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ICHTHYOLOGICAL AND PISCATORIAL PROBLEMS AT THE KISKÖRE WATER BASIN

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Abstract

During the course of the past 15 years the occurrence of 49 fish species had been demonstrated at the reaches of the Tisza river above Kisköre (Eastern-Hungary) and at the more than 100 km² large flood-plain water basin, resp., established lately at this section.

On the effect of the damming up started in 1973 the ratio of the rheophyll and limnophyll species strongly shifted to the advantage of the latter. Earlier this reach could be included in the upper section of the carp-zone, today it belongs to the lower section. In the shallow basin area the stand of the stagnophyll species also began to increase. Among our more important useful fish, the present circumstances are favourable for mainly the carp and pikeperch.

Firstly the increasing of the carp-stock is desirable at the basin, however, for this — contrary to the earlier practice — not the introductions, but the improvement of the conditions for natural increase is recommended.

Introduction

Till our days three river barrages had been established at the Tisza river: two in Hungary (at the settlements Tiszalök and Kisköre), and one in Yugoslavia (beside Novi-Bečej). The greatest change in the ecological relations of the river was caused by the operation of the barrage started at Kisköre, since here, above the river barrage, a water basin larger than 100 km² was also developed at the wide flood area. Water is stored at the averagely 4—5 km wide flood plain from March till October, and although today the water level is still about 1 metre lower than finally planned, a water-covering over 50 cm can be found at close to ten thousand hectares.

The water basin, however, has not become a uniform water area (Fig. 1). Protruding in the form of islands, the higher riverside sectors following the river more or less terminate the bed from the inner areas of shallow water even today. The ecological differences of the river-bed and storage area are also manifested in the species composition of their fish fauna, however, the situation is complicated by the fact that the storage area is only a periodical living place, from where the fish withdraw to the old backwaters and river-water beds (Tisza river, Small-Tisza, Eger-brook) at the time of Autumn draining.

From the viewpoint of fish economy the water area belongs to the Hungarian National Association for Fishing. However, in their present number, the anglers are unable as yet to utilize the basin duly, therefore small gear fishing is also allowed for the time being.

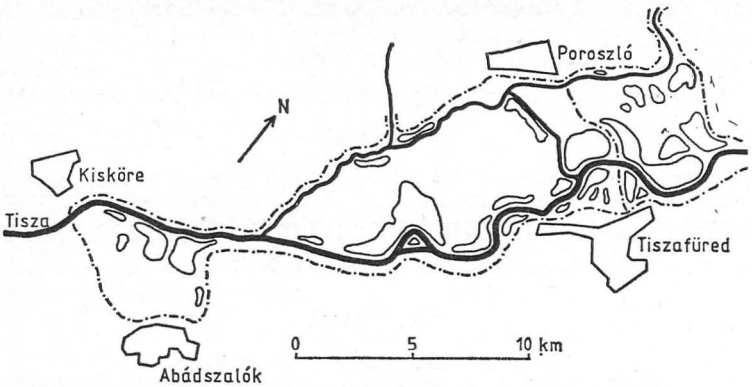

Fig. 1. Map sketch of the Kisköre water basin, indicating the bordering dams, river-waters and islands

The fish fauna of the water basin

During the course of our observations since 1970, the presence of 49 fish species had been demonstrated at the reach falling to the area of the water basin at the subsequently banked up (filled) storage area. The collections were mainly performed with fish-traps, small meshed drag- and square fishing-nets as well as with angling methods. For the determination of the samples the books of BERG (1949), BĂNĂRESCU (1964), BERINKEY (1966), LADIGES and VOGT (1965) and BALON (1967) were used, and in the case of the *Gymnocephalus baloni* the original description of the species was used (HOLČIK and HENSEL 1974). Firstly the work of MÜLLER (1983) served at the base for the style of writing the species names.

The place and incidence of occurrence are also referred to in a few words when listing the species.

Acipenseridae

Acipenser ruthenus L. — this was common earlier, today only few numbers occur in the river-bed.

Acipenser gueldenstaedti Brandt — an individual weighing 5 kg was caught on April 18, 1980 from the Tisza river at Tizsafüred.

