10 1971, on 84 occasions altogether.

### Method of investigation

In the backwaters, the predominating, and even nearly single, method of fishing is that performed with fish-baskets. In the period of our work, we haven't find any other method at all. The method of our work was determined by that.

We took part, together with the fishers, in taking up the fish-baskets at early dawn, and determined the fish that got out of the fish-baskets (STOHL-WOYNÁROVICH 1950, BERINKEY 1966, WOYNÁROVICH 1969), recording the data. At the Cyprinidae that can only be separated with difficulty we have applied Vásárhelyi's method (1956) of determination with throat teeth. (ossapharyngea inferiora). Our work was extended to the fish caught by the sport anglers, as well. In this way, we got hold of some data that could not be obtained with fish-baskets.

## Materials, results of investigations

In the course of the work we examined 4010 fish-baskets altogether in which 5597 fish exemplars were found. In addition, we have determined 1331 exemplars with the help of sport anglers. That means together with the previous ones 6928 exemplars. Our conclusions have been drawn on the basis of the elaboration of that fish quantity.

### 1. Qualitative composition of the fish population of backwaters:

In the course of the work, the 6928 fish exemplars were determined. A great part of the species, 14 species, belong to the family Cyprinidae, 4 species are representing the family Percidae, while one species each is from the families Siluridae, Ictaluridae, Esocidae and Centrarchidae.

Details are as follows:

#### Esocidae

1. *Esox lucius* L.

#### Cyprinidae

2. *Rutilus rutilus* L.
3. *Scardinius erythrophthalmus* L.
4. *Aspius aspius* L.
5. *Alburnus mento* AG.
6. *Alburnus alburnus* L.
7. *Blicca bjoerkna* L.
8. *Abramis brama* L.

9. *Abramis sapa* PALL.

10. *Abramis ballerus* L.

11. *Tinca tinca* L.

12. *Pelecus cultratus* L.

13. *Cyprinus carpio* L.

14. *Carassius carassius* L.

15. *Carassius auratus gibelio* BL.

#### Ictaluridae

16. *Ictalurus nebulosus* Le Suer

#### Siluridae

17. *Silurus glanis* L.

#### Centrarchidae

18. *Lepomis gibbosus* L.

#### Percidae

19. *Perca fluviatilis* L.

20. *Acerina cernua* L.

21. *Acerina schraetzer* L.

22. *Stizostedion lucioperca* L.

We should like to notice that the enumeration published here is no fauna register because it is sure that it does not contain every species. The reason of that is that (a) the fish-basket is only a selective instrument for catching fish, species of small individuals could not be get out of it; (b) these data are not a result of an observation for several years; this observation period is too short for constructing a fauna register; (c) the works went on only in four backwaters. Yet we felt necessary to construct this enumeration for giving — after being completed properly — a basis for comparison to later investigations a few years after the change in the present water-geographical situation.

The species belonging to the six families were found in the four backwaters in different distributions. Most species (19) were demonstrated from the Backwater of Füred. We succeeded in demonstrating 15 species from the Backwater of Örvény, and 14—14 ones from the Small-Backwater and Large-Backwater.

18 of the 22 species found in the backwaters are already mentioned by Vutskits, following OTTÓ HERMAN and others, but he does not deal with the quantitative distribution of the species recorded on by him. From among the known species, *Tinca tinca* L. does not occur in his work and, of course, there can't occur the species

naturalized since then, either, like *Carassius auratus gibelio* BL., *Ictalurus nebulosus* LE SUER, and *Lepomis gibbosus* L. (VUTSKITS 1904).

In every backwater lives *Cyprinus carpio* L. that prefers the waters of muddy bed, flowing slow.

*Tinca tinca* L. occurs similarly in all the four backwaters. From none of the places investigated was missing *Abramis brama* L., either. The presence of *Carassius carassius* L. in similar degree isn't any surprise, as well, as this species that tolerates well the shallow muddy pools is very frequent in the backwaters. It is, even on the basis of our investigations, more frequent in the backwaters than in the river itself.

*Rutilus rutilus* L. is of frequent occurrence because it prefers particularly the waters grown by vegetation.

*Scardinius erythrophthalmus* L. is everywhere present. The rapid breeding in mass if this species in the backwaters is particularly characteristic of the area investigated.

*Ictalurus nebulosus* LE SUER — although its distribution isn't known exactly even to-day — is a frequent prey in each of the areas investigated. As it tolerates well the muddy places that are poor in oxygen, its rapid breeding in the backwaters seems not to be checked at all.

