Studii şi Cercetări	Mai 2020	Biologie	29/2	23-27	Universitatea"Vasile Alecsandri" din Bacău

ANALYZING THE IMPORTANCE OF GAME AND FISH SPECIES FROM HARGHITA COUNTY

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Key words: *game funds, Harghita, trout, pine marten*

INTRODUCTION

The main purpose of game management is to obtain a maximum of favorable effects for society by emphasizing populations of wild animal species, the object of hunting in accordance with specific legislations.

The objective situation resulted from the current development of human society demands obtaining these effects in special conditions. These are determined by an increased growth of negative anthropic influences over the environment, by the intensification of vegetal and animal agricultural productions and by the necessity of producing higher quantities of wood materials through a more intensive silviculture.

This reality requires the foundation of managing species with a game interest based on more comprehensive bio-ecologic and economic knowledge. This request demands specialists involved in the management of wild species with a more profound knowledge of the species' life means as well as of the relations between these species and other elements of the ecosystems to which they belong.

Only a deeper knowledge of these aspects can lead in time to an efficient capitalization and continuity of game interest population species. These harmonization interests should be correlated with the interests of soil culture's main branches: agriculture and silviculture.

Game is useful only through the fact that it enriches field and mountain landscapes. Humans enjoy watching it. Scientific researchers from Romania and from abroad carry on studies, researches and experimentations on our game fund. The fields will lose a lot of its charm is it didn't had rabbits, partridge, quails or pheasants. The same applies to the forest lacking defers, capercaillie or boars (Cotta, et al., 2001).

The present article intends to emphasize the most important game and fish species from Harghita County and to analyze them through an analytical hierarchical process (AHP). The analyses were realized by using the Expert Choice Desktop software (Ciontu, et al., 2018; Bragă et al., 2019; Dincă et al., 2018).

The concept of non-wood forest products (NWFPs) was introduced four decades ago in tropical silviculture in order to take into account the entire production generated by the forest sector (Ciontu et al., 2018; Pleşca et al., 2019; Enescu et al., 2020). In Romania, non-wood forest products are mainly represented by forest fruits, mushrooms, medicinal plants and game, with approximately 350 species (Cântar et al., 2018; Enescu et al., 2018; Vechiu et al., 2018; Blaga et al.,2019).

MATERIALS AND METHODS

Harghita County is located in the middle of Transylvania, in the East part of Romania. With a territory of 6.639 km^2, the county is situated in East Transylvania and is neighbored by Neamț and Bacău Counties in East, Mureş in West, Braşov and Covasna in South, and Suceava in North (fig. 1). In 2011, Harghita had 310.867 inhabitants. The County is composed of 9 cities from which 4 are municipalities, 58 localities and 236 villages. Created in 1968, the County's name refers to Harghita Mountains, the second highest peak from this mountain chain (Harghita Mădăraş 1801 m); Răţitiş Peak (Călimani Mountains, 2021 m) – the highest from the county exceeds it only by a little.

The climate presents important differences based on height, slope, depression and currents. However, two main types can be remarked:

- *moderately continental climate* in Sub-Carpathian hills where summers are hot and rich in precipitations while winters are cold and sometimes with blizzards. The average summer temperature is of 18 degrees in July, while the winter one is of -5.5 degrees Celsius in January.
- *mountain climate* specific to high areas in which summers are short, breezy and rich in precipitations, while winters are frosty, with blizzard and a thick and stable snow layer. The average temperatures reach 10 degrees in the summer and -8 degrees during winter.

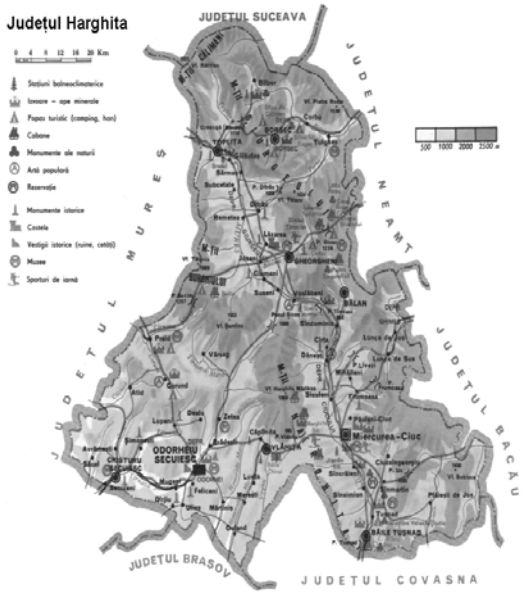

Fig. 1. Location of Harghita County (source www.pe-harta.ro)

Ciuc and Gheorgheni depressions stand out from a climatic point of view due to their specific topo-climate characterized by high frequencies and persistence of nocturnal and winter thermic inversions. As a consequence of these phenomena, the depressions are situated amongst the coldest regions from the country both during summer and winter (www.harghita.ro).