Salmonidae

Salmo trutta fario L. — a few individuals are carried off year by year with the Spring rise of the Eger-brook.

Salmo gairdneri RICH. — its occurrence is similar to that of the formes species.

Esocidae

Esox lucius L. — this is mostly frequent in the storage area, but the size of the stock strongly fluctuates.

Cyprinidae

Leuciscus leuciscus L. — one single individual was caught in the Tisza bed at Tiszafüred on November 16, 1978.

Leuciscus cephalus L. — this was common earlier, nowadays only a small stock lives in the river.
Leuciscus idus L. — this is similar to the former, but is more frequent.
Rutilus rutilus L. — it occurs in large numbers at the storage area.
Ctenopharyngodon idella VAL. — this is not rare neither in the river, nor in the storage area.
Scardinius erythrophthalmus L. — it is frequent in the storage area.
Aspius aspius L. — the species is quite frequent both in the river and at the storage area.
Leucaspius delineatus HECK. — it is no rare in the shallow pits found along the dams.
Alburnus alburnus L. — this species can be found in teams everywhere.
Abramis brama L. — it occurs in masses, being the most frequent hauls of the fishers and anglers both at the river and at the storage tank.
Abramis ballerus L. — this is frequent at the storage tank as well as in the river.
Abramis sapa PALL. — the species only lives in the river, its stock has strongly decreased.
Blicca bjoerkna L. — this was the most frequent fish in the river, compared to this its stock has fallen, but is still frequent.
Vimba vimba L. — this species was rare earlier, too, but not one sample was caught during the past years.
Pelecus cultratus L. — it lives in small numbers, mainly in the river-bed.
Tinca tinca L. — the species is increasing at the marish areas.
Chondrostoma nasus L. — this was common, but nowadays it only lives in small numbers in the river-bed.
Barbus barbus L. the species has greatly decreased in number since the banking up.
Gobio gobio L. — it occurred in large numbers earlier, now it is becoming rarer.
Gobio albipinnatus LUK. — this is frequent in the river and its stock is increasing.
Pseudorasbora parva SCHLEG. — this probably came to the storage tank from fish ponds, its increase is expected, but is rare at present.
Rhodeus sericeus amarus BLOCH — it is quite frequent in the shallow waters along the dams.
Carassius carassius L. — this began to increase in the storage area, but its stock is still small.
Carassius auratus gibelio BLOCH — the species greatly increased following banking up, later it slightly fell back, but is still frequent in the river and storage area.
Cyprinus carpio L. — its stock is made larger by introductions, it is frequent.
Hypophthalmichthys molitrix VAL. — its stock is of medium size, it is found both in the river and at the storage area.
Aristichthys nobilis RICH. — this species is similar to the previous one, but is rarer.

Siluridae

Silurus glanis L. — its stock is of medium size, mainly living in the river.

Ictaluridae

Ictalurus nebulosus LE SUEUR — it is rather frequent at the storage area.

Cobitidae

Misgurnus fossilis L. — the species is increasing at the storage area.
Cobitis taenia L. — it is more frequent than the former at muddy areas.
Cobitis aurata FIL. — this is frequent at the more current bed sections.

Anguillidae

Anguilla anguilla L. — the species regularly occurs in the river, but is rare.

Gadidae

Lota lota L. — its stock has greatly decreased in the river, nowadays it is rather a rarity.

Percidae

Perca fluviatilis L. — this is common everywhere, but not frequent.
Stizostedion lucioperca L. — it is frequent both in the river and at the storage area, its stock is increasing.
Stizostedion volgensis GMEL. — earlier it was rare, but it is increasing nowadays.
Gymnocephalus cernua L. — this is common everywhere.
Gymnocephalus baloni HOK. et HENS. — the species is not rare at the more current reaches.
Gymnocephalus schraetzer L. — this is quite frequent in the river.
Zingel zingel L. — it was common in the river, but has greatly decreased.
Zingel streber SIEB. — a smaller stock lived in the river, but its occurrence was not observed during the past years.

Centrarchidae

Micropterus salmoides LACEP. — 30 individuals were introduced in 1984 at a more confined (enclosed) bay (inlet?) of the storage tank.
Lepomis gibbosus L. — this occurs in smaller number, mostly at the storage area.

