

## THE EXPLOITATION OF THE RIVER-BASIN SYSTEM COLIBIȚA LAKE - BISTRIȚA ARDELEANĂ RIVER BY SPORTS TOURISM ACTIVITIES

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**ABSTRACT.** The river basin system Colibița Lake-Bistrița Ardeleană River is located in the eastern part of the Bistrița-Năsăud County, on the territory of Bistrița Bârgăului commune and is, by its characteristics, an important resource for the organization and conduct of nautical sports. The Colibița Lake is used for swimming, sailing, canoeing, kayaking, windsurfing, and on the Bistrița Ardeleană River you can practise kayaking, toobing, canoeing and controlled rafting. This is possible by ensuring hydrometric (water discharge, water levels) and hydrodynamic conditions (waves, currents, rapids, falls), and through regular water discharges from the lake. The present study seeks to highlight the characteristics of the river basin system and procedures for its recovery through sports tourism activities.

**Key words:** sports tourism, outdoors activities, active tourism, active leisure, Colibița Lake, Bistrița Ardeleană River, kayaking, canoeing, toobing, white water rafting, controlled rafting

**REZUMAT.** *Valorificarea sistemului hidrografic lacul Colibița - râul Bistrița Ardeleană prin activități de turism sportiv.* Sistemul hidrografic reprezentat de Lacul Colibița și râul Bistrița Ardeleană este localizat în partea de est a județului Bistrița-Năsăud, pe teritoriul comunei Bistrița Bârgăului și prin particularitățile sale reprezintă o resursă importantă pentru organizarea și desfășurarea sporturilor nautice. Pe lacul antropogen Colibița se practică balneazia, canoeingul, kayakingul, wind surfingul, iar pe râul Bistrița Ardeleană se poate practica raftingul controlat și canoeingul. Acest lucru este posibil datorită asigurării condițiilor hidrometrice (debite, nivele) și hidrodinamice necesare (valuri, curenți, repezișuri, cascade), prin deversarea regulată a apelor din lac în râu. Studiul de față își propune să scoată în evidență caracteristicile sistemului hidrografic amintit și modalitățile de valorificare a acestuia prin activități de turism sportiv.

**Cuvinte cheie:** turism sportiv, activități în aer liber, turism activ, Lacul Colibița, râul Bistrița Ardeleană, rafting, canoeing, rafting controlat

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## **Introduction**

Sport tourism is a form of leisure and relaxation activities, implying outdoor mobility, straining the body, and contributing to the maintenance of health. These activities include those applying on the aquatic units (rivers, lakes, seas, oceans), such as nautical sports (rafting, kayaking, canoeing, riversurfing, toobing, water skiing, yachting, etc.).

Therefore, the present study aims to highlight the potential for tourism of the water-drainage basin system represented by the Colibița Lake and the Bistrița Ardeleană River (segment between Electric Power Plant of Bistrița Bârgăului and Valea Ciorii of Prundu Bârgăului), and the ways and means of exploiting it through tourism activities. The study is a phase preceding the start of the project "Romania on whitewaters" released by the Ministry of Tourism in the framework of the Regional Operational Programme financed by the European Union through the European Regional Development Fund. Under this project the aim is fitting in that segment of the river, to carry out specific nautical sports such as rafting and kayaking in this case.

This project will be drawn up by the City Hall of Bistrița Bârgăului in collaboration with the Travel Agency Căliman Holiday Club on the Prior Axe-5: Sustainable development and the promotion of tourism - Exploiting the tourist potential and creating the necessary infrastructure for improved attractiveness of regions of Romania as tourist destinations.

The two component areas, Lake Colibița and the Bistrița Ardeleană River, represent important resources at regional level for sports tourism, which are differently regarded to. Thus, while the Lake Colibița is fully used for recreational boating and swimming, on the Bistrița River nautical activities are scarce at first, being organised solely by the Travel Agency Căliman Club Holiday from Bistrița, possessing appropriate equipment.

Implementation of this project would contribute to the development of tourism in the Bistrița Bârgăului commune, through increasing the number of visitors, the emergence of reception structures (hostels, catering), establishment of jobs, increasing incomes of local people, etc.

## **Methodology**

For the preparation of the present study several stages have been completed, as follows:

- consultation of specialized works in the area of watershed and hydrometry (Zăvoianu, 1978, 2006);

- processing of statistical data relating to sports tourism activities organized on Colibița Lake, and on the Bistrița River, downstream of Electric Power Plant of Bistrița Bârgăului, supplied by some leisure service providers (Căliman Holiday

Club, Sports Club, Schreiner, etc.) and by the Faculty of Physical Education and Sports of Babeș-Bolyai University, Bistrița Extension;

- conducting field observations during sports activities at Colibița, in the Bistrița River Gorges and to the sector between the Electric Power Plant Bistrița Bârgăului and Valea Ciorii from Prundu Bârgăului;

- carrying out geomorphological and hydrometrical observations and measurements on the river sector, on the river bed processes and some parameters like width and configuration of the river beds, level, speed and water depth;

- analysis of topographic maps and ortophotoplans for determining the degree of river bending subject to investigation and the relationship between it and the neighbouring meadow;

- consultation of the local sustainable development strategy of the Bistrița Bârgăului commune;

- development of cartographic materials (maps, profile) in order to illustrate the potential of the morphologically and hydrodynamic river segment in the study.

