UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE IAŞI

Research contract no.406/01.10.2007

Research topic:

MONITORIZAREA TRANSFORMARILOR PRIVIND AREALUL SI EFECTIVELE UNOR SPECII ENDEMICE DE PEŞTI DIN BAZINUL SUPERIOR AL BISTRITEI MOLDOVENESTI

MONITORING THE TRANSFORMATIONS CONCERNING THE AREAL AND THE AMMOUNT OF SOME ENDEMIC FISH SPECIES FROM THE UPPER BAZIN OF MOLDAVIAN BISTRITA RIVER

YEAR III

GRANT MANAGER,
Prof . univ. dr. PASARIN BENONE

I A S I 2009

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REPORT SYNTHESIS

GRANT MANAGER,
Prof . univ. dr. PASARIN BENONE

Report on the run activities and achieved results, compared with the project goals

TOPIC:

" MONITORIZAREA TRANSFORMARILOR PRIVIND AREALUL SI EFECTIVELE UNOR SPECII ENDEMICE DE PEŞTI DIN BAZINUL SUPERIOR AL BISTRITEI MOLDOVENESTI''

MONITORING THE TRANSFORMATIONS CONCERNING THE AREAL AND THE AMMOUNT OF SOME ENDEMIC FISH SPECIES FROM THE UPPER BAZIN OF MOLDAVIAN BISTRITA RIVER

IIIrd stage - 2009

SPECIFIC GOALS

1. Interpretation of the results issued from the sampled ichtiologic material (Assessment of numeric and gravimetric fish stock)

SCIENTIFIC AND MANAGERIAL ACTIVITIES

1.1. Calculation of species cenotic affinity index
1.2. Calculation of specific similarity index

2. Interpretative processing of the biodiversity data (Biologic evaluation of the aquatic environment quality)

SCIENTIFIC AND MANAGERIAL ACTIVITIES
2.1. Calculation of Shannon Weaver – species diversity index
2.2. Calculation of equitability index for the endemic species

3. Interpretative processing of the capture

SCIENTIFIC AND MANAGERIAL ACTIVITIES
3.1. Assessment of relative abundance for each captured species and collection points
3.2. Assessment of absolute abundance for each captured species and collection points

4. Interpretative processing of the biomass species

SCIENTIFIC AND MANAGERIAL ACTIVITIES
4.1. Assessment of relative biomass from whole capture
4.2. Assessment of absolute biomass from whole capture

5. Estimation of species constancy and dominance

SCIENTIFIC AND MANAGERIAL ACTIVITIES
5.1. Estimation of endemic fish species constancy

ABSTRACT

Lately, the research concerning the delimitation, monitoring and preserving those ichthyotaxons submitted to extinction of the Romanian fauna in general and of the North-East part of Romania in particular has suffered a pronounced regress. There were few studies that focused on the refuge areas of the rare and endemic species of fish of sweet water, having as habitat the mountain regions, their reproductive evolution, migrations, the impact of the invasive species, etc., the general emphasis being on thorough fundamental research regarding the species of major economic importance, the same species that represent the object of aquaculture.

Few of these published studies can be labeled as non-disparate, systematized and of deontological probity, as many of them comprise data from the inhabitants near the banks, from sportive fishermen or different forestry employees.

We grafted the research in the Northeast region of the country because:

1. The superior area of the Moldavian Bistrița includes a series of singular biotope in Romania and Europe, assertion that is supported by the fact that this is perhaps the last zone where the huch (*Hucho hucho L*), grayling (*Thymallus thymallus L*) and eel (*Eudontomyzon danfordi*) etc. can still be found.
2. In the upper area of Bistrița there is a species of miller's thumb unique in Romania (another species of this fish was discovered only in Sweden), bearing the name of variegated miller's thumb (*Cottus poecilopus Heckel* 1836);
3. In the above mentioned area there will probably be an expansion of the vast hydro-technical devices, which will involve important geographical changes in the course of the Bistrița river, from the end of the lake Bicaz up to Vatra Dornei region.

