

BIOGENIC CAPACITY ON SOMEȘUL CALD RIVER, ROMANIA, IN ORDER TO INCREASE THE SALMONIDS POTENTIAL

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ABSTRACT

The purpose of the present study is to determine the biogenic capacity and the salmonids potential of upstream Ic Ponor sector of Someșul Cald river, Cluj county, Romania in order to increase the live stock by population and river-bed construction works. The researches have been conducted on Someșul Cald river on a sector of 4.0 km. The determination of the biogenic capacity was established according to the method elaborated by National Institute for Research and Development in Forestry „Marin Drăcea” (Cristea, 2004) Romania, analysing the abiotic, biotic and anthropic factors which influence the salmonids production. After analysing the field data, we established a 68 average score for the entire sector, thus, the biogenic capacity on the investigated sector being VII, a class belonging to the category of medium-rich waters. The established salmonids production is 18.7 kg/km of river. The river bed construction works (floored waterfalls, anchored trees placement, small lakes for fry, juvenile trout population), salmonids fry introduction and river protection represent premises for the increase and amelioration of salmonid population, of the ecosystem they belong to, which, in time, determine a substantial economic contribution by selling fishing authorizations and also by developing zonal tourism, by promoting nature and its resources long-lasting management.

1. Introduction

Someșul Cald river is located in the Apuseni Mountains, at the south of the Vlădeasa massif, and is part of the fishing fund no. 5, Someșul Cald Superior. According to the fishery fund record, the basin covers a reception area of 30 km² with a total length of 47 km and an average width of 6 m. The average depth during the rainy season is 1,5 m, and 1 m in the dry season, the seasonal turbidity being 25 days.

The average summer temperature is 10°C and the winter average is 0°C, with 110 freezing days per year. The predominant rocks in the area are limestones, but there are also volcanic rocks. The dominant soils are eutricambisol, districambisol and podzol. The vegetation is represented by pure spruces forests and mixtures of spruce and fir. The salmonids fauna of Someșul Cald river is represented by indigenous trout (brown trout) (*Salmo trutta*), grayling (*Thymallus thymallus*), in addition to these, there are also european bullhead (*Cottus gobio*), minnow (*Phoxinus phoxinus*), chub (*Squalius cephalus*), perch (*Perca fluviatilis*) (Ciobanu, 2018).



Fig. Studied sector on Someșul Cald river (google maps processing)



The score established for I, II, III is successively subtracted from 100, then the average is made, resulting a final score that frames within a salmonids quality class (biogenic capacity), according to the table on the right.

According to quality class (biogenic capacity), there are:

- poor waters, with a biogenic capacity I-III;
- average waters, with a biogenic capacity IV-VI;
- rich waters, with a biogenic capacity VII-IX
- (waters with biogenic capacity X exist only on portions of rivers).

Final score	Quality class (biogenic capacity)
0-5	I
6-20	II
21-35	III
36-45	IV
46-55	V
56-65	VI
66-75	VII
76-85	VIII
86-95	IX
96-100	X

Salmonid productivity was calculated with the formula:

$$P = B \times L \times h \text{ (kg/km)}$$

which indicates the amount of salmonids (trout and grayling) in kilograms per 1 km of the river.

P – salmonids productivity (kg/km râu);
 B – biogenic capacity (quality class)
 L – average width of running water (m); in each sector of 200 m, the width of the bed was measured in 5 points, then the average was made for the sector, and finally, the average for the entire river segment. The width of the bed was measured with a tape measure
 h – habitat (the ratio between the area useful as shelter and food and the total surface of the river. This parameter was determined for each river sector, the area useful as food and shelter being established as a percentage (%) of the total area of the river segment, then the average for the entire studied river segment was calculated.

2. Aim and objectives

The aim of present study was to determine the biogenic capacity (quality class) and salmonids productivity on Someșul Cald river, upstream of Ic Ponor.

Objectives:

- updating the situation in the field regarding the characteristics of the salmonids fishing water territory in the studied portion of the river;
- identification and assessment of biotope, biotic, abiotic and anthropogenic factors that influence the salmonids potential, in order to determine the biogenic capacity and include the studied portion of the river in a quality class;
- identification of areas with low productivity and proposals for works and actions in order to raise salmonids productivity.