### Study Area

The river-basin system represented by the Colibița Lake and Bistrița Ardeleană River, the segment Electric Power Plant Bistrița Bârgăului-Valea Ciorii Prundu Bârgăului is situated in the north-eastern part of the Bistrița-Năsăud County, in the territory of Bistrița Bârgăului and Prundu Bârgăului municipalities (fig. 1).

Colibița Lake has anthropogenic origin and occupies the western compartment of the Colibița Basin (Bâca, Șteff, 2010), being formed by the accumulation of Bistrița Ardeleană River behind a rockfill (andesites), built between Dealu Pușcă (1081 m) and Capu Dealului (1051 m). Hydrometric parameters of the lake are significant and show its potential for supporting the activities of tourism and nautical sports (table 1).

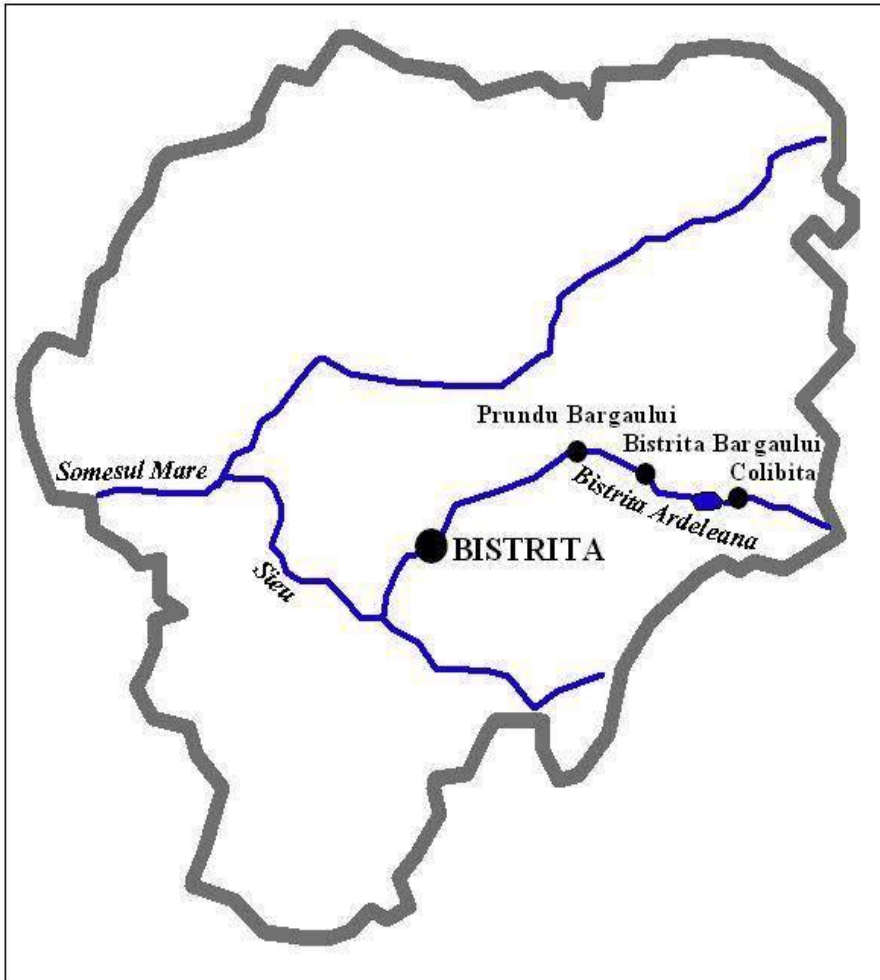
**Table 1.**

The Hidrometric parameters of Colibița Lake (source SGA Bistrița-Năsăud)

Area (ha)	Lenght (km)	Max. width (km)	Max. depth (m)	Volume (mil.m <sup>3</sup> )
300	7	1,5	60	75

The Bistrița River has its source in the Bistricior massif from the Călimani Mountains, drains the eastern part of the Colibița Depression (Mița basin) and flows into the reservoir, from where, under the dam, crosses over a length of 7 km the gorge sector, after which he continued his course to the confluence with Șieu river, at Sărățel.