Chaotic forestry exploitations have altered the equilibrium achieved in tens or hundreds of years, by removing sawdust from the riverbed of the emissaries, by wild rafting, by spilling used fuel and lubricants, sonic pollution, sunstroke, trepidations etc.

DETAILED ABSTRACT

The study aimed to characterize the state of ichthyofauna in an area where the river Bistrita, naturally, is included habitat of endemic species and endangered. At the same time, sought to find usable parts scientifically sustainable management of ecosystem integrity in the study.

Also, the results can be a database for further research, aimed at finding some changes to the structure and operation of fish communities in the area due to environmental factors and anthropogenic influences.

Research, both at the stage of evidence collection and processing phase and the evaluation results were achieved with modern principles, agreed nationally and internationally.

Thus, the results allow the formulation of conclusions consistent with results of other similar research bill, as follows:

● taxonomic analysis of the material collected shows the presence of 16 fish species, species belonging to seven families - Cyprinidae (6 species), Cobitidae (2 species), Cottidae (2 species), salmon (three species), Thymallidae (species) Petromyzomidae (one species) and Godidae (one species).

● With the spread of species in the study area is noted ubicity of nine species present in all three fishing stations, but the majority of small body size and without economic value or for fishing.

● In some habitats have been found valuable species, rare or endangered (*Hucho hucho, Endomytizon danfordi, Cottus poecilopus and Cobiltis aurata Balkans*), protected by national legislation or international conventions.

● stock assessment numbers and gravimetric expressed in catch per unit effort is equal to 100 m^2 or electric fished catch made with 100 m gillnet, show values ranging between a minimum of 30 specimens/100 m^2 and 173 specimens/100 m^2 respectively 527 ± 0.29 per 100 m^2 and 1800± 1.28 g/100 m^2.

● The ecological importance ihtiocenoze, assessed by fractional conjunction of structural features, *Phoxinus phoxinus*, *Gobio gobio*, and *Leuciscus cephalus Alburnoides bipunctatus* are driving species without economic value, and *Salmo trutta fario, Hucho hucho, Cottus gobio* and *Leuciscus cephalus* are species characteristic of the area studied.

INTRODUCTION

Natural and anthropogenic changes are so current situation fishery fauna of natural emissaries must withstand considerable external pressures to find solutions to hazards warning constitutes a major demand, both in terms of management of the fisheries resources and the measures ichthyofauna conservation and protection.

Through our study we proposed to update data on ichthyofauna fish in some mountain areas have been studied in the past (Bistrita river basin), and the premiere of some aspects of ecology of ichthyofauna consists of rare species and endangered.

Besides fauna data, species list, we wanted to give information on aspects of ecology of fish populations and communities, addressed through analytical and synthetic indicators.

Biological evaluation of water quality was studied by the method IBI (Index of Biotic Integrity), according to the method adopted in the study area considered hidrogeographic (2, 7).

Information obtained on the condition of aquatic habitats and studied area ihtiocenoses allow the realization of the degree of change in the aquatic environment associated with measures of protection and conservation of fisheries and fishing funds.

MATERIAL AND METHOD

In preparing the paper we used the data resulting from exploratory fishing trips organized during the three months of 2006, and during the two months of 2008, using both conventional gear (gillnets, purse) and electric fishing, respecting the methodology to calculate the reported catch "equal effort unit (quantitative samples) (2, 17, 18, 23, 16).

During the study, were driven over 700 km of rivers and streams, with a large area over 8700 km2, establishing three target study areas (upstream of Vatra Dornei, the confluence of the Bistrita confluence with the brook Barnar and the brook Borca (Fig. 1), performed the experimental catch, 33 in a number of three stations (upstream Vatra Dornei), between Vatra Dornei and Brosteni, between Brosteni and Bicaz lake). It was captured a total of 1812 specimens, weight total of 32.92 kg (Fig. 1).