It should be mentioned in connection with the *Cobitus aurata* that it was described from the Tisza river by JÁSZFALUSI (1948) under the naming *C. a. bulgarica* DRENSKY, but this subspecies is not included by BERINKEY (1966) in his work on the Hungarian fish fauna, only the *C. a. balcanica* KARAMAN subspecies. The ecological demands of the population living here are rather indicative of the former, but morphologically they show a transition between the two subspecies.

The fish stand before (prior to) the damming up of the water.

Before damming up, the Tisza reaches dealt with — in accordance with its middle-section character — ensured varied environmental conditions for the fish. Sections of both shallow and deep water, as well as slow and rapid current occurred.

The substance of the bed was generally formed by rough sand in the current line and by fine sand at the shores, but pebbly sections also occurred where the average granule size surpassed 8 mm (LÁSZLÓFFY 1982). The banks were also manifold. Many variations occurred, from gently sloping sand-beds to underwashed, dividing riverside sectors; from barren banks to such lined by forests and slanting trees.

In this manifold environment numerous species found their living conditions, thus the fish fauna was also characterized by great variety and relatively high species number. On the basis of the dominancy relations regarding the occurring species, before the banking up the reach could be ranked among the upper section of the carp-zone (bream-region), adjacent to the barbel-region.

Mainly the predominance of the limnophyll species increasing in the stagnant waters of inundations gave ground for the ranking amongst the carp-region; the most significant being: *Blicca bjoerkna, Abramis ballerus,* abramis brama, *Cyprinus carpio, Stizostedion lucioperca* (HARKA 1974), but the same was strengthened by the reophyll species characteristic to the carp-region, too: *Abramis sapa, Gobio albipinnatus, Cobitis aurata, Acerina schraetzer, Leuciscus idus,* etc.

The nearness (vicinity) of the barbel-region was indicated by the high ratio of the reophyll elements demanding more intensive current: *Acipenser ruthenus, Barbus barbus, Chondrostoma nasus, Leuciscus cephalus, Lota lota,* furthermore, the *Zingel zingel* and the *Zingel streber.*

The effect of the banking up

The banking up of the water started in 1973 displayed its effect even in the first years. Despite the fact that till 1977 the water had only filled up the bed, the speed of the river considerably decreased, leading to enhanced sediment formation. The pebbly bed sections dissappeared and the rough sand dominating earlier at the current line was replaced by fine sand at the upper part of the storage tank and first by clayey-sandy mud going downwards, then by deep mud layer at Kisköre (BANCSI et *al.* 1981).

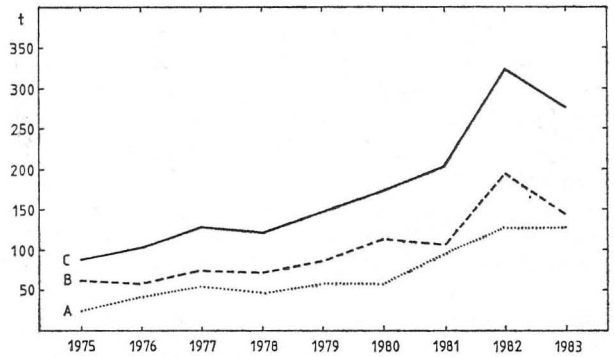

Fig. 2. Development of the total hauls at the water basin (in tons). A: anglers, B: fishers, C: the two together

The experiences gained at Tiszalök demonstrated that following the beginning intensive alluviu-deposition the situation became stable (MÁTRAI 1973), nevertheless, the species roeing on firm bottom — e.g. *Acipenser ruthenus, Barbus barbus* — were less and less able to find spawning-ground, therefore their migration had begun,

The canged ecological relations were unfavourable for every reophyll species, and this was well reflected in the number of individuals caught during the course of the probe fishings (Table 1). The great decrease exhibited for the certain species indicated the tendency of the river-water's fauna becoming poorer.

