

STATUS OF PEACEFUL AND PREDATORY FRESHWATER FISH STOCKS IN THE DANUBE SECTOR KM 1047 - KM 1071 IN CORRELATION WITH THE VARIATION OF RIVER TEMPERATURES AND LEVELS DURING THE 2020 YEAR

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Abstract

The purpose of this paper was to analyze the influence of environmental factors on the capture and family structures of fish from Danube River, sector km 1047- km 1071. The fish was collected from January to December 2020. During the year, following the scientific fishing, 2.676 fish specimens belonging to 6 species were collected. The dominant family, Cyprinidae (78.21% in terms of number fish) was represented by 3 species (Cyprinus carpio, Carassius gibelio, Abramis brama), followed by the Siluridae (11.47%) with one species (Silurus glanis), Percidae (9.87%) with one species (Sander lucioperca) and Esocidae (0.45%) with one species also (Esox lucius). Both temperature and water levels were raised in correlation with total catches and fishing effort. The highest capture was 933 fish (34.87% of the total catch) during the autumn season (September-November), followed by the summer season with 717 fish (26.79 % of the total catch) and spring season (Martie-May) with 580 fish (21.68% of the total catch). The water level and water flow showed a high correlation with both number, total catch, and fishing effort, respectively.

Keywords: Danube River, abiotic factors, catch, fish communities

INTRODUCTION

The Danube River with its length of 2860 km is the second largest in Europe after the Volga, represents a true aquatic ecosystem that hosts a number of 28 species of fish that are subjected to commercially fishing. Systematically, these fish species are included in 5 families and 18 genres (Antipa, 1909). Due to the geographical location within the continent of the Danube river basin, at the contact between the temperate-oceanic climate in the west, temperate-continental in the east, and the Baltic influences in the north, the hydrological regime of the Danube is characterized by significant variations in level and flow, during the year and over time (Chioveanu, et al. 2020). Therefore, it is very well known that Danube is a major river with an extreme spatial and temporal variability of physical,

chemical, hydrological, and biological characteristics (Sandu, et al. 2013). The scientific community has shown in numerous studies that seasonal variation of the physico-chemical and hydrological parameters, can have extremely important consequences on the structure and dynamics of the fish communities (abundance, migration, diet, growth, reproduction, recruitment, mortality, catch, etc.) (Chowdhury et al. 2015; Coast-Conserv, 2011).

In this context, the present study aims to evaluate the state of peaceful and predatory fish stocks for the most commercially important species on the Danube sector km 1047- km 1071, in correlation with the variation of river temperatures and levels.

MATERIALS AND METHODS

Fishing area

The monitoring took place between January - December 2020 on the Danube sector km 1047 - km 1071 at the Iron Gate I (Figure 1), where the water levels and

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temperatures were monitored in two stations as follows: S1- Baziaș (GPS coordinates 44.822760, 21.387634) and S2- Moldova Veche (GPS coordinates 44.723698, 21.615794). The water temperature was measured using the Hach-Lange HQ40D portable two-channel digital multiparameter, while the water levels were measured according to the reference level for stations S1 and S2. The fish analyzed was scientifically fished on the Danube sector km 1047 - km 1071 from January to December 2020, inclusive.

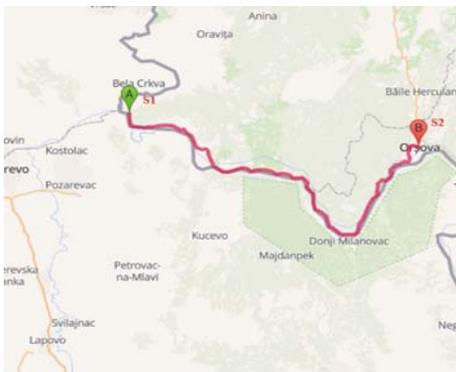


Figure 1 Sampling location during January – December 2020

Fishing gears and methods

The fishing has been made with the same fishing filtering floating gears: gill nets and trammel nets. Dependent on the season and on the followed group of breeds, their sizes varied as follows: gill nets (Lp: 100 - 200 m; Hp: 2.5 - 3.5 m, a: 40 - 60 mm), trammel nets (Lp: 150 - 200 m; Hp: 2.5 - 4.0 m, a: 40 - 80 mm). The gill nets and the trammel nets are made of synthetic materials (relon).

The analysis of the capture data:

The capture data comes from the scientific fishing made by the fishermen coordinated by the researchers of the Institute of Research and Development for Aquatic Ecology, Fishing, and Aquaculture in Galați, and the obtained data were processed by the researchers into the laboratories. Statistical analysis included one-way ANOVA test to analyze the variance significance, followed by Tukey Test to observe any significant differences between the data strings.

RESULTS AND DISCUSSIONS

Fish distribution and abundance are strongly influenced by the rainfall and by the variation of levels and temperature (Holčík, 2003).

The Danube level ranged in Baziaș station (km 1071) as follows: in spring between 564±5.8 - 596±17.6 cm, in summer between 568±9.9 - 591±27.3 cm, in autumn between 564±7.4 - 591±18.1 cm, in winter 566±8.3 - 581±15.1 cm (Figure 2).

Over the last century, the temperature of our planet has gradually increased (Zolnikov et al. 2018). Global mean surface temperatures have increased by 0.75°C over the past century, with the rate of change increasing from the 1970s (Harrod, 2016). The medium water temperature in the study areas in both station during spring, varied between 7.9±0.6 - 18.2±1.7°C, during summer between 21.9±1.2 - 26.3±0.5°C, autumn between 9.6±1.9 - 26.3±0.5°C and in winter varied between 3.5±0.7 - 4.7±1°C.