Also to provide a causal explanation as appropriate on the worsening condition ichthyofauna found in some sections of the river Bistrita, he proceeded to complement organic results collected from the field with laboratory tests, which highlighted concerns over the effects of wastewater behavior of species like green algae, and fish microcrustaceae in contact with various concentrations of pollutants (32, 33, 45, 18).

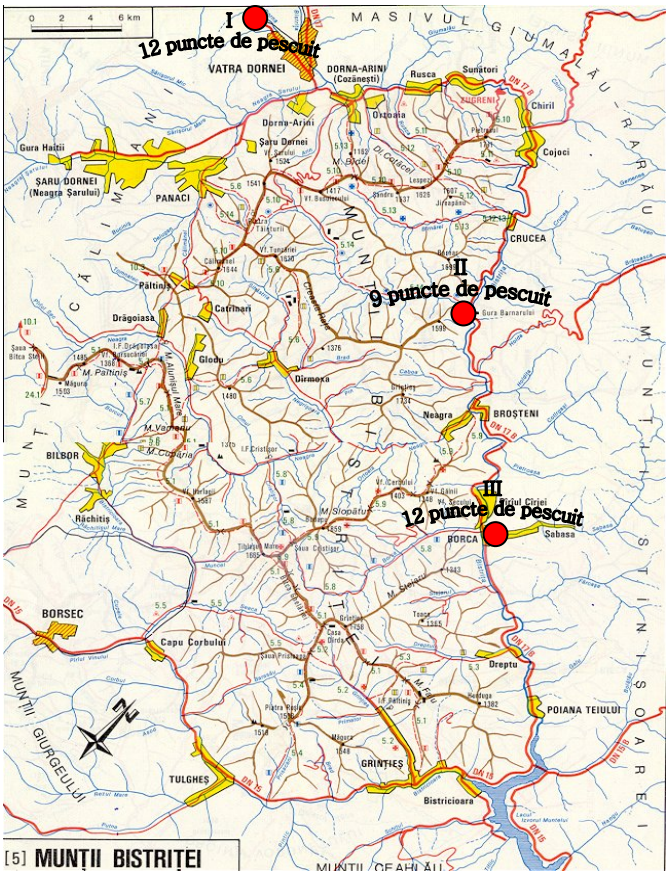

Fig. 1 Bistrița River and the 3 fishing experimental stations

RESULTS AND DISCUSSIONS

Variety of environmental conditions of water catchment of the river Bistrita biogeographical zoning allows one to fish in these waters. Thus, under his classification Vermaux (1977) (18), adapted and modified by Matthew and Manea (1990) (18, 17, 22, 25, 27) in flowing water ecosystems in Moldova, according to environmental performance of Fish a biocenotype there are nine socio-ecological groups, of which the first four are found in physical-geographical and ecological conditions of the studied area of the river Bistrita.

Results obtained in fishing station nr.I

a) relating to numeric and gravimetric stock The catch sharing plan control were considered data of fish supplied by the river Bistrita monograph, monograph due to C. Motas and V. Anghelescu, 1944 (17) and can encompass a diverse area of investigation as . Thus, it was felt that more should be fishing in the series which according to previous studies, belonged hochner (*Hucho hucho*) and mottled bullhead (*Cottus poecilopus*). For the first fishing station (upstream of Vatra Dornei, at the confluence of the river Bistrita river Dorna), electroshock was performed by a number of 12 collections, 612 specimens fishing is fish total weight of 11.95 kg (x = 19.52 ± 0.23 g / copy). Fish collected belonged to a number of 11 species representing seven families, all local. From Fig. 2 and Fig. 3 it is noted that if numerically dominant species *Phoxinus phoxinus* (24%), followed by species *Gobio gobio* (20%) and species *Barbusse Peteny meridionalis* (16%), small

species, as gravimetry stock (biomass) most important species was *Salmo trutta fario* (37%) and *Hucho hucho* (22%), representing approx. 59% of the total catch.

