Tiscia (Szeged) Vol. XVII, pp. 191—197 (1982)

ICHTHYOLOGICAL RELATIONS OF KÖRTVÉLYES DEAD CHANNEL IN MÁRTÉLY LANDSCAPE PROTECTION AREA

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(Received 15 October, 1981)

Abstract

I have been investigating Körtvélyes dead channel since 1972. A holiday resort was established on the banks of Mártély dead channel, as a consequence of this the ecological conditions of the dead channel have changed.

I shortly introduce my methods of investigation. I mention the plant species and plankton which are important from the point of view of fish fauna. I indicate their significance, the pathogen bacterium flora of the dead channel and the resulted fish-death. I describe the frequent fish species, the quantitative and growth relations of fish stand and alevin. I call attention to the circumstances endangering the fish stand.

I set up fauna list about fish species found in the dead channel in 1976 and 1981. I indicate their frequency. I call attention to the changes in the dead channel wich have happened during this period. I describe the fish species decreasing or increasing in number, in the menatime disappeared or appearing fish species according to their frequency. On the basis of my observations I try to explain the presumable causes of this phenomena.

Introduction

The research of fish fauna the observation of reproductive and growth relations of single species have important economic interest. As a result of foundation of industrial units, application of chemicals artificial fertilizers our rivers and natural waters have become more and more polluted. So the protection of indigenous fauna and flora is absolutely necessary. Our state wish to ensure the achievement of this aims by foundation of landscape protection areas. The third landscape protection area of our country after Tihany and Badacsony, the Mártély landscape protection area can be found on the left bank of river Tisza. Two dead channels take up positions on the landscape protection area: Mártély and Körtvélyes dead channels. Few literary data are available about the fish fauna of dead channels (FARKAS 1976) from this part of river Tisza (FERENCZ 1965, MARIÁN 1971). The Committee of Tisza Research of Hungarian Academy of Sciences deal with the complex investigation of dead channel.

Material and Methods

I investigate into the fish fauna with the help of fishermen trusted with fishing of the dead channel. The fishing is done by laying down of fish-baskets, by curtain-net (so called „marázsa") and binding up angle. The whole dead channel is fished every year twice or three times with trail-

net. So I have opportunity to observe both the quantitative formation of fish fauna and the frequency of single species. In addition to this my own fisher-tackle also helps to take a survey of fish fauna. My instruments are: 1.5 m×1.5 m brood-trap, 4 mm×4 mm close-meshed net, fishing tackle and drag-net. I sort the fish caught during the general fishing according to species, I determine their age on the basis of their scale-annual rings then I measure the weight of same aged fish and I calculate their average weight. The totality of caught fish was regarded as 100% from this I established the frequency and percentage amount of single species on the basis of individual number of every single species.

From 1000 pieces caught fish:

+ rarely occuring species	1—5
+ + less frequent	5—20
+ + + frequent	20—50
+ + + + very frequent	50—200

I investigated into the stomach-content of predatory fish only. The fish species being in the stomach were determined on the basis of their scales, fins and pharyngeal teeth.

Description of Körtvélyes Dead Channel

Körtvélyes dead channel is situated on the left bank of river Tisza between 201—203 riverkm-s east of Szeged. Its length is about 5 km its average width is 300—400 m. It is U-shaped, periodically closed dead channel. The depth of the water at the two ends of the dead channel is 0.5 m, while in the middle part 2.5—3 m. It becomes gradually deeper from the two ends towards the middle part. The bed is covered by thick mud-layer wich is thickened annually by the flowing back flood. The subsoil of the dead channel is previous (ANDÓ, BODROGKÖZY and MARIÁN 1974).

It is periodically closed dead channel. It is flooded by Tisza annually several times. During rainy years we can account with 10—13 floods, during droughty years twice or three times. Regular flood is the so called spring-flood in May or June and the flood taking place because of rains in October—November. During the time of flood the water level is growing with 3—5 m. The dead channel is the former bed of Tisza before regulation. It has an overweir at 201st riverkm. Here the overflow is leaving (SIMÁNDY 1978). At the end of the dead channel near the dyke a pumping station can be found wich supplies the rice fields with water, resp. let the drained water get into the dead channel.