The sector of river that is the subject of the present study is between the Electric Power Plant from Bistrița Bârgăului and Prundu Bârgăului, and is distinguished by geomorphologic and hydrometric parameters suitable for practicing controlled rafting and other water sports (kayaking, canoeing, toobing) (fig. 2).



**Fig. 1.** The geographic position of the study area

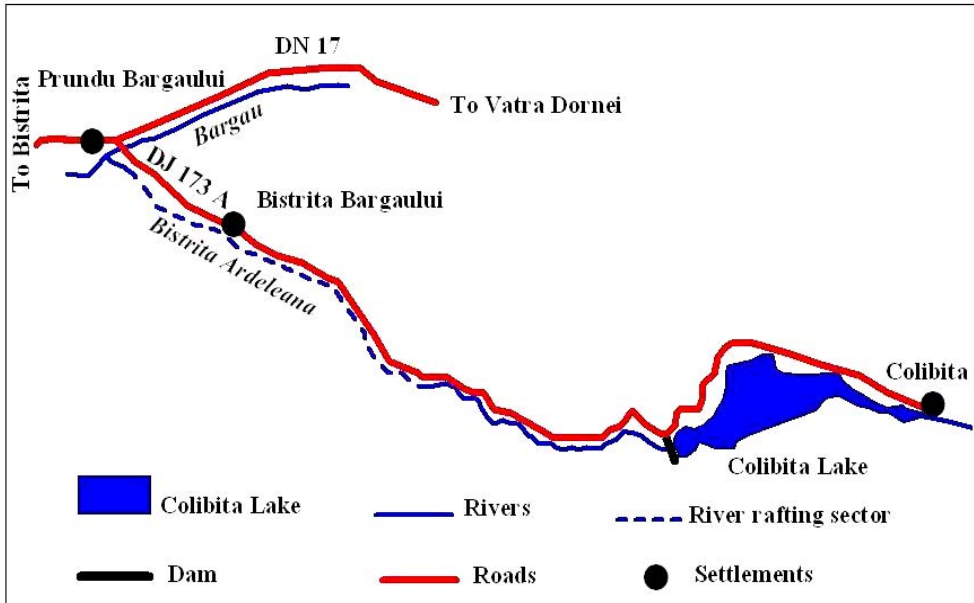


Fig. 2. The river-basin system Colibița Lake - Bistrița Ardeleană River

## Results and Discussion

### *Exploitation of Lake Colibița through teaching activities*

By its parameters, Lake Colibița supports the pursuit of various forms of sport and teaching tourism such as swimming, windsurfing, kayaking and canoeing. These activities are extremely attractive, with internships accelerated as the material is specifically adapted to applications. The kind of effort is beneficial involving the bio-physical functions of the body, the mobility having as fundamental element the adaptability to a wide range of variables (mainly climatic), and the foresight of uncertainty and adventure rises attractiveness. Infrastructure and the specific offers of the entrepreneurs are well represented by providing services that meet the requirements of the market.

Practicing with students and masters from the Faculty of Physical Education and Sport from Bistrița, started with the idea of upgrading the natural potential of the area in question, by organizing aquatic activities comprising a significant number of participants, taking into account the development of the concept of eco-culture (very little is currently known)

The programme is addressed mainly to students and masters from their specific specializations which interact deeply with the natural environment, and being the most appropriate in respect to the change of mentality, in the

attitude towards the environment, and active approval. Synthesizing, the main objectives relate to:

- highlighting the tourism potential by practicing adventure tourism;
- development of domestic tourism through the promotion of tourism offers based on active leisure;
- raising the importance of the events organized by increasing the number of participants and the expansion of the offer.

In this context, we have been monitoring the past three aquatic applications being run on Lake Colibița in collaboration with local businesses specialized in the field of active entertainment, during which we launched the concept of aquatic weekend (table 2, fig.3).

The programme of activities has been carried out on two lessons, as follows:

1) Lesson 1 - learning/stabilisation:

- briefing/information on land;
- transportation manoeuvres of equipment on land;
- boarding and overboarding manoeuvres;
- paddling techniques;
- rescue/operation of overthrow situation;
- methodical line kayaking/canoeing navigation on freestanding water;
- games for improving movement/change of direction;

2) Lesson 2 - stabilisation/improvement, took place in the form of a nautical team game called "The naval battle", and requires cooperation, coordination, strategy and tactics. The terms of regulation may refer to:

- the whole group is divided into two teams (red/yellow), each team gets an equal number of the following types of equipment:
  - inflatable double-kayaks (battleships) which are very stable, but larger and slower; are ideal for passing defence and involve simultaneous/paddling manoeuvres / related work in a team;
  - inflatable single-kayaks (frigates), with intermediate skills, with a good compromise between stability and speed; it have inflatable outer tubes like the battleships, but are shorter and have an enhanced hydrodynamic; ideal for blockages, escort, coverage;
  - plastic kayaks (torpedo), which are the fastest and highly manoeuvrable, but suppose a good balance and paddling techniques (you can flip them relatively easy);