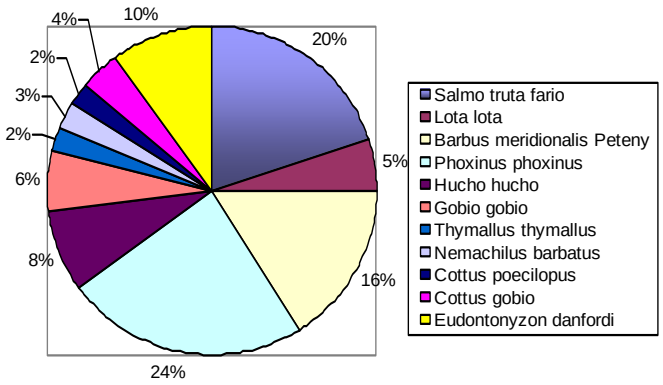

Fig. 2 Fish numeric stock from whole capture

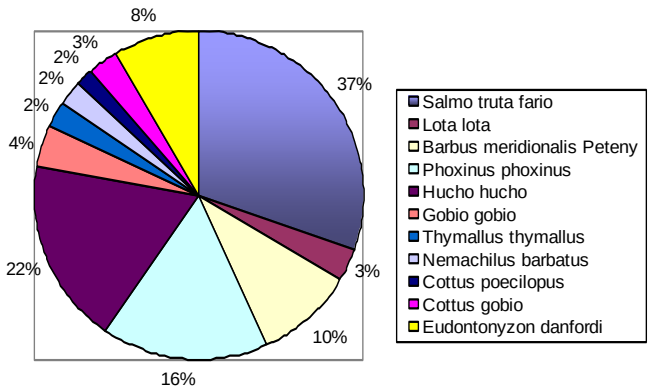

Fig. 3 Fish gravimetric stock from whole capture

Mathematical data and analysis shows different values between species.

Thus, stock numbers had values of between 30 specimens/100 m^2 and 143specimens/100 m^2 variations are due to particularly small species and juveniles. The confluence of the Bistrita area with Dorna brook, stock number reached 150 specimens/100 m^2.

Regarding stock gravimetry values ranged between 275± 0.17 g/100 m^2 and 1800 ± 1.23 g/100 m^2 with the highest values recorded in the confluence of its tributary river Bistrita with Dorna.

b) Cenotic dentogram affinity index showed an affinity for 65.32% of group characteristic species researched area. The value of this index increased (50%) showed the presence of the species most common in the State fishing catch I work due to a better adaptation to specific local habitat conditions, but adaptation to changing environmental factors induced period dry and rainy periods.

c) specific similarity index highlights the special character of Station I, fishing, species present *Hucho hucho, Thymallus thymallus* and *Cottus poecilopus*, single basin of the Siret River in Romania, which supports the need for protective measures.

d) species diversity index

Degree of diversity was expressed by the Shannon Weaver index of biodiversity and euitability index for all 12 points of Station I. Thus fishing, fishing in nine points were taken between 9 and 11 species of fish, three points and capture fisheries is between three and seven species, equity index values ranging between 0.54 and 0.88.

Except in areas to observe a strong human impact (disposal of sewage waste discharge sawdust, cutting trees by the banks, etc.), We can say that in the studied conditions are similar, this being confirmed by habitat uniform nature.

