Study Concerning the Evaluation of Fauna from Mureş County, Romania

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Abstract— Mureș County holds on its 671.400 ha surface (from which 220.218 ha is forest fund) 64 game funds and 23 fish funds, amounting to a rich and diversified fauna. The main game species from this county are brown bear, wolf, red deer, roebuck, wildboar, hare, pheasant, badger, fox, wild cat, marten), complemented by fish species that live in the county's rivers and lakes (trout, carp, salmon, chub, common barbel, nase). From them, we have chosen 8 species (roebuck, wildcat, pheasant, fox, collared dove, common starling, common barbel and nase) that were classified based on 19 criterias established by specialists. This was obtained through the analytical hierarchy process (AHP) and with the Expert Choice Desktop software. Roebuck and common barbel are the species with an important interest for hunting and fishing, while the least important ones are wildcat and collared dove.

Keywords— Eurasian collared dove; game funds; Mureș County; roebuck; wildcat.

I. INTRODUCTION

The concept of hunting itself was and is understood in different ways. From its apparition until today, humans have been forced to procure material goods (meat, fur etc.) by sacrificing wild animals through hunting. If in this case we understand hunting as harvesting animals for covering a set of needs, later on, hunting becomes a training or a means of satisfying a pleasure. Finally, during the last decades, the notion of hunting enlarges its content, becoming an objective connected with game culture, caring and studying it in order to protect and conserve it [6].

Today, simply knowing wild animals without multiple and consequent protection actions for them cannot ensure the survival of wild fauna, especially in the condition of a less controlled harvesting. By judiciously managing game funds, humans can improve a series of elements that belong to the natural environment. In this way, we can influence favorably their spreading and the effective of game distribution, a fact that can offer better conditions for a superior capitalization in accordance with socio-economical interests [6].

Forests from Romania offer numerous resources to the entire society: trees [2], [11], shrubs [23], [12], soils [14], [7], [15], [10], mushrooms [9], medicinal plants [27], forest fruits [28], [26], [25], other non-wood products [24], [3], [13], animals [5], [8], [4], [22].

II. MATERIALS AND METHODS

The study was carried out in Mureş County, located in the central-north-east part of Romania, in the middle of Transylvania's Plateau. With a population of 671.400 ha, the area's relief includes an intra carpathian basin that goes down steadily in stages, from the volcanic peaks of Călimani (2100 m) and Gurghiului Mountains towards the middle of Transylvania's Plateau (276 m), grooved by Mureşului Valley and fragmented by its affluents. The hill units with smooth interfluves of 500-600 m altitude belong to Transylvania's Plateau.
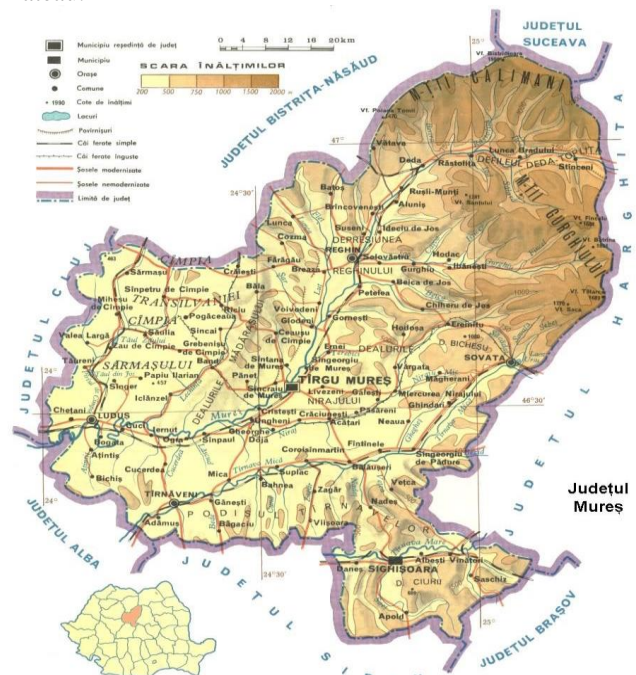

Fig. 1. Location of Mures County [30]

Forests from Mureş County cover 220.218 ha from which: 104.065 ha are public state forest funds, 40.399 ha are public property forest funds managed by administrative-territorial units, 31.310 ha are private property forest funds owned by physical or juridical persons and 33.280 ha are fields with forest vegetation located outside the national forest fund. These surfaces are occupied by 64 game funds and 23 fishing funds with a rich and diversified fauna [31].