The same changes displayed positive effect in respect to the limnophyll species as well as the whole fish-produce. The water's transparency increased with the decrease of the floated (suspended?) alluvium, thus providing more favourable light conditions for the photosynthesis of algae. Even earlier, only the lack of light hindered the more enhanced organic matter production in the water rich in nutriment (HAMAR 1977), therefore the greater primary production as the consequence of the banking up also resulted the considerable increase of the water's fish-aliment stock (supply).

Since 1978 the barrage has held back the Spring inundations, thus the long-lasting water covering has become regular in the storage area, creating rather favourable conditions for the limnophyll species of the carp-region. The spread water warms up more quickly, which speeds up *the maturity of the...!?* and shortens the period of roeing, furthermore, promotes the increase of aliment-organisms. The growth of

Table 1. *Distribution according to species of the fish caught at the river-bed, on the basis of data of probe fishings with fish-trap. A: before damming, B: bed-damming, C: filled up storage tank*

	A	B	C
Acipenser ruthenus	20	—	1
Esox lucius	233	597	1194
Leuciscus cephalus	32	2	2
Leuciscus idus	46	49	40
Rutilus rutilus	59	33	151
Ctenopharyngodon idella	2	95	16
Scardinius erythrophthalmus	—	2	40
Aspius aspius	5	17	29
Abramis brama	570	521	1829
Abramis ballerus	988	766	965
Abramis sapa	849	84	35
Blicca bjoerkna	3169	398	703
Vimba vimba	3	2	—
Pelecus cultratus	38	14	13
Tinca tinca	—	—	10
Chondrostoma nasus	77	6	5
Barbus barbus	271	2	5
Carassius auratus gibelio	292	4074	1667
Cyprinus carpio	143	569	379
Hypophthalmichthys molitrix	1	211	20
Aristichthys nobilis	1	2	2
Silurus glanis	227	74	36
Ictalurus nebulosus	54	38	55
Lota lota	86	1	3
Perca fluviatilis	21	3	30
Stizostedion lucioperca	393	328	408
Stizostedion volgensis	—	3	12
Zingel zingel	53	3	—
	7633	7894	7650

the brood becomes faster, so that period of life shortens during which the fish are the most sensitive to diseases and unfavourable environmental effects.

The *Rutilus rutilus,* the *Carassius auratus* gibelio and the *Esox lucius* rapidly increased under the new conditions. Similar increase was also experienced in the case

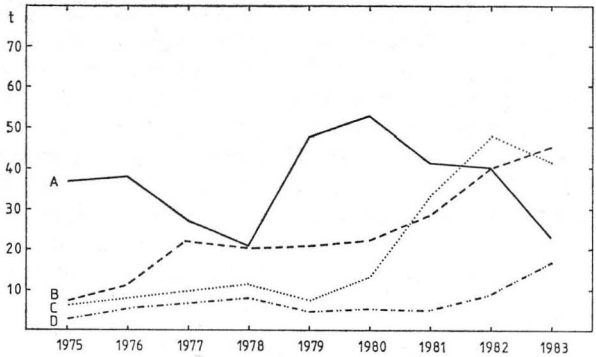

Fig. 3. Development of the joint hauls by fishers and anglers in respect to the most significant fish species (in tons). A: pike, B: carp, C: pike-perch species, D: silure

of other species, too: *Abramis brama, Cyprinus carpio, Stizostedion lucioperca,* etc. These changes can mostly be seen from the results of the probe fishings (Table 1) and from the total catching data for the more important species, respectively (Fig. 3). Data on species of small measures — e.g. *Alburnus alburnus, Rutilus rutilus,* etc. — were mainly obtained during the course of our fishings with 1 cm mesh square fishing-nets.

Where marsh-like living places developed at the storage area, the earlier repressed stagnophyl species also started to increase: *Tinca tinca, Carassius carassius, Misgurnus fossilis,* however, their stock is still not significant.

On the basis of the changes taking place in the fish stock, it could be determined that the studied section of the Tisza river no longer belongs to the upper part of the carp-region, but to the lower, and this should be taken into consideration regarding the fish economy interventions.

Problems related to fish economy

Approximate picture of the fish amount caught from the water basin could be formed on the basis of the catching registers kept by the anglers and the statistics of the fishery co-operative functioning at the water area. It can be seen from Fig. 2. that the caught amount of fish significantly increased following the embankment of the storage area.