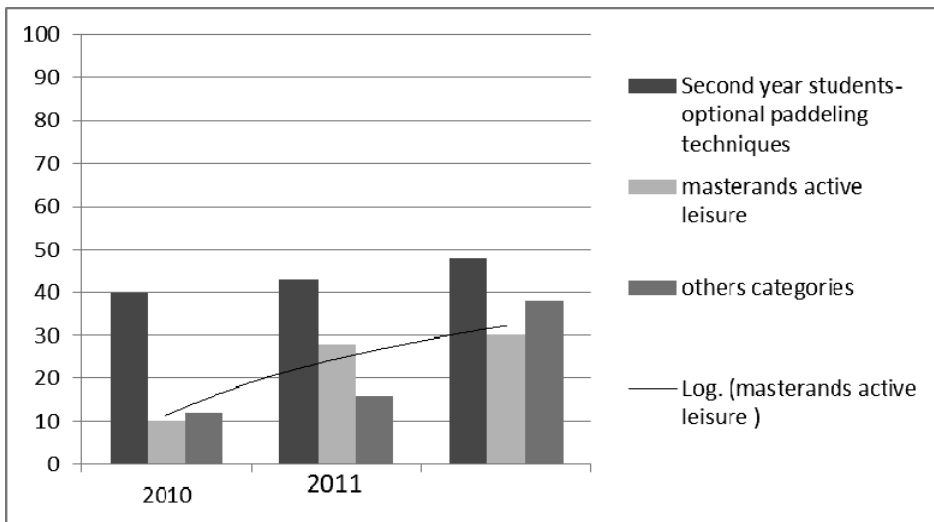
After that, the two teams and the paddle man for each kind of craft need to be established. Then follows the cutting on the water, on the groups and on the types of boats.

Each group is led by a guide who will demonstrate the paddling techniques and specific handling; a period of time for exercises shall be granted, and then practice is considered ready to begin the battle.

**Table 2.**

Categories and number of participants at nautical activities in the Colibița Lake area

Year unfolding	2010	2011	2012	Total
Second year students-optional paddling techniques	40	43	43	131
Masterands active leisure	10	28	30	68
Others activities	12	16	38	66
Total	62	67	116	245



**Fig. 3.** Comparative diagram of participants in nautical practical activities between 2010 and 2012

***The exploitation of Bistrita Ardeleană River by educational and sport tourism activities***

*The geomorphology of controlled river rafting sector*

The presence of the Colibita Reservoir favours practicing nautical sports, particularly rafting, but only on the sector between the Power Plant from Bistrița Bârgăului and Prundu Bârgăului, where geomorphological and hydrodynamic conditions are met.

The Power Plant is located at the exit of the Gorge of Bistrița River, on the left side of the river, and generates electricity (21 MW) based on a water pipeline from the Colibița Lake. After activating the turbine power plant, water is ejected in the Bistrița Ardeleană River with a discharge rate of 13 m<sup>3</sup>/s,

which ensures the necessary hydrodynamic parameters for controlled rafting, such as: raising the level and speed of the water, the emergence of the rapids and waves, production and the increase of the streams.

The discharge of water from the Power Plant into the river its made by a particular program, which takes account of the requirements of the national electricity system, increasing the level of water in Colibița Lake in rainy periods and the Bistrița city's water needs.

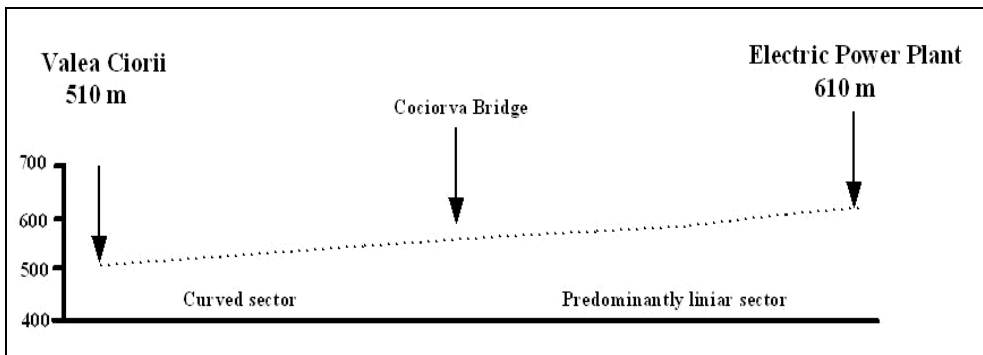
The section of the Bistrița Ardeleană River under study presents the following geomorphometric and hydrometric features (table 3):