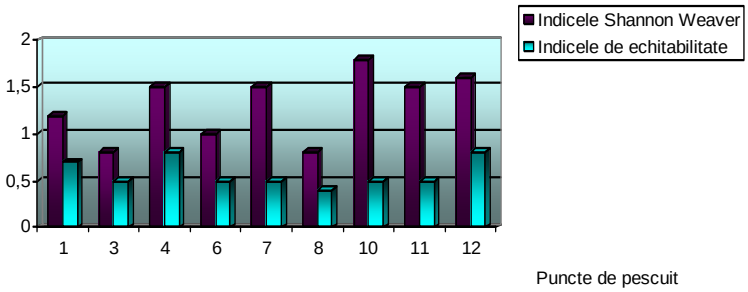

Fig. 4 Values of diversity and equitability indexes for Fishing station I

Among the species caught was found the presence of five species of rare and endangered species listed in Annex II of the Law 462/2001 (Law of species requires the establishment of protected areas), namely *Hucho hucho, Endontomyzon danfordi, Cottus poecilopus, Thymallus thymallus* and *Lota Lota*.

Results obtained in fishing station no. II

a) relating to stock numbers and gravimetric

In the Station no. II (Bistrita river confluence with tributary Barnar) by electroshock were performed a total of nine collections, fishing is 517 specimens of fish, total weight of 10.73 kg (x = 20.75 ± 0.17 g / individual).

Fish collected belonged to 13 species have been classified in a number of five families, all local.

Analyzing Fig. 5 and Fig. 6 numerically dominant species is noted that *Gobio gobio* (27%), followed by *Bipunctatus Alburnoides* species (19%), *Nemachilus barbatulus* (18%) and *Barbusse Peteny meridionalis* (15%), all species are small, and that the biomass most representative species were *Leuciscus cephalus* (28%), *Salmo trutta fario* (19%) and *Hucho hucho* (16%), which represented approx. 63% of the total catch.

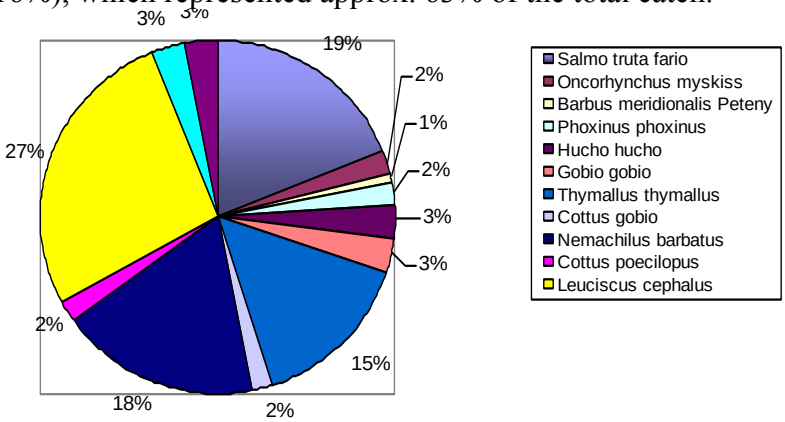

Fig. 5 Fish numeric stock from whole capture

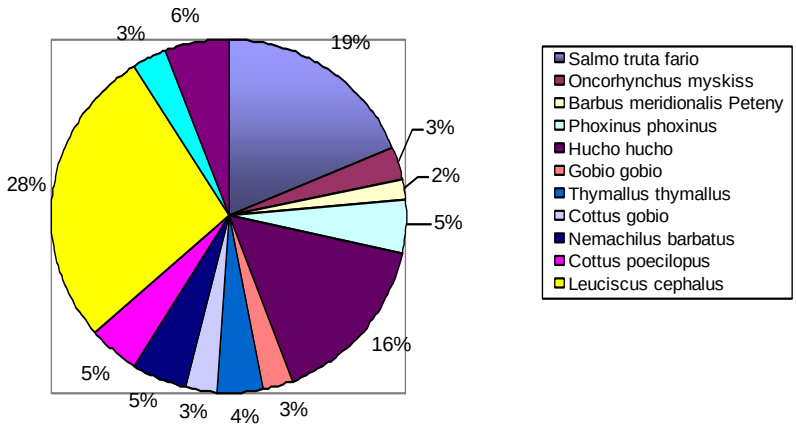

Fig. 6 Fish gravimetric stock from whole capture

On the stock and number of fish caught in gravimetry of the two fishing stations, data analysis shows different values, but beyond 70 specimens/m^2, the highest value occurring at the confluence of the tributary river Bistrita Barnar - 149 specimens / 100 m^2, but was considered different species and juveniles.