The forest fund of Harghita County amounts to 88.315 ha and is composed of: 22.902 ha – public state forests, 21.851 ha – public forests of administrative-territorial units, 32.746 ha – private forests of physical and juridical persons, 10.816 ha – public forests of local administrative authorities. (www.rosilva.ro)

Harghita County contains 45 game funds that integrate 593.944 ha and the following game species: bear, wolf, lynx, common deer, buck, boar, rabbit, wild cat, capercaillie, pheasant, badger, marten, ferret and weasel. Among them, eight species (bear, fox, capercaillie, pine marten, hooded crow, trout and grayling) were studies and used in an analytical hierarchic process (AHP). The analyses were realized by using the Expert Choice Desktop software.

AHP is one of the most used worldwide decisional support models for solving complex problems of decision making in many domains, including biological sciences (Aras et al., 2004, Wang et al., 2004, Park et al). The analytical hierarchy process uses pair comparisons of selected criteria in order to evaluate how important is those of the other ones (Huang et al., 2011). As such, the complex problem (namely the scope of the research) is structured hierarchically with the objective at the top, while the criteria (and sub-criteria if they exist) and alternatives (namely the eight non-wood forest products selected) are located at the base of the hierarchy (San Cristóbal, 2011).

RESULTS AND DISCUSSIONS

The following species were selected for this study: bear (*Ursus arctos* L), fox (*Vulpes vulpes* L), capercaillie (*Tetrao urogallus* L), pine marten (*Martes martes* L), magpie (*Pica pica* L), hooded crow (*Corvus cornix* L), trout (*Salmo trutta fario*) and grayling (*Thymallus thymallus*).

The alternative AHP classification for the 10 criteria taken into consideration is rendered in Table number 1:

Table 1. AHP alternative ranking

Criteria		Animal species							
		Ursus arctos	Vulps vulpes	Tetrao urogallus	Martes martes	Pica pica	Corvus cornix	Salmo trutta fario	Thymallus thymallus
		1	2	3	4	5	6	7	8
1	Harvesting period	2	8	1	3	6	7	4	5
2	Harvested quantity by one worker in 8 hours	1	4	2	3	5	6	8	7
3	Harvesting cost	8	6	7	5	1	2	4	3
4	Harvesting knowledge	5	3	8	4	1	2	7	6
5	Tools needed for harvesting	2	4	6	5	1	3	8	7
6	Complexity of harvesting process	3	4	8	5	2	1	7	6
7	Development of the process of harvesting	3	7	5	4	1	2	8	6
8	Knowledge for recognition	1	5	3	7	2	6	4	8
9	Distribution range	7	6	1	4	2	8	5	3
10	Biotic threats	1	2	7	3	5	4	6	8
11	Abiotic threats	1	2	6	5	3	4	8	7
12	Perishability	4	5	6	3	1	2	8	7
13	Market potential	7	4	3	5	1	2	8	6
14	Market demand	7	4	3	5	1	2	8	6
15	"Celebrity" of the product on the market	7	5	6	3	2	1	8	4
16	The price of raw product	8	5	4	7	1	2	6	3
17	The price of the derived product	4	7	1	8	2	3	6	5
18	Portfolio of derived products	7	8	3	6	1	2	5	4
19	Transport from the harvesting point to the storage center	8	4	7	3	1	2	6	5

By taking into consideration the AHP results, the most important game and fish species from Harghita County are trout and grayling, while the least important ones are hooded crow and magpie (Figure 2).

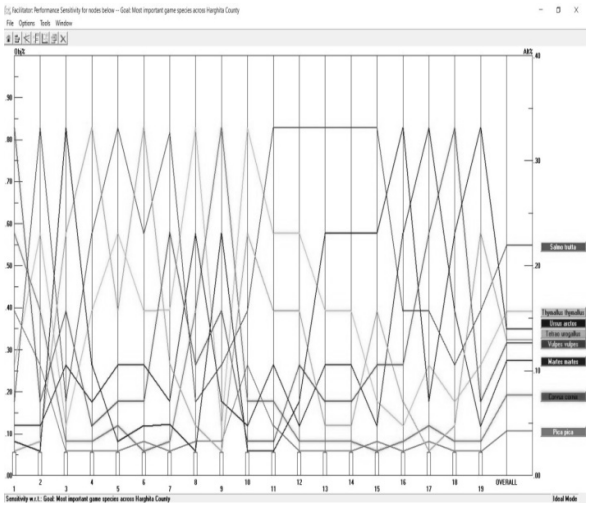

Fig. 2. Ranking of the selected NWFPs

According to the AHP results, the most important fish and game species from Harghita County are the two representatives of the Salmonid family (Salmonidae). These species have a high interest among fishermen, being present in almost all the county's rivers. The least important game species resulted from the AHP process are hooded crow and magpie, both belonging to the Corvid family (Corvidae). The species should be considered in the activity of combating them but this is done less and less today as it doesn't present an interest for hunters.