**Table 3.**

The geomorphometric and hydrometric parameters of the river rafting sector

Lenght (km)	Width (m)	Depth (m)	Drop (m)	Medium slope ‰
8	6-30	0,6-1,50	100	12,5

The longitudinal profile of the river is generally straight, has continued dropping and shows some cracks of sloping (La Remiză, La Cociorvă, Bridireasa) which results in increased hydrodynamic processes, increasing the attractiveness required by rafting (fig. 4). Through its gradient of 12.5‰, the section of the river is among the most important destination for rafting in the country, alongside the rivers Rebra (22‰), Cerna (16‰), Arieș (9.5‰), Jiu, or Bistrița Aurie. Although the best practice for commercial rafting is on the rivers sector with a slope between 16‰-24‰, in the case of Bistrița Ardeleană River the smaller slope is compensated by the lower course of the river and a constant discharge during outflow from the Power Plant.



**Fig. 4.** The profile of the river rafting sector



The detail of the river in this area is represented by a sequence of pools, rifles, sectors with gradient, benches of gravel, steps and thresholds, which at high levels and discharge of water do influence hydrodynamic processes. Thus, the pools generates a laminar slow flow of the water and rifles, steps and thresholds sustain the turbulent and rapid flow of water, accompanied of waves, and small waterfalls.

An important role for the hydrodynamic processes, relevant for controlled rafting, is the presence of man-made steps in the longitudinal profile of the river, built to mitigate the flood, for Sewage Treatment Station (La Magazin) or for distilleries (La Biserici, La Ciopa). They have a height of 1-1.5 m, and at large discharge and levels generate waterfalls which increase the attractiveness of navigation. There should also be mentioned two gravel islands, one downstream of Podul Sălăgeanului, near the distillery, and the second downstream of Podul Bridireasa, which determine the split of the river.

Downstream of the Valea Bârnelor sector, the initial morphology of the riverbed has been changed between 2007 and 2010 by works settlement, which caused the shaping of ponds, larger sectors and grinds on both sides of the river.

In transverse section, the river sector features a minor streambed with widths frequently between 6-18 m, growing downstream, bounded by a large meadow, occupied by households, agricultural fields, forests with alder and willow, and traffic routes (fig. 5). The maximum width of the riverbed is recorded in the Podul lui Cociorvă sector, measuring 35 m. The width of active surface of the river during the water discharges from the Power Plant is 6-30 m.

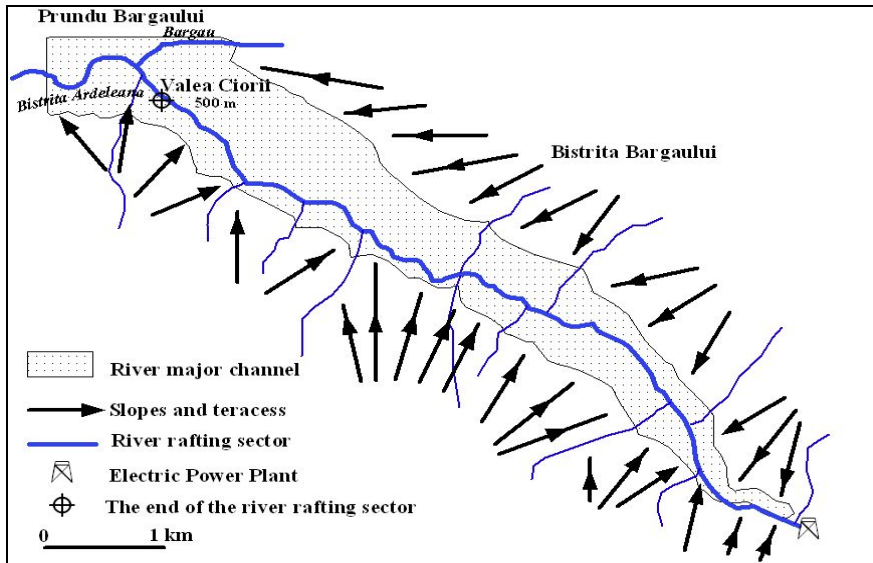


Fig. 5. Geomorphologic sketch of the river rafting sector

On the left side of the meadow, the river is accompanied by a causeway, which permits the access and the motion of tourists and on the right side runs the County Road DJ 173. The height of the meadow is maintained, generally between 2-3 m, but in some areas it reaches just below 1 m, which allows craft mooring and regrouping of the teams (upstream of the Bridireasa, Valea Ciorii).

Throughout its extent, the river sector is crossed by 6 decks (La Fabrică, Bugnărești, Sofia, Boncu, Prigon, Velnița lui Orban) and 5 bridges (Tătarca, Sălăgean, Cociorvă, Bridireasa, Biserici), which allow the movement of tourists, crossing of the river and the observation of rafting boats.