Regarding stock gravimetry were mean 312 ± 0.33 g/m^2, the highest values occurring throughout the area of the confluence with its tributary river Bistrita Barnar.

b) Making a dentogram of cenotic affinity, we achieved an index value of 57.3% cenotic affinity for characteristic species group, species are sector specific Region I of mountain water, the grayling (*Thymallus thymallus*). Complementary and related species, the affinity index ranged from 18.3% cenotic first class and 8.6% in the second category.

c) The similarity index specifies Station II highlights the particular nature of fishing, species present *Hucho hucho, Cottus poecilopus, Lota Lota* and maintaining *Thymallus thymallus* introduction and enforcement of protective measures.

d) species diversity index. As for Station I, the degree of biodiversity has been expressed by the Shannon Weaver diversity index and index equitability for all 9 points Fishing Station II. Thus, fishing six points were taken between 8:11 species (x = 9,5 ± 1.16 species / fishing point), a single station were harvested five species (x = 5 , 0 ± 0.12 species / fishing point), and two stations were taken between six and nine species (x = 7.3 ± 1.28 species / fishing point).

Equity index values ranged between 0.38 and 0.89. Shannon Weaver diversity index values have ranged from a minimum of 0.632 and a maximum of 2104 (Fig.7).

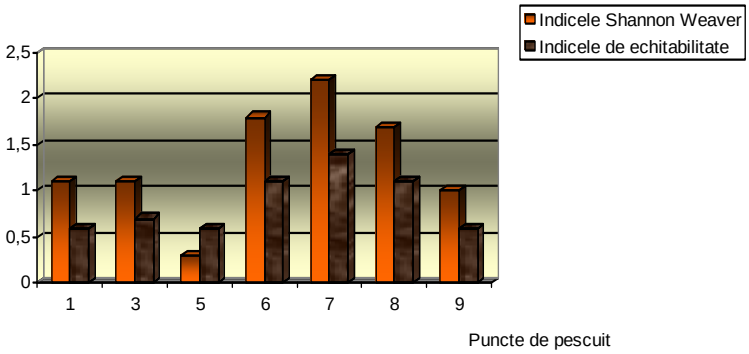

Fig. 7 Values of diversity and equitability indexes for Fishing station II

Among the species caught in March found the presence of rare and endangered species listed in Annex II of the Law 462/2001, ie *Hucho hucho, Endontomyzon danfordi* and *Cottus poecilopus*.

Results obtained in fishing station no. III

a) relating to numeric and gravimetric fish stock. In the Station no. III (Bistrita river confluence with tributaries Borca and Sabasa) by electroshock was performed a total of 12 collections, 683 specimens fishing is fish total weight of 10.24 kg (x = 15.25 ± 0.34 g / individual).

Number of species collected in 12 points ranged from 4 species (Borca downstream point, point in the discharge of wastewater) and 12 species (Sabasa point upstream).

Quantitative differences between collection points are easily observable (both in number and as biomass), being determined by environmental conditions and human impact. Number of specimens collected collection point varies between 38 fish and 235 fish, weighing between 517 g and (x = 517 ± 1.06 g) and 4317 g (x = 4317 ± 1.43 g).

From Fig. Fig.9 is observed in August and that the species *Leuciscus cephalus* (18%), *Gobio gobio* (17%), *Alburnoides bipunctatus* (16%), and *Phoxinus phoxinus* (13%) are most important in number, representing together more than half of total catch (64%). Low effective *Cobitis aurata Balkan* (2%), a benthic species very sensitive to pollution, indicates that water is sufficiently high pollution.

