

NOURISHMENT OF GAME FROM THE CARNIVORA ORDER – DAMAGES AND BENEFITS IN HUNTING ECONOMY, FORESTRY AND AGRICULTURE*

ZORAN POPOVIĆ, NENAD ĐORĐEVIĆ, MILOŠ BEUKOVIĆ¹

SUMMARY: An overview of different types of damage caused in hunting grounds and agriculture in general by wildlife from the Carnivora order is given in this paper. Predators present one of the greatest problems for the hunting grounds, since they are destroying primarily progeny and eggs of game while searching for food. Most damage to the stock of game offspring is caused by jackal, who is in expansion in the recent years. Fox is feeding primarily on rodent-type vermin and predate on game offspring only in a small percent. Wolf may cause damage both on game and domestic animals stock. Wild boar may cause significant damage to game stock by predate on progeny of other game species. The brown bear may cause significant damage on corn and wheat crops. Unlike all aforementioned species, who are also scavengers, lynx feeds exclusively on living prey. One of measures for predator population control is considered hunting. Supplemental nutrition of carnivores by carrion is allowed by planning and construction of carrion baits.

Key words: game, carnivora, damages, control.

INTRODUCTION

Beside economic benefits that man obtains from game and its positive influence on the habitat, it is also important to consider negative impact that game may produce, both in forestry and farming and on domestic animals and wildlife itself. Damages caused by game are usually caused by lack of, poor quality and inadequate distribution of food within the hunting grounds, as well as by disturbing of game and even by habits of the

Review paper / *Pregledni rad*

¹ Dr Zoran Popović, assoc. professor, Dr Nenad Đorđević, assoc. professor, Faculty of Agriculture, Zemun. Dr Miloš Beuković, assoc. professor, Faculty of Agriculture, Novi Sad.

Corresponding author: Dr Nenad Đorđević, associate professor, Faculty of Agriculture, Zootechnics institute, Nemanjina 6, 11080 Zemun, Serbia. Tel: +381 11 261 5315, e-mail: nesadj@agrif.bg.ac.rs

* This paper is integral part of the TR-20019 project, financed by Ministry of science and technological development of republic of Serbia (2008-1010)

game (Popović, 2006-a).

Damages may be reduced or prevented by adequate management of the hunting grounds (Popović, 2006-b). Increase in natural food production within the hunting grounds and provision of additional food from other sources that is conducted during the period when damages occur are among the more important measures. (Đorđević et al. 2006; 2008). These procedures may help to maintain adequate game population (Popović et al. 2008), control losses (Popović and Bogdanović, 2001) and increase trophy value (Popović and Bogdanović, 2002; Popović and Gačić, 2006). A series of protective measures for farming and horticulture crops, orchards and vineyards, forests, domestic animals and beehives, as well as fencing the hunting grounds, which allows to breed game in a controlled environment, may be undertaken (Popović and Đorđević, 2009). High degree of wildlife control and protection is obtained in national parks (Beuković et al. 2006)

Wildlife from the carnivore order may cause specific type of damage both in hunting grounds and on livestock and beehives. „Predatory“ type of damage may also be caused by wild boars, although this species is an omnivorous even-toed ungulate and not a carnivore (Beuković et al. 2006). Specific protective measures are required to ward against this type of damages. This overview is dedicated to that particular problem and possibilities for its resolving.

TYPES AND EXTENT OF DAMAGE

Foxes and, in the recent years, jackals, are most numerous carnivores in our hunting grounds, followed by wolves, while examples of lynxes and bears are located primarily in the national parks (Beuković et al. 2007). Damages caused by carnivores are determined on the field, based on the remains (wildlife and domestic animals, beehives) or the gastric content of shot animals' (Đorđević et al. 2009).

Nutrition of foxes in our hunting grounds is based primarily on mouse-like rodents, which is highly advantageous for the agriculture. According to Popović and Đorđević (2009), daily meal of a fox contains at least 10-15 voles (*Microtus sp.*) with average mass of 25 grams per vole.

Through study of stomach contents of foxes in Hungary, Lanszki (2005) determined that 24.3% of meal samples comprised vole and that vole may form up to 37.3% of sample biomass. Still, rest of foxes' nutrition consists of game, primarily pheasant and rabbit, which represents a substantial harm to hunting economy. According to Popović (1996) and Beuković et al. (2009), beside unfavorable weather conditions, foxes are second principal cause of significant loss in rabbit progeny.

It is also thought that bad physical shape of pheasants from intensive production, raised in pheasantries and released in hunting grounds may be particularly beneficial to the fox (Pekeč et al. 2008; Popović and Stanković, 2009; Popović et al. 2009). According to Linnella (2007), eighteen year long research of roe deer in hunting grounds of Sweden and Norway showed that fox is the principal predator of fawns of up to three months of age. Fawn losses reached up to 50% and in some areas 100% of fawn losses were caused by foxes.