The riverbed is made up of volcanic conglomerates (between the Power Plant and Podul Sălăgeanului) and clay (between Podul Sălăgeanului and Valea Ciorii), and the silting of riverbed are coarse, being represented by debris, gravels and blocks which, at rates and levels, is reflected on the hydrodynamic processes through induction of turbulent flow, and the emergence of waves, rapids, falls and streams, elements necessary for the rafting.

The analysis of the riverbed pattern takes out two separate sectors:

- the Power Plant - Podul lui Cociorvă sector, with a length of 4 km, widths of 6-17 m, declivity of 7,5‰ and the predominance of straight segments;
- the Podul lui Cociorvă - Valea Ciorii sector, with a length of 4 km, widths of 8-30 m, declivity 17,5‰, meanders more significant (1,14 sinuosity coefficient, the length of meanders: 200-500 m).

The channel processes are moderate, because the water-discharge on the Bistrița Ardeleană River is controlled by the Colibița dam, but nevertheless there are some sectors with shore erosion, benches of gravels, and alluvial fans at the mouth of major tributaries (Pietroasa, Bridireasa), which at high levels induce optimal hydrodynamic conditions for rafting (waves, rapids, streams).

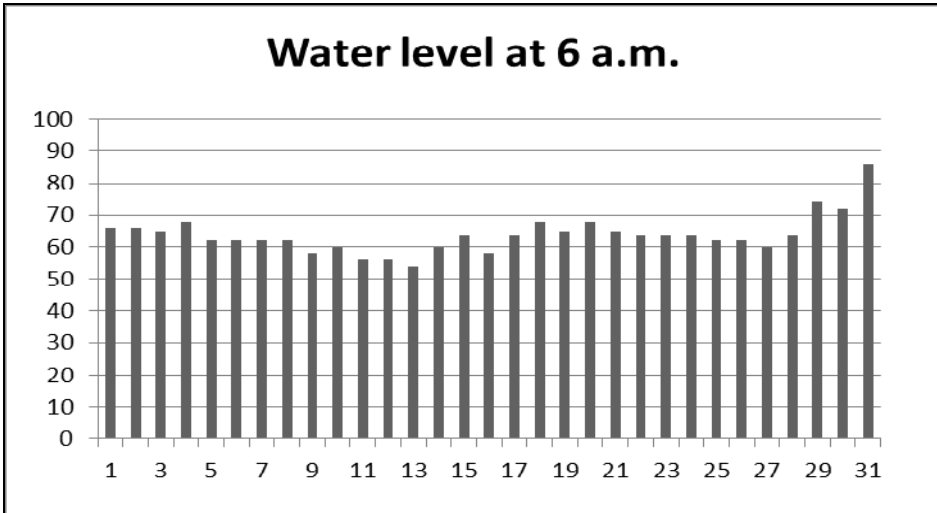
#### *The hydrodynamic features of the river sector*

The studied river sector is relevant for water sports and rafting only when the water is discharged from the Power Plant, with different purposes (electricity supply, discharge stabilization, ensuring water needs for the city of Bistrița). At that time, discharge and high levels ensure the floating of the craft, and determine the hydrodynamic elements attractive for tourist activities, like waves, streams, rapids and falls.

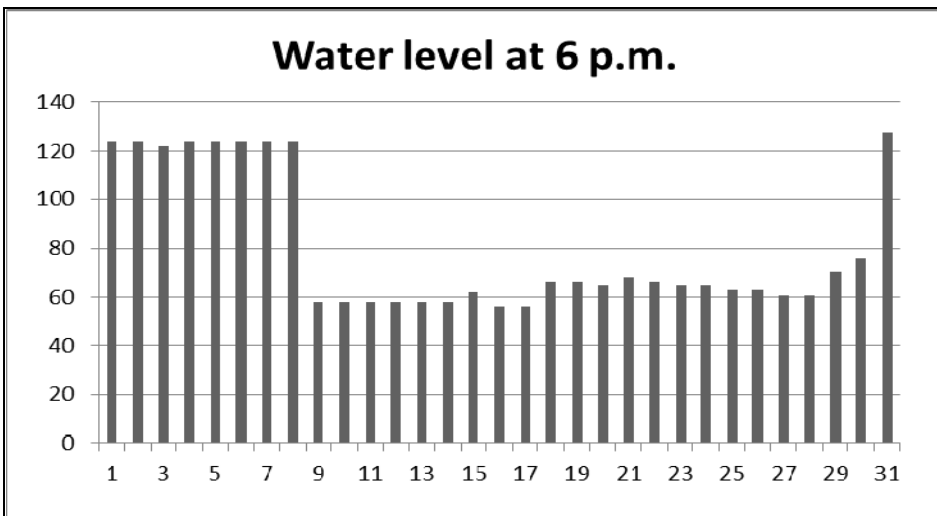
The water level in periods when the Power Plant is not working is between 50-80 cm, at a normal discharge of 5,47-0,65 m<sup>3</sup>/s (fig. 6).