The species of backwaters supplying the most fish to the market is *Esox lucius* L. As its favourable food, Cyprinidae, live in large numbers in the backwaters investigated, it develops well, occurring in a high individual number.

*Perca fluviatilis* L., although occurring in every area investigated, has properly multiplied only in the backwaters abounding in water.

*Stizostedion lucioperca* L., avoiding the rapid reaches of a river, but looking for biotops of deeper water, subsists in the backwaters well. But we met it in large numbers only in the Large-Backwater.

Taking into consideration, how worthless economically *Lepomis gibbosus* L. is, it is regrettable that it has pullulated in every backwater. It multiplies in high degree in the easily warmed backwater (e.g., in the Small-Backwater.) It is often fished in the river, too, but its occurrence in the backwaters is more considerable.

The 11 species mentioned seem to be fond of the ecological conditions in the backwaters as they are present in all the four backwaters. In addition to them, however, we must reckon on the occurrence of other species, as well. There belongs to them *Abramis ballerus* L. that was not found in the Small-Backwater and Örvény-Backwater, both poor in water, but is present everywhere in the slowly moving waters abounding in water. *Blicca bjoerkna* L. was now present only in two backwaters. It is to be attributed only to the size of the two *Alburnus* species that they could not be found in the waters investigated only by means of fish-baskets; we consider as probable also their presence in other backwaters. The occurrence of *Carassius auratus gibelio* BL., forming its population only of females, is increasing even under the conditions of backwaters. It is proved by its individuals fished in the Small- and Large-Backwaters that they are propagated by their multiplication in the way of gynogenesis (Deckert 1969) in wider and wider limits in the backwaters, too. *Acerina cernua* L. can be fished both in the backwaters and in the water of river. Its frequent occurrence in the backwaters — even if not only in large numbers — can be regarded to be proved.

Further 5 species are less characteristic of these areas. The occurrence of *Aspius aspius* L. in the backwater is recorded by the literature, too (Deckert 1969) but here it was found but with few exemplars. *Silurus glanis* L., *Pelecus cultratus* L., and *Abramis sapa* Pall. are rather species from river water. *Acerina schraetzer* L. is rare

in other water, as well. The individuals of these species must have remained behind in the backwaters at the separation after the inundations.

2. Quantitative composition of the fish population in the backwaters investigated:

In respect of the quantitative occurrence the backwaters are showing a colourful picture in spite of the presence of many identical species. That is, to be sure, ecologically reasoned. Fish is highly responsive to any change in the biocoenosis, and its multiplication, development depend decisively upon the conditions of life. That is complicated in case of a backwater by that the fish living there do react not only to the change in the biocoenosis of the backwater but, owing to the periodical connection with the living Tisza, to the changes in the Tisza, as well. The backwaters investigated differ from one another in respect of their ecological peculiarities. It may be explained by that from the point of view of quantitative occurrence the identity is much rarer. Considering that, we had better analyse shortly the backwaters investigated one by one (Table 1a, b, c, d).

As one of the aims of the work is to serve as a basis for comparison to later investigations, we have elaborated the frequency of the occurrence of the single species not with marking but numerically. We hope to get a picture more exact in this way.

#### a. Small-Backwater:

Three of the fourteen species, caught by means of fish-baskets from the backwater containing less and shallower water, are predominating: *Lepomis gibbosus* L. (33.16 per cent), *Scardinius erythrophthalmus* L. (23.35 p.c.), and *Carassius carassius* L. (12.87 p.c.). These are giving approximately 70 per cent of all the fish caught. *Ictalurus nebulosus* Le Suer (7.38 per cent), *Rutilus rutilus* L. (6.27 p.c.), *Esox lucius* (530 p.c.), and *Perca fluviatilis* L. (4.04 p.c.) are the further species to be called frequent in that area. The other seven species don't achieve even 8 p.c. what refers to unfavourable conditions being for them in that area. The exemplars of *Abramis brama* L. coming from that area have shown the marks of scragginess.

#### b. Large-Backwater:

The conditions of life found in a deeper water of larger surface resulted in a somewhat differing quantitative composition. Beside *Scardinius erythrophthalmus* L. (21.6 per cent) and *Carassius carassius* L. (16.06 p.c.) that tolerate the backwater conditions like these, as well, *Lepomis gibbosus* L. (1.78 p.c.) went strongly back while *Rutilus rutilus* L. (17.96 p.c.) and *Esox lucius* L. (21.17 p.c.) found better conditions in the backwater of richer vegetation. That the essential conditions are of different character as compared to the former ones, it is shown by *Stizostedion lucioperca* L. (6.78 per cent) whose occurrence to a greater extent — considering its individual weight, too is important economically, as well. This fact is proved also by the frequent occurrence of further four species: *Ictalurus nebulosus* LE SUER (3.19 p.c.), *Carassius auratus gibelio* BL. (2.49 p.c.), *Abramis ballerus* L. (2.43 p.c.), and *Cyprinus carpio* L. (2.16 p.c.). The occurrence of *Carassius auratus gibelio* BL. in a such a proportion is considerable even faunistically.

