USAMVB Timisoara
"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH IN APPLIED LIFE SCIENCES"
27 November 2020
"Young people and multidisciplinary research in applied life sciences"

A STUDY CONCERNING THE IMPORTANCE OF GAME AND FISH SPECIES FROM ARAD COUNTY

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Abstract: *The forest fund surface of Arad County amounts to 101.672 ha, being characterised by a continental temperate climate with very hot summers and very cold winters, but with a homogenous regime caused by the plain relief's uniformity. The County contains 74 game funds with a total surface of 743.114 ha. Eight species (fallow deer, mouflon, big duck, quail, snow bird, jay, chub and tench) were selected from the county's main game species and ordered based on 19 criteria(harvesting period, quantity harvested by a worker in 8 hours, harvesting cost, harvesting knowledge, harvesting instruments, the complexity of the harvesting process, the development of the harvesting process, knowledge for recognizing the species, distribution domain, biotic threats, abiotic threats, perishability, market potential, market request, "popularity" on the market, price of the raw product, derived product, the portfolio of derived products, transport from the harvesting place to the storage location). Grades from 1 to 8 were given for each studied species by using an analytical hierarchy process (AHP) and the Expert Choice Desktop software. The species with an important game interest are fallow deer and quail, while the least important ones are tench and jay.*

Introduction

- The main purpose of game management is to allow the achievement of a maximum of favourable effects for society by valuing populations of wild animals that are the subject of the game activity, by respecting current specific laws.
- This reality involves the necessity of substantiating the management of game interest species on well-determined and inclusive bio-ecologic and economic knowledge. This request requires that specialists involved in the management of wild species have an advanced knowledge of the species' life situations and of the relations that they establish with other species and with the other elements from the ecosystem to which they belong(Cotta, *et al.,* 2001).
- The management of game funds limits the number of hunted species and intends to maintain habitats and biodiversity (Molnár, 2011, Momir*et al*., 2015).
- The present study intends to emphasize the most important game and fish species from Arad County and to evaluate them based on an analytic hierarchy process (AHP). The Expert Choice Desktop software was used for the analyses. (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 the tropical silviculture in order to take into account the production generated by the forest sector (Ciontu et al., 2018; Plesca et al., 2019; Enescu et al., 2020). In Romania, non-wood products are mainly represented by forest fruits, mushrooms, medicinal plants, and game, amounting to approximately 350 species (Cântar et al., 2018; Enescu et al., 2018; Vechiu et al., 2018; Blaga et al.,2019).

Material and method

- *Research location*.The study was realized in Arad County, located in Romania's West Gate and considered one of the country's most important county. Named „Little Wien" by Nicolaelorga, "a Third Rome" by Romanian historians and "the Hungarian Golgotha" by Hungarian historians, Arad city is spectacularly displayed with large parks and monumental buildings on Mureşriver. The spectacular Traian Bridge from the city's heart was once the border between provinces, countries and empires, the place where the Ottoman Empire united with the Habsburg Empire, where Transylvania united with Hungary and Banat.

Fig. 1 Location of Arad County (sourcewww.pe-harta.ro)

- The total surface of the forest fund managed by Arad Forest County through its 10 forest districts amounts to 101.672 ha, representing approximately 13% of the county's surface. From this forest fund's surface, 98.748 ha are forests, while 2924 ha are other fields. Resinous species (Norway spruce, fir, others) represent 6% of the forest fund's surface, namely 5462 ha. Broad-leaved species (common beech, quercus, some hard, some soft) represent 94% of the forest fund's surface, namely 93.286 ha (www.rosilva.ro).

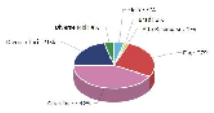

Fig. 2 Total surface of Arad's forest fund

- Arad County is comprised of 74 game funds that amount to 743.114 ha occupied by the following game species: bear, wolf, lynx, common deer, fallow deer, mouflon, buck, boar, rabbit, wildcat, pheasant, badger, fox, marten, ferret, and weasel. Furthermore, the fish fauna is also well represented. From them, eight species (follow deer, mouflon, bug duck, quail, snow bird, jay, chub and tench) were selected and studied in an analytic hierarchy process (AHP). The analysis was realized with the Expert Choice Desktop software.
- AHP is one of the most used decisional support models at a global level for solving complex decision-making problems in various domains, including biological studies (Aras et al., 2004, Wang et al., 2004, Park et al). The analytic hierarchy process uses pair comparisons of selected criteria for evaluating the importance of the other ones (Huang et al., 2011). As such, the complex problem (meaning the purpose of this research) is structured hierarchically with the objective at the hierarchy's top and the criteria (and eventual sub-criteria) at the hierarchy's levels. The alternatives (meaning the selected eight non-wood forest products) are at the base of the hierarchy (San Cristóbal, 2011).