During periods when the Power Plant operates and discharge water to the river, the water level, at a discharge 16,2-17,7 m<sup>3</sup>/s, is situated between 122-128 cm (fig. 7). Under these circumstances, in sectors with coarse sediment waves are forming, with heights of up to 1,5 m (La Velnița la Cociorvă, Bridireasa,

La Neamțu), on the slope sectors arise rapids (La Remiză, Podul Sălăgeanului, La Velniță la Orban, Bridireasa) and in areas with thresholds and steps small waterfalls can be seen.



**Fig. 6.** Water level at 6 a.m. (May, 2012)  
(source SGA Bistrița-Năsăud)



**Fig. 7.** Water level at 6 p.m. (May, 2012)  
(source SGA Bistrița-Năsăud)

### *Comparative problems*

The rafting is a recreational activity that is carried out in Romania on several rivers, such as Jiu, Bistrița, Arieș, Buzău, Cerna, Nera, Rebra (Munteanu, 2010), etc. In all these cases, the periods favourable are fall, spring and during summer floods, when the discharge and levels ensure the craft flotation. The controlled rafting runs only on the Buzău river, downstream the Siriu Power Plant, and on the Bistrița Ardeleană river downstream the Power Plant from Bistrița Bârgăului. This activity may take place throughout the year, by the discharge of water from Siriu and Colibița Lakes.

Downstream of the confluence with the Bâsca River, the discharge of Buzău River is controlled by the Siriu Power Plant and has an average of 25 m<sup>3</sup>/s, and the length of navigable sector is 10-15 km. Hydrodynamically, we distinguish waves of up to 2 m, rapids, waterfalls, accelerated sectors by narrow and linear obstacles. The associated forms of tourism can include: hiking, etnotourism, cyclotourism, enduro, etc.

### ***The tourist exploitation of the river sector***

The biggest advantage of this river sector is the presence of the Colibița Reservoir. This makes it possible to practice rafting and kayaking at any time of the year, not only in spring, when the rivers of Romania have a high discharge due to snow melting in the mountains and precipitation. So, in summer months, when most of the rivers have a low discharge, the Bistrita Ardeleană river represents an ideal opportunity for those that love aquatic sports. The length of this sector is 8 km and the average gradient is 12,5 m/km, and when the water from the Colibița Lake is discharged, the river turns into a whitewater torrent, very attractive for practicing rafting and kayaking.

The class of difficulty is II-III (medium), especially because of the strong current of water and the long portions without quiet water, where sustained techniques and manoeuvres to keep the boat on the correct path are necessary. The river has numerous rapids, thresholds, white waves, being a true whitewater river throughout the entire length.

Practicing nautical sports on the river must be considered in the context of experience gaining, and that is what will happen on the methodical structure which begins from standing water. Therefore, the nautical base for initiation and strengthening the skills was established on the Colibița Lake, then it will move gradually to the more spectacular developments on river sectors, increasingly more difficult and technical. More and more, at this level security measures and help power in case of overthrow of the craft are necessary.

In the nautical weekend of Colibița, the leisure and educational activities have continued on this segment of the river, according to the following schedule:

1) The second day:

Lesson III-IV/ improvement, which was practicing controlled rafting on the river sector, action attended by 65 people;

2) The third day:

Lesson V/ processing, where the participants have been practicing kayaking on the same river sector.

### ***Associated tourism forms***

In addition to nautical sports, supported by the river basin system Colibița Lake - Bistrița Ardeleană River, there can also be practiced other active forms of tourism in the vicinity, such as:

- hiking (Bistrița Gorges and the side valleys Șoimu, Stegea, Repedele; the massifs Piatra Mare, Dl. Pușcă, Piatra lui Orban ridge);
- cyclotourism (Colibița, Bistrița Gorges, etc.);
- climbing (Bistrița Gorges);
- tourism for gathering ornamental and medicinal plants;
- ecotourism (Protected area Repedea);
- sport fishing (Colibița Lake, Bistrița Ardeleană river);
- cultural tourism (Bistrița Bârgăului village);
- camping tourism (Bistrița Gorge, Gura Șoimu, Colibița).

### **Conclusions**

The drainage system of the Colibița Lake and Bistrița Ardeleană River, the sector between the Power Plant Bistrița Bârgăului - Valea Ciorii from Prundu Bârgăului is an important resource for practicing nautical sports.

Discharge rates and levels provided on the river by the release of water from Lake Colibița in the Bistrița Ardeleană River, the geomorphologic and hydrometric features of the segment studied (length, width, slope, detailed morphology) and hydrodynamics induced by them (waves, currents, waterfalls, rapids) favour practicing controlled rafting, kayaking and canoeing.

According to the International Scale of River Difficulty, the studied river sector fall into categories II-III medium and can be disposed for pleasure navigation, for relaxation and leisure.