3. Material and method

The studied river segment (4 km) was divided into sectors of 200 m length to facilitate the recording of the necessary data, and at the end, an average was calculated for each recorded parameter.

The determination of the biogenic capacity was established according to the method elaborated by National Institute for Research and Development in Forestry „Marin Drăcea”, Romania (Cristea, 2004) analysing the abiotic, biotic and anthropic factors which influence the salmonid production.

I. Abiotic factors:

- torrential character (0-10 points)
- geological structure of the bank and of the bottom bed (0-10 points)
- stability of the bottom bed (0-10 points)
- bed instability in the horizontal plane (0-10 points)
- average altitude and frost (longitudinal ice bridge) (2-5 points)

II. Biotic factors

- areas with salmonids (0-10 points)
- areas with benthic fauna (3-10 points)
- unforrested banks (3-10 points)
- areas with brook lamprey (0-5 points)
- clearings and meadows (0-5 points)

III. Anthropogenic factors

- human settlements (4-10 points)
- sources of pollution (5-15 points)
- transport facilities (2-5 points)



Fig. Someșul Cald river (google maps processing, foto by Aldo Csaki)

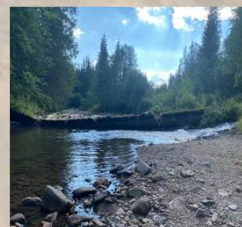


Fig. Existing wooden waterfall (foto by Aldo Csaki)



Fig. 3D concept wooden waterfall (by Aldo Csaki)

4. Results and discussion

Regarding the abiotic factors, the water depth had values between 30 and 91 cm, the average pH value was 7, the water speed varies between 0.14 and 0.9 m/s, the torrential character is weak-medium, the rocks present in the bed bottom are mainly limestone, the bed bottom is stable, the instability of the bed in the horizontal plane is particularly good, the altitude varies between 1030 to 1050 m, the freezing of water in the cold season occurs on 80-90 % from the length of the studied sector.

The biotic factors are presented as follows: the presence of salmonids was reported throughout the studied sector (between ¼ and 1), the benthic fauna exists (between ¼ and 1), unforrested banks exist in a proportion that varies between 1 and 10 and 2/3 of the length of the sectors, the brook lamprey (*Eudontomyzon danfordi*) was not reported on the studied river section, the presence of meadows/clearings on the river bank varies from 0 to ½ per sector.

The influence of the anthropic factor is present in three sectors out of the 20 analyzed. The transport facilities are represented by the forestry road Obârșia Someșul Cald which accompanies the river for 85% of its length, and the sources of pollution are represented only by tourist activity, there are no mines and hydrotechnical installations in the area.

The score obtained on the 20 river sectors varies quite a little, the maximum value was obtained in sector 16 (37 points), and the minimum value in sector 8 (28 points), the average for the studied river segment being 32 points.

According to the working method for the studied river segment, the identified biogenic capacity B (quality class) is 7.

The average width of the river bed (L) is 8.9 m, and the parameter habitat (h) has the value of 0.3.

With the help of the biogenic capacity B , of the average width of the river and of parameter h , a salmonid productivity value of 18.7 kg/km was determined.

5. Conclusions

The biogenic capacity ($B=7$) of the Someșul Cald river is above average, which makes Someșul Cald river (upstream of Ic Ponor place) be considered a rich water, with high potential and whose salmonid productivity can be increased. For this, we propose maintaining the current state of the situation of the river by the abiotic, biotic and anthropic factors, but actions are needed to increase the value of the habitat parameter (h). We therefore propose increasing this parameter by creating feeding and sheltering places for salmonids, by building wood bridged waterfalls, simple stone waterfalls, stone dams, placing anchored trees. Raising the value of the h parameter to 0.4 will lead to an increase in salmonid productivity to 25kg/km. The growth of spawn in brooks and population with salmonids is another activity through which the salmonid productivity of Someșul Cald river can be increased.

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