Results and discussions

- The following species were selected for this study: follow deer (*Damadama* L), mouflon (*Ovies aries musimon*L), big duck (*Anas platyrhyncos*L), quail (*Coturnix coturnix*L), snow bird(*Turdus pilaris*L), jay (*Garrulus glandarius*L), chub (*Squalius cephalus*) and tench (*Tinca tinca*).
- The alternative AHP classification for the 19 criteria taken into account is rendered in Table number 1:

Table 1. Alternative AHP ranking

	Criterium	Animal species							
1	Harvesting period	5	6	5	1	3	5	7	8
2	Harvesting quantity by one worker in 8 hours	1	2	4	6	7	3	5	8
3	Harvesting cost	8	7	6	5	4	3	2	1
4	Knowledge for harvesting	7	8	5	6	3	1	2	4
5	Tools needed for harvesting	7	5	8	6	4	3	2	1
6	Complexity of harvesting process	7	5	6	8	4	3	2	1
7	Development of the process of harvesting	8	7	6	5	4	3	2	1
8	Knowledge for recognition	1	2	3	4	5	6	7	8
9	Distribution range	4	1	2	7	8	6	5	3
10	Biotic threats	4	3	7	8	6	1	2	5
11	Abiotic threats	3	7	4	6	8	1	5	2
12	Perishability	7	3	5	4	6	1	2	8
13	Market potential	4	8	6	5	3	1	2	7
14	Market demand	8	7	6	5	3	1	2	4
15	Price by unit of raw product on the market	8	6	5	7	4	3	2	1
16	The price of raw products	8	7	6	5	4	3	2	1
17	The price of the derived product	7	8	6	5	4	3	2	1
18	Portfolio of derived products	8	6	8	7	4	3	2	1
19	Transport from the harvesting point to the storage centre	8	6	7	5	3	1	4	2

- Based on the AHP's results, the most important game and fish species from Arad County are follow deer and quail, while the least important ones are tench and jay. (Figure 3).

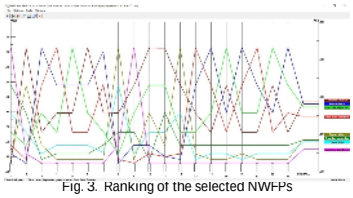

Fig. 3. Ranking of the selected NWFPs

- Even though the follow deer does not have a long harvesting period and requires higher harvesting costs and transportation periods, its derived product portfolio is more consistent, followed by a large distribution range and a high market demand.
- This is also the largest core and the one with the best genetic aspects from our country. Quail is the second product as importance, being a bird that is highly sought by both Romanian and foreign hunters (especially from Italy, Spain and France). The least important game species that have resulted from the analytic hierarchy process are tench and jay. The tench has a weak presence in Arad's lakes and is not sought after by anglers, while jay has low grades at all criteria with the exception of its long hunting period and is mainly hunted as a prevention method.

Conclusions

- The diversity and potential of harvesting and trading game interest species is higher in Arad County due to the fact that the forest area is more well represented (74 game funds with a total surface of 743.114 ha). As such, game species have the proper space and environment in which to develop while their harvesting and trading represents an important income source for game fund owners.
- Follow deer and quail are the most important species from this area, while tench and jay are the least important ones. These results were obtained by analysing 8 species with an analytic hierarchy process. Follow deer and quail are hunted because of their longer harvesting period, larger distribution range, larger portfolio of derived products and a higher market request. On the other side, tench is almost inexistent in the county's lakes and does not have a high market request. Even though it has a longer hunting period, jay has recorded the lowest grades and does not present interest for hunters except as a prevention purpose.
- The results of this study have shown that important evaluating, harvesting and marketing contributions can be obtained for the county's game species by evaluating the NFWP's potential.
- The Expert Choice Desktop software combined with the analytic hierarchy process proved to be a tool easy to use for solving a complex decision problem. Further studies are recommended for results that are more pertinent and should be complemented by additional criteria and factors.