On the basis of the data obtained it can be seen that the total number of participants increased significantly in reported cases of all categories (IInd year students, masters, other categories of participants).

The last item mentioned recorded the highest increase, since the other two categories are limited by the amount of tuition fees. They also recorded an increase in the number of masters due to the emergence of new lines of master from the Bistrița University Extension.

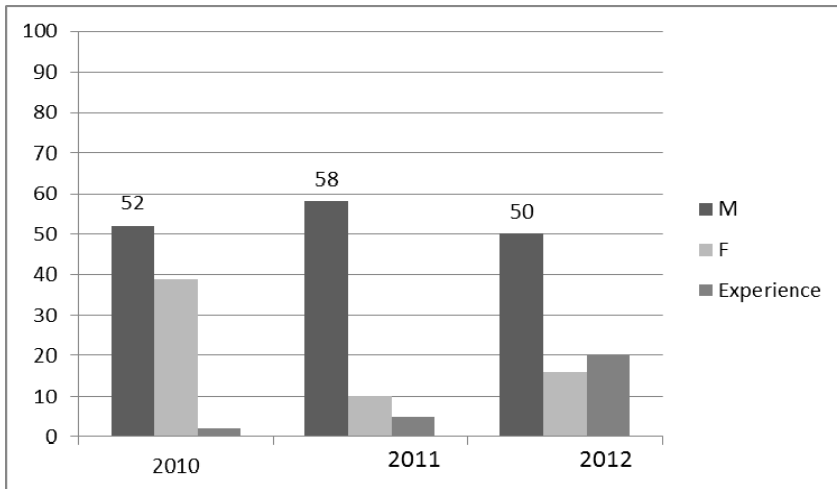
Other significant items registered refer to the average age of participants, sex of participants, and the presence of those who previously practiced nautical activities (table 4).

**Table 4.**

Medium age, genre and previous experience of participants at practical nautical activities

ITEMS	Medium age	M	F	Experience
Second year students-optional paddling techniques	18-40	52	39	2
Masterands active leisure	23-35	58	10	5
Other categories	30-45	50	16	20
Total	18-45	160	65	27

These compared data show the fact that the average age of participants is 18-45 years, the proportion of male persons is considerably higher than the female, the same the percentage of participants with previous experience increases markedly in the case of the two last categories, which reveals the attractiveness and positive impact registered from the participants (fig. 8).



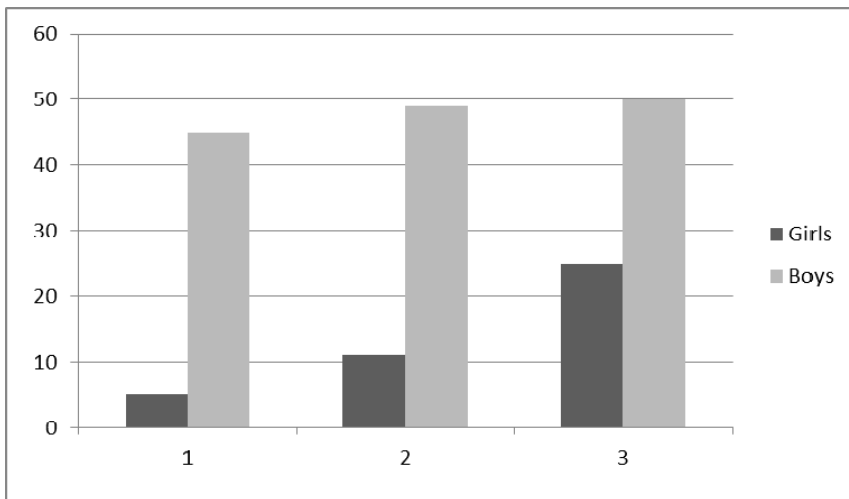
**Fig. 8.** Comparative chart weighting of the participants to practical nautical activities

Another form of nautical leisure refers to the organization of active camps and adventure focused on initiating/consolidation/training in kayaking/canoeing/rafting for children. This type of activity is organized mainly during school holidays and will be carried out in conjunction with other active mountain practices such as: climbing, tourist orientation, sightseeing, mountain touring (table 5, fig. 9).

**Table 5.**

Structure of participants of the adventure camps at Colibița during the period 2010-2012

Year unfolding	2010	2011	2012	Total
Profile camp	cayaking-canoeing	cayaking-canoeing	cayaking-canoeing-rafting	ccr
Participants	50	65	70	185
Girls	5	11	25	41
Boys	45	49	50	144



**Fig. 9.** Comparative chart of the participants at Colibița Adventure camps 1-2010; 2-2011; 3-2012

Selected data reveals the increased interest manifested in the course of this period, which spotlighted the growing number of children who participate in this kind of activity, under the circumstances in which a certain retainer should be manifested in relation to those activities considered to be hazardous.

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