Characteristic plant species of the dead channel:

On both banks of the dead channel rich plant vegetation can be found, *Salicetum albo-fragilis* association, as well as *Phragmites communis, Lythrum salicaria, Lythrum virgatum, Potamogeton sp., Trapa natans; Carici-Typhoidetum, Caricetum gracilis, Lythro virgatae-Alopecuretum* (BODROGKÖZY and HORVÁTH 1977). The maximum of these associations is in June, the minimum is in October. The roots of *Salix* and *Populus* species usually reach the water from the bank. These are very favourable places of roe-laying for *Lucioperca* and *Alburnus* species. *Trapa natans* means hiding place, worms living on its roots and stems mean food source for Cyprinidae species. *Trapa natans* covers the shoals of the dead channel contiguously from May till November. *Abramis brama, Esox lucius* like to lay their roes on the water-covered parts of *Lythrum* and *Potamogeton* species during flood (FARKAS 1978).

Plankton-stand: concerning the greatest species- and individualnumbers of zooplankton always Rotatoria species are dominant except April. Protozoa and Entomostraca species can be found in medium species — and individualnumbers (GÁL 1977).

List of occuring more important species:

PROTOZOA: *Arcella discoides, Difflugia globulosa, Centropixis aculeata, Vorticella campanulla.*
Rotatoria: *Polyarthra vulgaris, Keratella cochlearis, Brachionus angularis.*
Entomostraca: *Moina recrirostris, Bosmina longirostris-typica.*

Concerning the total individualnumber of zooplankton annually two maximums appear: a bigger in Spring (usually in May) and a smaller in Autumn (mostly in September or October). The formation of individualnumber is significantly influenced by the temperature. The optimal watertemperature is between 15—25 °C. At high waterlevel the number of zooplankton strongly decreases, after the flood is re-estblished. In Körtvélyes dead channel beside diatoms Chlorococcales green-algaes occure in great number (KISS 1976).

For young fish the above mentioned formation of zooplankton-number is very favourable because the hatched larvae and young fish find rich food especially Rotatoria in the water. We can explain the quick growth and vitality of hatched fish with this. Reproductive conditions of fish of the dead channel:

As the dead channel is flooded annually several times by Tisza the fish stand is continually changing. From the flooded area fish get into Tisza, or into dead channel, by chance into pits (so-called "kubik") after flowing back of the flood. The first flood usually coincides with the reproductive period of Cyprinidae species and on the flood area in the shallow, easily warming up water the young fish quickly hatch. After the flood young fish find favourable conditions in the dead channel. During Summer this individuals grow stronger, then they get back into Tisza with the Autumn-flood. Consequently from the point of view of fish breeding and as a place of laying roes the role of Körtvélyes dead channel is very important concerning the fish fauna of Tisza (FARKAS 1978).

Factors damaging the fish fauna of the dead channel:

The water-quality of the dead channel according to investigations of M. HEGEDÜS (1981) is "clear" 1st class; obligate faecal bacteria for example faecalis coliform, faecalis streptococcus and species of Salmonella genus very rarely can be found. The number of bacteria-plankton is 1—1 000 000 m^3, it increases during floods and decreases in Autumn.

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The water of the dead channel is polluted by the social sewage-water of surrounded settlements as well as by the the drained waters of rice-fields consisting plant-protecting agents. I have experienced more important fish-death in 1975, then in 1977 in the middle of August. According to investigations of M. HEGEDÜS (1981) the fish death was caused by *Salmonella* and by the polluted water (3rd class) of inflowing channel.

The very active fishing is also a damaging factor of fish stand of the dead channel. During the autumnal general fishing a lot of young fish jam into the close-meshed nets For this reason a great number of fry is perishing During the flowing back of Spring-flood fishermen pull curtain-net ("marázsa") between the two banks of the dead channel in every 50—100 m. During some weeks they totally fish the whole fish stand of the dead channel. We should more thoroughly protect our indigenous fish stand in a landscape protection area.