The carp found favourable conditions at the storage tank, and its catching showed steady increase (Fig. 3B). The experiences of the labellings performed in 1972 provided basis for their growth and migration. The labelled fish averagely weighing 400 g were set out in April, and by the beginning of August in the following year they reached an average body mass of 2040 g, and several individuals weighing around 4 kg were found in the Summer of 1974 (HARKA 1975).

The number of carps staying at the reach where they were introduced could be concluded on the basis of the individuals found at the area one year after labelling. Two-thirds of these originated from the water flows belonging to the area of the water basin. The farthest notifications proved the covering of about a 100 km long path both up and down the river. Nevertheless, this labelling was performed before the barrage was set into operation, therefore it cannot be regarded as authentic in respect to the present situation, however, the newer labellings have not yet provided evaluable results.

The banking up of the storage-tank was also favourable for the pike-perch. Although the species could be found in unchanged amount at the bed, its catching greatly increased at the storage area (Fig. 3C). Studies on the development of this species were carried out at the time when only the bed's banking up was being performed at the reach (HARKA 1977). In that period the growth rate of the pike-perch from the Tisza river surpassed that of the slowly growing stock from Lake Balaton (BÍRÓ 1970), but as a matter of fact it appeared to be rather moderate. Since the banking up of the storage tank, however, the experiences have manifested considerable improvement of their condition, as well as their faster growth. The newer studies on growth should determine the degree of changes. It is worth mentioning in connection with the results of pike-perch hauls (Fig. 3C) that these also include the data of the Stizostedion volgensis, which come to about 5% of the whole.

The annual amounts of hauls regarding the pike were in general characterized by large fluctuations, and this characteristic feature could also be followed from the data gained during the course of the past decade (Fig. 3A). In the years following the

banking up of the storage tank the ratio of pikes from the hauls increased here as well, but this — as also experienced in the case of other storage tanks (BOGDANOV and LIFSIC 1976) — was only a transitional phenomenon.

The pike is a species capable of fast accommodation and great tolerance, playing pioneer role in the stocking of new living places, besides the *Rutilus rutilus* and the *Carassius auratus* gibelio of similar character. Its development is fast (RISTIČ 1963, BALON 1967) and our studies on the local population (HARKA 1983a) showed that the pikes brooded in the Summer of 1978 — growing under favourable conditions — could be hauled in the Autumn of 1979.

The great migration as well as the increasing competition of the pike-perch starting to grow with about 2 years' delay played significant role among the causes of the regression. The pikes getting into the river-bed at the time of the Autumn draining of the storage tank's water, set off in search for spawning-ground swimming up-stream at the time of the Spring overflow, but in such manner their route did not lead to the storage area, but to the upper reaches. The migration is not a new phenomenon, however, its effect is felt better since the river barrage hinders the swimming up of the new generation.

The hauling results of the silure had only started to improve in the recent years. Its growth falls behind that of the silures in the Don river (BIZJAEV 1952) and at the Danube section in Yugoslavia (RISTIČ 1972), but is faster than in the Slovakian waters (SEDLÁR and GECZŐ 1973), thus it is not unfavourable (HARKA 1983b). Being a favorite sport fish, it is desirable to keep the level of the stock.

Possibilities for increasing the fish stock

The utilizer of the water area — the Hungarian National Association for Fishing — firstly aims at the increasing of the carp stock from our useful fish, in the interest of which it allots considerable amounts to carp introductions year by year. These introductions play role in the continuous increase of the hauls, nevertheless, according to our opinion the increase of the stock under present circumstances should firstly be achieved by the better utilization of the possibilities, the promotion of natural increase as well as by the protection of the progeny. The most important conditions for this are the followings:

1. The best spawning-grounds should be determined and care should be taken not to damage these during the course of adjustments at the area of the storage tank.

2. The beginning of spawning should be followed with attention, and at this period — for the promotion of spawning — the water level should be raised by a few centrimetres.

3. The raised water level should be kept till the larvae brood, to prevent the roe of fish from getting on dry surface.

4. At present, it is of negative effect on the complete fish stock that numerous fish — mainly offsprings — remain outside the plains without any outlet and die on the occasions of the Autumn drainings. To prevent this, the area adjustments and canal-buildings should be further continued, making it possible for the brood to reach deep waters as well as for the sake of their safer over-wintering.