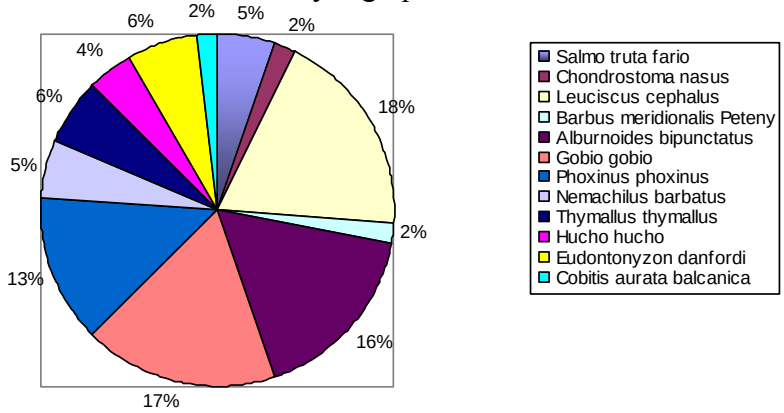

Fig. 8 Fish numeric stock from whole capture

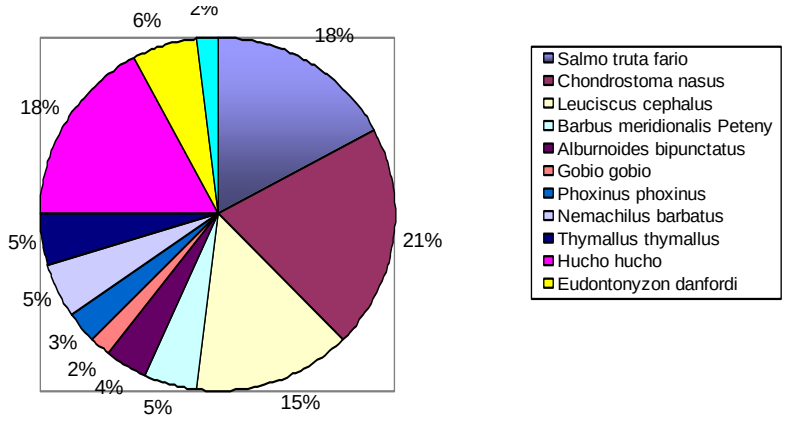

Fig. 9 Fish gravimetric stock from whole capture

As biomass, the most representative species were *Chondrostoma nasus* (21%), *Salmo trutta fario* and *Hucho hucho* (18%), with *Leuciscus cephalus* (15%).

Mathematical, numerical and gravimetric stock on the fish caught in the third station of the fishing, the analysis concludes that the values were different, ranging between a minimum of 43 specimens/100 m^2 and a maximum 173 specimens/100 173 with a significant contribution of small and juvenile fish species.

Gravimetry on stock values ranged from 257 ± 0.29 per 100 m^2 and 886 ± 0.53 per 100 m^2, the best results occurring at the confluence with tributaries Borca and Sabasa Bistrita.

b) Analyzing the cenotic dentogram, affinity group observed species *Gobio gobio* and *Leuciscus cephalus* with an index higher, 78.9% and can be regarded as a species with greater tolerance to pollution.

Barbusse Peteny meridionalis species, *Nemachilus barbatulus, Cobitis aurata Balkan* and *Thymallus thymallus* are dependent on unpolluted water. Among the species caught was recorded presence of two rare species and an endangered species listed in Annex II of the Law 462/2001, namely: *Endontomyzon dandordi*, *Balkan and Hucho hucho Cobitis aurata*.

c) Tags ecological and fisheries associations

Analysing ecological significance index values can be concluded that the species *Leuciscus cephalus* (W = 25.8%), *Alburnoides bipunctatus* (W = 21.7%), *Gobio gobio* (W = 21.3%) and *Phoxinus phoxinus* (W = 16.3%) species are regarded as the leading species, while species *Salmo trutta fario* (W = 12.6%), *Hucho hucho* (W = 11.3%), *Barbusse Peteny meridionalis* (W = 11.0%) and *Nemachilus barbatulus* (W = 10.6%) are characteristic species. All other species fished species are either related or accidental species.