The role of fish stand in bird- and mammal-fauna:

In Körtvélyes dead channel a peculiar flora, bird-, fish- and mammal-fauna of Europe can be found. At the two ends of the dead channel our water-birds find

food. Bird-species feeding in the dead channel: *Egretta alba, Egretta garzetta, Ardea cinerea, Ciconia ciconia, Ciconia nigra, Platalea leucorodia, Anas platyrrhynchos, Nycticorax nycticorax, Pandion haliaetus, Fulica atra, Lutra lutra* and *Ondatra zibethica* also occur in the dead channel. Unfortunately *Lutra lutra* isn't able to settle down there because of the intense fishing (CSIZMADIA 1976, 1980).

Results

I determined 31 fish-species in the dead channel in 1976. In 1981 I experienced changes in the number and frequency of fish-species.

Comparison of fauna-lists from 1976 and 1981 according to changes of species-individualnumber

Fauna-list		1976	1981
Acipenseridae	*Acipenser ruthenus* LINNÉ	+	—
Esocidae	*Esox lucius* LINNÉ	+++	++++
Cyprinidae	*Rutilus rutilus*	++++	++++
	Leuciscus cephalus LINNÉ	+	+
	Leuciscus idus LINNÉ	+	+
	Scardinius erythrophthalmus LINNÉ	++	++
	Aspius aspius LINNÉ	+++	++
	Tinca tinca LINNÉ	+	+
	Gobio gobio LINNÉ	+	+
	Barbus barbus LINNÉ	++	—
	Alburnus alburnus LINNÉ	+++	++++
	Blicca bjoerkna LINNÉ	+++	+++
	Abramis brama LINNÉ	++++	+++
	Abramis ballerus LINNÉ	+++	++
	Pelecus cultratus LINNÉ	++	++
	Rhoedeus sericeus amarus BLOCH	+++	++
	Carassius carassius LINNÉ	++++	+
	Carassius auratus gibelio BLOCH	+	++
	Cyprinus carpio m. *hung.* HECKEL	+++	+++
	Cyprinus carpio m. *acuminatus* HECKEL	+++	+++
	Hypothalamichthys molitrix VALENCIENNES	+	+
	Ctenopharyngodon idella VALENCIENNES	+	+
Siluridae	*Silurus glanis* LINNÉ	+	+
Amiuridae	*Amiurus nebulosus* LE SUEUR	++	—
Anquillidae	*Anquilla anquilla* LINNÉ	+	+
Gadidae	*Lota lota* LINNÉ	+	+
Centrarhidae	*Lepomis gibbosus* LINNÉ	+++	++
Perciadae	*Lucioperca lucioperca* LINNÉ	++	++
	Lucioperca volgensis GMELIN	+	+
	Perca fluviatilis LINNÉ	++++	++++
	Acerina cernua LINNÉ	++++	++++
	Acerina Schraetzer LINNÉ	++	++

We can explain the rapid breeding of Esox lucius with the repeated flood in February and March as well as with the increased individualnumber of *Alburnus alburnus* and the unchanged great individualnumber of *Rutilus rutilus. Esox lucius* has layed roes during the Spring-flood in February—March in every year from 1977 up to this time. The hatched young fish found good feeding conditions and hiding place in the dead channel their growing parameteres were also very favourable. 12% of total weight of in Autumn fished fish was *Esox lucius,* its average weight was 1200 g/individual at the age of three. The cause of decreasing number of *Barbus barbus* and Aspius aspius probably is the increasing amount of mud in the riverbed because of