The game interest species from Mureş County are: brown bear, wolf, red deer, roebuck, wildboar, hare, pheasant, badger, fox, wildcat, marten. These are complemented by fish species that live in the county's rivers and lakes: trout, carp, salmon, chub, common barbel and nase. Amongst them, we have chosen 8 species (roebuck, wildcat, pheasant, fox, collared dove, common starling, common barbel and nase) for

an analytical hierarchy process (AHP). The analyses were obtained through the Expert Choice Desktop software.

AHP is one of the most used decision support models employed worldwide in solving complex decision-making problems in different domains, including biological sciences [1], [29], [19]. The analytic hierarchy process uses pair comparisons on selected criteria in order to evaluate their importance [16]. As such, the complex problem (namely the purpose of this research) is structured hierarchically, with the objective at the hierarchy's peak, followed by the criteria (and sub-criteria if they exist) at the hierarchy's levels and the alternatives (namely the eight non-wood forest products) at the hierarchy's base [20].

The present study uses an analytic hierarchy process (AHP) for evaluating the performance of the selected alternatives by pair comparisons. The analyses were obtained with the Expert Choice Desktop software [5].

III. RESULTS AND DISCSSION

The study is based on evaluating the performances of the selected alternatives by pair comparisons and through an analytical hierarchy process (AHP). The analyses were obtained by using the Expert Choice Desktop software.

The selected NWFP for evaluating the performances were: roebuck (Capreolus capreolus), wildcat (Felis silvestris), pheasant (Phasianus colchicus), fox (Vulpes vulpes), collared dove (Streptopelia decaocta), common starling (Sturnus vulgaris), nase (Chondrostoma nasus) and common barbel (Barbus barbus).

The following table presents the alternative AHP classification for the 19 criteria taken into account:

TABLE 1. AHP alternative ranking

	Criteria	Animal species							
		Capreolus capreolus	Felis silvestris	Phasianus colchicus	Vulpes vulpes	Streptopelia decaocta	Sturnus vulgaris	Chondrostoma nasus	Barbus barbus
		1	2	3	4	5	6	7	8
1	Harvesting period	7	3	6	8	1	2	4	5
2	Harvested quantity by one worker in 8 hours	1	2	6	3	5	7	4	8
3	Harvesting cost	8	5	7	3	1	2	4	6
4	Knowledge for harvesting	8	4	7	1	3	2	6	5
5	Tools needed for harvesting	5	1	6	4	2	3	8	7
6	Complexity of harvesting process	7	2	5	4	3	1	8	6
7	Development of the process of harvesting	8	3	5	2	4	1	6	7
8	Knowledge for recognition	2	4	3	1	5	6	7	8
9	Distribution range	6	1	7	8	4	5	2	3
10	Biotic threats	8	2	7	1	3	4	5	6
11	Abiotic threats	6	2	5	1	3	4	7	8
12	Perishability	3	2	4	1	5	6	8	7
13	Market potential	8	2	7	3	4	1	6	5
14	Market demand	8	2	7	3	4	1	5	6
15	Celebrity" of the product on the market	8	6	7	4	3	1	2	5
16	The price of raw product	8	2	7	3	4	1	6	5
17	The price of the derived product	8	7	6	3	2	1	5	4
18	Portfolio of derived products	8	2	5	4	3	1	7	6
19	Transport from the harvesting point to the storage center	8	3	6	7	2	1	4	5

Based on the AHP results, the most important game and fish species from Mureş County are roebuck and common barbel, while the least important ones are wildcat and collared dove, as it can be seen in Figure number 2.

Amongst the important species, even though it has a shorter harvesting period and highest costs, the roebuck has a larger portfolio of derived products, a larger distribution, and a high market demand. The biggest challenge concerning this species is its harvesting, which is not always easy. The second important product, the common barbel, requires many and more complex harvesting tools, as well as deeper knowledge for recognizing the species, as well as a higher attention toward the product's perishability.