5. The periodicity of the drainings would serve the same purpose, during the course of which faster and slower decreases in level would alternate. The aim of the faster fall would be to prompt the fish to flight, while the slower decreasing of the level would give them possibility to find their way of escape. The period and degree of the fall should be chosen on the basis of practical experiences, since the lower and upper part of the storage tank reacts differently to the same intervention.

6. For the purpose of maintaining the fish productivity of the storage tank it would be desirable to have the mud at the bed bottom dry out and aired through at times. At present this only takes place in part, since after draining rainy, then frosty periods arrive soon. Therefore it should be investigated from what time the water demand of the utilizers could be met from the completely filled canals, and the time-point of draining should be brought forward as much as possible. The aerobic processes taking place in the drying out mud layer greatly contribute to the maintenance of the storage tank's productivity.

The water basin firstly serves watering purposes, thus the viewpoints of fish economy can only be taken into consideration in the second place. Nevertheless, with the better harmonizing of the demands and with tighter co-operation it is accessible to have it contribute to the enrichment of the Tisza river's fish stock, to a larger extent than at present.

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A Kiskörei-víztározó ichthyológiai és halászati problémái

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Kivonat

A tanulmány a Tisza folyó Kisköre fölötti 30 kilométeres szakaszának, illetve az ennek hullámterén kialakított víztározó halállományának változását elemzi.

A területről az utóbbi 15 év során 49 halfaj jelenlétét sikerült kimutatni. A duzzasztás óta a reofil és limnofil fajok arányában igen jelentős eltolódás történt az utóbbiak javára. Míg korábban a folyószakasz a pontyrégió fölső szakaszába tartozott, ma az alsó szakaszába sorolható, a tározótérben pedig a stagnofil fajok állománya is növekedésnek indult.

A jelenlegi körülmények — a gazdaságilag fontos fajok közül — főként a ponty és a süllő számára kedvezőek.

A tározóban elsősorban a pontyállomány növelése kívános, de ezt — a korábbi gyakorlattól eltérően — nem telepítésekkel, hanem a lehetőségek jobb kihasználásával kell elérni. Ennek megfelelően a tanulmányban megfogalmazott javaslatok is főként a természetes szaporodás elősegítésére és az ivadék védelmére vonatkoznak.

Кишкерейское водохранилище Ихтиология и проблемы рыбоводства

ГОРКО А.

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Резюме

Исследования анализируют рыбный состав водохранилища реки Тисы, расположенного на 30 км выше Кишкера. За последние 15 лет здесь обнаружено 49 видов рыб.

После запруда водохранилища в нем произошли значительные сдвиги в направлении реофильных и лимнофильных видов особенно со значительным перевесом последних. Раньше этот отрезок реки относиться к коропному вернему региону, а в настоящее время его следует зачислить к нижнему отрезку, где началось развитие стегофильных видов.

В современных условиях для рыбного хозяйства особый интерес представляет развитие корона и судака. В хранилищах в первую очередь желательно разводить корона путем естественного размножения (охраны мальков).

Ihtiolo ki i ribolovni problemi akumulacije Kisköre

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Abstrakt

Na oko 30 km dižinskoj deonici reke Tise, odnosno izgradjenoj akumulaciji iznad naselja Kisköre, utvrdjeno je prisustvo 49 vrsta riba, tokom zadnjih 15 godina. Usled akumulacije znatno se povećao broj limnofilnih vrsta, dok su reofilne vrste potisnute. Ova deonica reke ranije je pripadala gornjem regionu šarana, dok se danas već uvrštava donjoj regiji. U akumulaciji se i stagnofilne vrste brojnije javljaju. Postojeći uslovi su povoljni za šarana, smudja, štuku i soma, od ekonomski značajnih vrsta riba. U cilju rastenja njihovih populacija, autor, umesto dosadašnje prakse naseljavanja, predlaže poboljšanje uslova za reprodukciju u prirodnim uslovima, i zauzima se za stvaranje uslova za uspešnije prezimljavanje mladji.