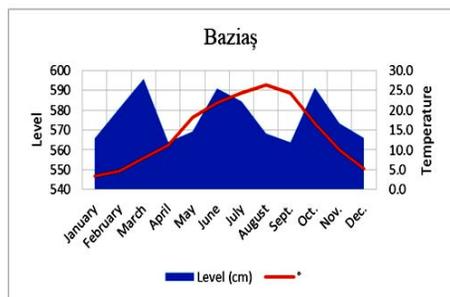


Figure 2. Water levels (cm) and temperature (°C) dynamics during the 2020 year in the S1 station

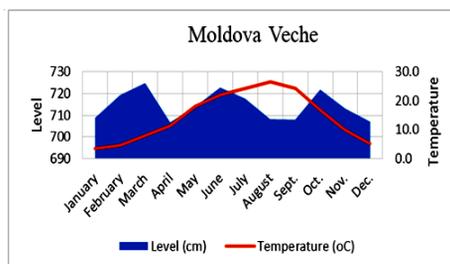


Figure 3. Water levels (cm) and temperature (°C) dynamics during the 2020 year in S2 station

The Danube level ranged in Moldova Veche station as follows: in spring between 690

- 740 cm, in summer between 690 - 750 cm, in autumn between 708±5.8 - 722±12.8 cm, in winter 707±11.5 - 713±9.8 cm (Figure 3).

Correlation analysis revealed that there is a direct positive correlation between both water temperature (Pearson coefficient = 0.98753), respectively water level (Pearson coefficient = 0.99218) and peaceful fish catches in the study area.

During the year 2020, 2676 fish of 6 species and 4 families were collected (Figure 4, Table 1). The species of fish caught were taxonomically identified as follows: *Cyprinus carpio* (Linnaeus, 1758), *Carassius gibelio* (Linnaeus, 1758), *Abramis brama* (Linnaeus, 1758), *Sander lucioperca* (Linnaeus, 1758), *Exos lucius* (Linnaeus, 1758) and *Silurus glanis* (Linnaeus, 1758) (Table 1, Figure 4). Following the ichthyological analysis, the fish specimens were separated into two categories depending on the feeding regime as follows:

peaceful species - *Cyprinus carpio* (carp), *Carassius gibelio* (crucian), *Abramis brama* (bream), and predatory species - *Sander lucioperca* (pikeperch), *Exos lucius* (perch) and *Silurus glanis* (catfish).

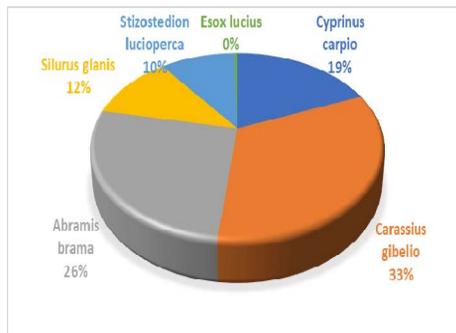


Figure 4. Fish communities' structure, by species

Table 1 Quantitative fish communities' structure in the fishing area (in number of fish)

No. crt.	Month	Species						Fish	Percent (%)
		Carp	Crucian	Bream	Catfish	Pikeperch	Pike		
1	January	35	109	30	18	2		194	7.25
2	February	23	72	44	15	4		158	5.90
3	March	29	125	71	42			267	9.98
4	April	38	49	17	35			139	5.19
5	May	97			77			174	6.50
6	June	69	83	48	59			259	9.68
7	July	42	84	76	12	45		259	9.68
8	August	56	41	76		26		199	7.44
9	September	71	103	137	22	45		378	14.13
10	October		129	141	19	94	8	391	14.61
11	November	25	54	34	3	45	3	164	6.13
12	December	18	34	33	5	3	1	94	3.51
	TOTAL	503	883	707	307	264	12	2676	100

The highest capture was 933 fish (34,87% of the total catch) during the autumn season (September-November), followed by the summer season with 717 fish (26,79 % of the total catch) and spring season (Martie-May) with 580 fish (21,68% of the total catch).

Radu (2012) and Chiovenu (2019) noticed that in the years or seasons with water levels and water flow higher, peaceful species are

advantaged, with more chances of escaping the predator attack, and years or seasons with small water levels favoring predatory fish species, a fact confirmed by our study as well. We noticed that peaceful fish catches are higher than predatory fish ichthyophagous fish catches (Table 1, figure 4).

CONCLUSIONS

Fish community composition is a basic ecological aspect, knowledge of which is necessary for the correct exploitation, regulation, and management of fishing and water resources. The influence of abiotic and biotic factors on the total catch and fish communities' composition was analyzed. Generally, the overall number of fish species caught from the Danube area, between km 1071-1047 was 6, belonging to 4 families. Cyprinidae, the dominant family, was represented by 3 species (*Cyprinus carpio*, *Carassius gibelio* and *Abramis brama*). Other families had the following structure: Siluridae with one species (*Silurus glanis*), Percidae with one species (*Sander lucioperca*), Esocidae with one species (*Esox lucius*). The data collected showed the presence of stable ichthyocenosis, in special for Cyprinidae family. The research suggests that the ichthyofauna structure is dependent on ecosystem characteristics and consequently is affected by ecological processes.

As the main conclusion, it can be said that there is a direct positive correlation between water temperature registered in Danube River (at 1047 and 1071 river km) and total peaceful catches from the study area (Baziaș- Moldova Veche) as well as between water level also registered in Danube River (at 1047 and 1071 river km) and total peaceful fish catches from the study area (Baziaș- Moldova Veche).

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