Game species with a less important role are wildcat and collared dove. In the case of wildcat, even though Habitat Directive and International Conventions have prohibited its hunting due to a harsh decrease in European effectives, Romania has currently over 10.000 specimens. Widespread from the mountain area to the sea's bank, they lead an extremely discrete life so that the above-mentioned specimens might be underestimated. On the other hand, the collared dove does not present an interest for Romanian hunters, harvesting quotas being obtained through hunts with foreigners, especially Italian and French hunters.

The roebuck is one of the most promising big game species from our country (30.614 specimens in the national harvesting quota for the 2021/2022 hunting season and 1.835 specimens for Mureş County) [17].
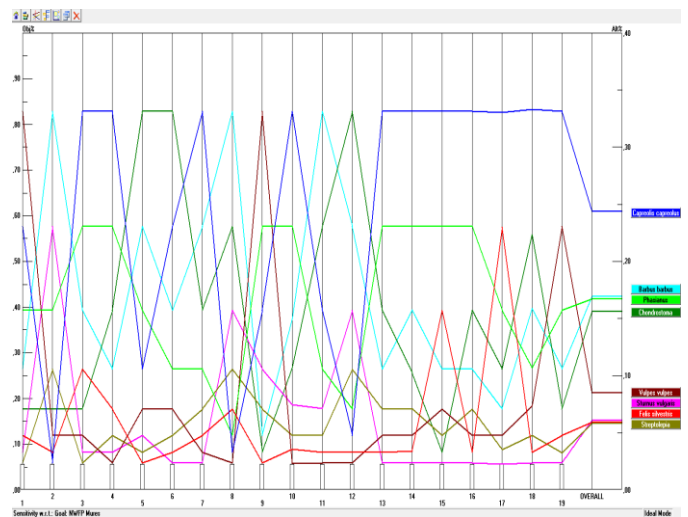

Fig. 2. Ranking of the selected NWFPs

As for small game, hare occupies the first place (96.267 specimens in the national harvesting quota for the 2021/2022 hunting season with 1.204 specimens for Mureş County) [18]. Numerous countries record an accentuated decrease in the number of hare, this being correlated with intensive agriculture and monocultures [21].

Pheasant is the most promising species among small feathered game species (126.969 specimens in the national harvesting quota for the 2021/2022 hunting season, with 2.018 samples for Mureş County) (tab. 2) [18].

TABLE 2. Harvesting quota for mammals and birds from Mureș County in the 2021-2022 season

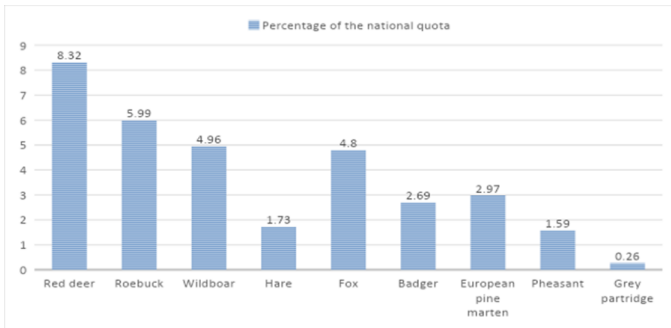| Species	Red deer	Roebuck	Wild Boar	Hare	Fox	Badger	European pine marten	Pheasant	Grez partridge
Harvesting quota	55	634	1.204	1.412	2.105	42	23	2.018	52

Fig. 3. Percentage of harvesting quota for mammals and birds for the 2021-2022 season for Mureș County compared with national quota

IV. CONCLUSION

The main species with a game and fish interest from Mureș County represent an important income source for game and fish fund owners, as they have the proper space and environment in which to develop.

By analyzing 8 species through an analytic hierarchy process, the most important species from this county (that can be hunted and fished on the 64 game funds and 23 fish funds) are roebuck and common barbel, while the least important ones are wildcat and collared dove. If the roebuck is hunted because it has a large portfolio of derived products, a wide distribution range, and a high market demand, wildcat is prohibited from hunting, and collared dove does not present an interest for Romanian hunters.

Based on this study, we can conclude that the presented evaluation method represents an important contribution to evaluating the NWFP potential, especially concerning harvesting, marketing and other connex activities.

The Expert Choice Desktop software, combined with the analytical hierarchy process proved to be an easy-to-use instrument for solving a complex decision problem. In order to obtain more pertinent results, future studies should take into account additional criteria and especially the concerned factors.

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