the long-lasting floods of Tisza. The pebbly bottom is less, where these two species can lay their roes. The roots of willows standing on the banks of the dead channel are very advantageous for laying roes of *Alburnus alburnus*. Here they lay roes in great quantity. The number of *Abramis ballerus, Rhodeus sericeus amarus, Carassius carassius,* shows ever decreasing tendency. I think it is caused by the rapid breeding of food-competitors. *Carassius auratus gibelio* reproduced itself rapidly after 1976. Nowadays its individualnumber shows decreasing tendency, in my opinion it is caused partly by the spread of intense fishing partly by the food-competition of *Abramis* species. *Amiurus nebulosus* probably because of illness nearly totally perished from Tisza and its dead channels. *Ctenophoryngodon idella* has appeared in the dead channel in 1977. In 1978—79 significant part of *Trapa natans* was eated by them. They endanger the existence of indigenous fish fauna. From 1980 their individualnumber has been decreasing. They got into Tisza by chance from fish-ponds during floods. Individuals of *Cyprinus carpio* morpha *hungaricus* were considerably mixed with morpha acuminatus. They prefer to be in the dead channel. The shallow part of the bed overgrown with *Trapa natans* is very favourable for them. The weight of their 4—5 years old individuals reaches 1000—1200 g. In 1975 and 1980 their spawning was very succesful. The great number of *Perca fluviatilis* is attributed to the advantageous ecological environment. It is a fish with very low demand of oxygen. It occurs also on the more shallow places of the dead channel. In its nutrition first of all *Alburnus alburnus* plays role, *Rutilus rutilus* is only 24% of its food. I have got the same result at the investigation of stomachcontent of *Esox lucius* too. The reason of this — in my opinion — that *Rutilus rutilus* is able to hide better. *Lucioperca lucioperca* occured only in lower individualnumber in the dead channel. They are mostly 15—20 cm long individuals. Their growing time is good at the age of three they reach 700—750 g in weight (FARKAS 1980, HARKA 1972).

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A Mártélyi Tájvédelmi Körzet Körtvélyesi-holtágának ichtiológiai viszonyai

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Kivonat

A terület holtágainak ilyen irányú kutatásai 1972 óta folynak. Megállapítást nyert: a halfaunája szezonális változását tekintve összefüggés adódott a holtágak mikroflóra és faunösszetételének mennyiségi és minőségi változása között. Hasonló eredmények születtek a patogén baktériumflóra és az időnkénti halpusztulás vonatkozásában is.

Szerző adatokat közöl e vizek halfajainak gyakoriságára, a halivadék mennyiségi és egyednövekedési viszonyaira egyaránt. Elkészült a holtágak halfajok faunalistája is, öt évi vizsgálatainak szintéziseként. Ezáltal nyomon követhetők az időközben eltűnt, vagy megjelent fajok is. Felhívta a figyelmet a halfaunát károsító, így a természetvédelem érdekeit is szolgáló hatásokra, azok elhárítására egyaránt.

Ihtiološke osobenosti mrtvaje Körtvélyes zaštićenog okruga Mártély

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Abstrakt

Istraživanja su zapo^{5}eta u 1972. godini. Utvrdjena je uzajamna uslovljenost izmedju sezonskih promena ihtiofaune i kvalitativnih i kvantitativnih promena =ikroflore i faune mrtvaja. Slični su rezultati i u odnosu na patogene bakterije i povremenog pomora riba.

Prezentovani su podaci o čestoći pojedinih vrsta riba u ovim mrtvajama kao i o uslovima kvantitativnog i pojedinačnog rasta riblje mladji. Kao sinteza petogodišnjih istraživanje izradjen je spisak ihtiofaune mrtvaja. Na osnovu toga moguće je pratiti kako vrste koje su nestale, tako i nove koje su se u medjuvremeno pojavile. Ukazano je i na, za faunu riba, štetne uticaje i otkalnjanje istih, a time i na zaítitu životne sredine.

ИХТИОЛОГИЧЕСКИЕ ОТНОШЕНИЯ СТАРИЦЫ КЁРТВЕЙЕШ МАРТЕЛЬСКОГО ЗАПОВЕДНОГО РАЙОНА

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Резюме

Исследования на старицах наших рек проводятся с 1972 года. В результате пришли к такому заключению, что в количественных и качественных отношениях здесь образуется взаимная связь между микрофлорой стариц и сложением их ихтиофауны. Подобные результаты возникают также между патогенной бактериальной флорой и сезонной гибельню рыб.

Автор приводит результаты по встречаемости видов рыб в водах, а также о количестве мальков рыб в отношениях их развития. На основании пятилетних исследований был составлен список рыбной фауны этих стариц. В связи с этим можно ознакомиться с ростом и гибелью рыб, а также с причинами приводящими к ущербу рыбной фауны, одновременно с возможностью их устранения, что является интересом охраны природы.