#### c. Backwater of Örvény:

It is a typical „pond” of carp-pike-tench. These species markedly multiplied in the backwater refreshed by the inundation and since then becoming slowly drier.

Besides the occurrence in large numbers of *Carassius carassius* L. (45.71 per cent) and *Esox lucius* L. (14.94 p.c.) the presence in high proportion of *Tinca tinca* L. (10.30 p.c.) may be emphasized, in agreement with some literary data that notice the enormous multiplication of the tench, too, in some places (DECKERT 1969). Apart from these three species — that come to 71 per cent of the fish caught from the backwater — *Ictalurus nebulosus* LE SUER (6.86 p.c.), *Scardinius erythrophthalmus* L. (6.5 p.c.), *Lepomis gibbosus* L. (5.02 p.c.), *Cyprinus carpio* L. (4.11 p.c.), and *Rutilus rutilus* L. (3.90 p.c.) are worth mentioning.

#### d. Backwater of Füred:

Investigating the data of this backwater, it is to be mentioned that we have so far taken into consideration only the results of the sport anglers. We can get a real picture after completing these in the following with an investigation by means of fish-baskets, as well. *Alburnus alburnus* L. (39.00 p.c.), *Alburnus mento* AG (6.60 p.c.), and *Pelecus cultratus* L. (5.4 p.c.) could not be found elsewhere at all or not in this ratio. This can be attributed in case of the two *Alburnus* species to the method of catching while the occurrence of *Pelecus* in such a high degree cannot be generalized and only be considered as a consequence of the transitional state after the great flood of 1970. In respect of other species, also the backwater of Füred shows the feature of other backwaters.

After evaluating the summarized data, we may confirm the generalizations contained in the above analysis. The species, in respect of their occurrence and quantity, can be put in four groups (Table 1, total fish). We have considered as occurring in large numbers the fish achieving 10.00 per cent. In the other categories, apart from their number, we took into consideration the demands of fish, as well.

#### A. There live in large numbers in the area investigated:

*Scardinius erythrophthalmus* L. (19 p.c.), *Carassius carassius* L. (16 p.c.), *Lepomis gibbosus* L. (15.63 p.c.), *Rutilus rutilus* L. (10.20 p.c.), and *Esox lucius* L. (10 p.c.). Those together are giving 70.83 per cent of the 6928 fish exemplars examined that proves their backwater character. Taking into consideration not only the number but also the weight of the individuals, we find a prevalence of pike whose exemplars weighing more than 1 kg are not at all seldom in these waters. The carp, owing to its wantlessness, develops in "poorer waters", as well. That is the explanation for its much larger backwater distribution than that of the carp.

The roach and white-fish are not to be underrated as food for the fish of prey; like fishing products, however, they are worthless. The common sunfish is noxious in the backwaters, too, because of its voracious roe-eating.

#### B. There are frequent in the area investigated:

*Alburnus alburnus* L. (7.03 per cent), *Ictalurus nebulosus* LE SUER (4.3 p.c.), *Perca fluviatilis* L. (2.7 p.c.), *Tinca tinca* L. (2.22 p.c.), *Stizostedion lucioperca* L. (2.21 p.c.), *Cyprinus carpio* L. (1.73 p.c.), *Acerina cernua* L. (1.7 p.c.), and *Abramis brama* L. (1.6 p.c.). Although being frequent, they live only sporadically in large masses. The carp is to be mentioned because of its importance. Its multiplication in large numbers cannot be recorded on, unfortunately, anywhere in the backwaters. This directs our attention to the vital importance of the acclimatization of carps.

C. There are common in the area investigated:

*Alburnus mento* AG. (1.2 per cent), *Abramis ballerus* L. (0.91 p.c.), *Carassius auratus gibelio* BL. (0.81 p.c.), and *Blicca bjoerkna* L. (0.72 p.c.).

D. There are rare in the area investigated:

*Pelecus cultratus* L. (1.00 p.c.), *Acerina schraetzer* L. (0.9 p.c.), *Abramis sapa* PALL. (0.06 p.c.), *Aspius aspius* L. (0.04 p.c.), and *Silurus glanis* (0.04 p.c.).

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