Local trout is by far the most beautiful and graceful representative of trouts. He is also known as common trout and is present in almost all of Harghita's rivers. He has a fusiform corporal shape, with a full body and well-developed muscles. The muzzle is short, with a large terminal or slightly sub terminal mouth, well provided with strong and backward bent teeth. Small scales with the exception of the head and operculums cover its body. It normally reaches 15-30 cm and 150-500 g, but can grow up to 40 cm and 1kg. The color varies a lot, based on the medial parameters, age, sexual maturity and shadowed areas. The general color is an olive green with a darker yellow on the dorsal part and a lighter one on the sides and in the central area. The body's sides have black spots disposed in irregular longitudinal rows. Furthermore, some black spots are also present on the head. The middle sides, namely around the lateral line, contains red spots circled by a narrow white margin. Worldwide data show that local trout has the majority of adepts among sportive fishermen. The explanation is relatively simple: capturing "fair-play" this "knight" of mountain rivers is the "highest school of sportive fishing". According to a renowned English saying, the trout fisherman is three times more beautiful than other fishermen because the fish, the fishing and the landscape are all beautiful.

The grayling is a sweet water fish, similar with the trout, from the Salmonid family that lives in the inferior part of fast mountain rivers with clear cold water and stone bottom. It reaches 30-35 cm in length with a maximum of 60 cm, 300-400 g in height with a maximum of 6,7 kg. The males are larger than females and can live up to 12-14 years. The body is elongated and slightly compressed laterally and covered with relatively large scales. The head is small, with a sharp muzzle, a small transversal semi inferior mouth that contains sharp small teeth disposed on a single row. The body's color is green-ash on the back, yellow-pink or purple-slivery on the sides and white-silver (sometimes towards red) on the abdomen. Small black and round spots appear over the lateral line, while brown longitudinal lines appear on the sides. The pair flippers are yellow or red, while the non-pair ones are purple and the dorsal one is dark towards blue and red. The species has an economic purpose as a fishing species. Its meat is white, very tasty and with a thyme smell when it is fresh, However, the meat doesn't last too long and must be kept in salt after 1-2 hours from its capturing. His presence is correlated with macroinvertebrates communities from some rivers, such as Siret (Nechifor and Năstuneac, 20118) or Vedea (Ureche, 2018).

CONCLUSIONS

The main game and fish species from Harghita County represent an important income source for owners of game funds as they have the proper space and environment in with to develop.

By analyzing the eight species with the help of an analytical hierarchy process, the most important fish species from Harghita County were the local trout and grayling. The species are present in almost all the county's rivers and have a high interest for fishermen.

The least important game species were hooded crow and magpie. They are bird species unwanted in a game fund, a fact that places them in the prevention activity and without a game interest for hunters.

Based on this study, we can conclude that the evaluation method presented represents an important contribution in evaluating the NWFP's potential by taking into consideration the harvesting, marketing and other related activities.

The Expert Choice Desktop software combined with the analytical hierarchy process proved to be an easy to use tool for solving complex decision-making problems. For more pertinent results, future studies have to consider additional

criteria and especially the important factors from the domain.

ABSTRACT

The surface of game funds from Harghita County amounts to 593.944 ha gathered in 45 funds. They are characterized by a moderately continental climate in Sub-Carpathian hills and a mountain climate in the high areas. Eight species were selected among the county's main game and fish species, namely bear, fox, capercaillie *pine marten*, magpie, hooded crow, trout and grayling. The species were classified based on their results from 19 criteria (harvesting period, harvested quantity by one worker in eight hours, harvesting cost, harvesting knowledge, required instruments, the harvesting process's complexity, distribution array, biotic threats, abiotic threats, perishability, market potential, market request, the product's market "popularity", raw product price, derived product price, derived products portfolio, transport from the harvesting place to the storage center). Grades from 1 to 8 were given to each analyzed species by specialists.

As such, the most important species are the trout and, grayling while the species with the smallest percentage were hooded crow and magpie. The species' harvesting and distribution potential as well as their diversity in the county are high as both the forest and fish areas are very well represented. In this way, the game and fish species with a high interest have the space and environment in which to reproduce and develop.

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