d) species diversity index

Degree of biodiversity has been expressed by the Shannon Weaver diversity index and equity index for all 12 points of Station III fishing. Thus, fishing seven points were captured between 7 and 10 species (x = 8.5 species / point of fishing), fishing in capturing five points is between five and eight species (x = 6.5 species / fishing point), equity index values ranging between 0.463 and 0.772, which shows that fish community structure is relatively diverse, with an average degree of equilibrium (Fig. 10).

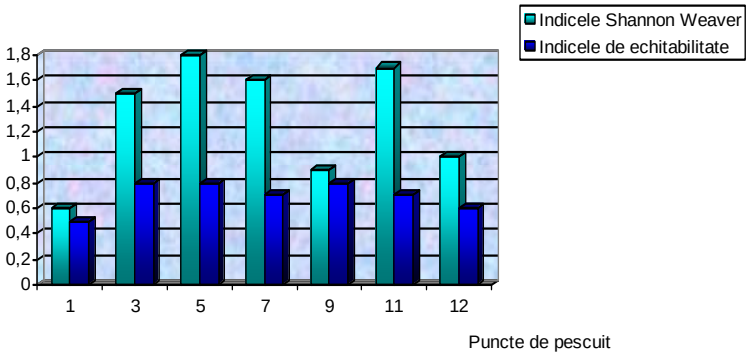

Fig. 10 Values of diversity and equitability indexes for Fishing station III

It can also specify that the fishing zone belonging Station III environmental conditions are dependent on human impact, particularly household spills, residues from farming activity and local private industry (sawmills, presses for forest fruit, primary processing of mushrooms, forest exploitation parquet etc.).

CONCLUSIONS

The study aimed to characterize the state of ichthyofauna in an area where the river Bistrita, naturally, is included habitat of endemic species and endangered. At the same time, sought to find usable parts scientifically sustainable management of ecosystem integrity in the study.

Also, the results can be a database for further research, aimed at finding some changes to the structure and operation of fish communities in the area due to environmental factors and anthropogenic influences.

Research, both at the stage of evidence collection and processing phase and the evaluation results were achieved with modern principles, agreed nationally and internationally. The results obtained allow to formulate conclusions consistent with other research results similar bill, as follows:

1. Taxonomic analysis of the material collected shows the presence of 16 fish species, species belonging to seven families - Cyprinidae (6 species), Cobitidae (2 species), Cottidae (2 species), salmon (three species), Thymallidae (one species), Petromyzomidae (one species) and Godidae (one species).

2. With the spread of species in the study area is noted the ubicuity of nine species present in all three fishing stations, but most are small body size and without economic value or for fishing.

3. In some habitats have been found valuable species, rare or endangered (*Hucho hucho, Endomytizon danfordi, Cottus poecilopus* and *Cobiltis aurata Balkans*, protected by national legislation or international conventions.

4. Stock assessment expressed numerically and gravimetrically catch per unit effort is equal to 100 m2 or electric fishing catches made by 100 m of gillnet, show values ranging between a minimum of 30 specimens/100 m^2 and 173 specimens/100m^2 respectively. 527±0.29 g/100 m^2 and 1800±1.28 g/100 m^2.

5. After ecological importance of ihtiocenoze, assessed by corroborating structural characteristics and fractional, *Phoxinus phoxinus, Gobio gobio*, and *Leuciscus cephalus Alburnoides bipunctatus* are driving species without economic value, and *Salmo trutta fario, Hucho hucho, Cottus gobio* and *Leuciscus cephalus* are species characteristic of the area studied.

* *The goals and activities for 2009 year have been fully acomplished*

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