According to Popović (2007), fawn losses by foxes and stray dogs in Serbia are

lower (about 20%) while main cause of losses is anthropogenic factor – agricultural mechanization, traffic, poaching, snaring, fawn catching...

Fox is also an approved poultry predator and it was shown that it may induce losses in offspring of small livestock. Spreading and transfer of parasites and contagious diseases to other wildlife, domestic animals and even humans is a particular type of damage caused by foxes. Rabies is a dominant problem of this kind (Ristić et al. 2008).

Jackal expansion in Serbia is evident in the recent years, a problem significantly contributed by illegal landfills and disposition of dead farm animals against sanitary and veterinary regulations – directly in hunting grounds areas (Ćirović et al. 2008).

Carrion, primarily originating from domestic animals, as well as various slaughterhouse waste, such as bowels, skins, bones and entrails, dominate in jackal nutrition. Since jackal is a bad hunter its nutrition is comprised mostly of mouse-like rodents and game offspring. Based on analysis of stomach contents and meal remains, it was determined that jackals may cause significant damage to hunting grounds through destruction of fawns, young rabbits and earthbound bird nests. Jackals are also capable to organize in a group and hunt adult rabbits by use of drive and ambush (Pantelić, 2008).

A predominant carnivore, wolf may cause significant damage to wildlife and livestock. It was shown that wolves are capable to dwell in vicinity of men, in cattle-breeding areas (Kusak, 2002), in fields or along town outskirts. They may base their nutrition almost exclusively on livestock. For example, sheep, goats and dogs comprise 84% of wolves nutrition in Dalmatia region, but roe and red deer and, to a lesser extent, wild boar, comprise 77% of wolves nutrition in Gorski Kotar region (Štrbenac et al. 2005). According to Sidorovich et al. (2003), wild even-toed ungulates in Belarus comprise 80-88% of wolves nutrition.

Wolves cause substantial damage to hunting grounds by predated on wild even-toed ungulates, but that activity is also beneficial as it is mostly old, sickly and out-of-shape animals that wolves predate on (Ballard et al. 1981). Wolf's menu also includes stray dogs, sheepdogs and hunting dogs (Popović et al. 2008-b). Actual damage caused by wolves should nonetheless be estimated with some precaution, as livestock (primarily bovine) remains in wolf's refuse may have come from carrion and carrion baits.

Damages caused by bear are inflicted on plant cultures, wildlife, domestic and cultivated animals. Farming crops and orchards are most damaged by bears. Beehives in some countries are also menaced by bears, so specific averting measures such as electric fences are frequently utilized (Sillings et al. 1989). Animals rarely serve as food source for brown bear, which happens when there is lack of bear-edible plant food in the hunting grounds. In that case bear will firstly predate on roe and red deer and then attack flock of sheep, goats and grazing horses. Ultimately it may attack pens and stables and may even attack people. In ex Socialist Federate Republic of Yugoslavia, a bear attacked and killed one person in Plitvice, Croatia (Mihić, 1996). According to Popović (2006-a) bears killed three heads of large cattle and eight heads of small cattle in three observed hunting grounds („Šipovo“, „Borja“, „Ribnik“). As a rule, attacks occurred in early spring and late autumn, a consequence of decreased production of natural food resources in these periods. Further harm scored 12 beehives, 1.5 ha of oat and 46 trees of fruit in ripening phase. Certain amount of bear-induced damage may also occur in forestry as a result of peeling off of bark and destruction of saplings (Malik and Karnet, 2007).

Unlike other carnivores, lynx feeds exclusively on living prey, in average 3.3 kg daily. Damages caused by lynx are generally related to a significant reduction of population of wild even-toed ungulates in the hunting grounds, while loss of domestic animals is of minor significance (Marinović, 2008). Summer nutrition of lynx consists primarily of rodents, while winter nutrition consists of wild even-toed ungulates (roe and red deer, chamois, wild boar, mouflon). Lynx may occasionally also prey on birds, foxes and small domestic animals (sheep and goats). According to Stahl et al. (2001) sheep losses by lynxes in France in period 1984-1998 amounted to 0.14-0.59% of total number of sheep, wherein lambs and young sheep were most common victims. Lynx may down prey four times its size.

DAMAGE PREVENTION MEASURES

Different averting methods may prove to be uncertain particularly in the case of carnivores. Most important methods by all means are population control and considered hunting (Popović and Đorđević, 2009). "Službeni glasnik Republike Srbije" (Official Journal of Republic of Serbia) (1994) recommends „Continuous monitoring of numbers and spread of both periodically and permanently open season predators and regulation of their population through shooting.“ Lesser importance may be attributed to additional nurture provided by carrion baits (Đurđević, 2004), while construction of feeders is recommended for bears. However, this additional food source may incite bears, thus accustomed to new scents, to enter human habitats and scavenge for food in garbage containers and landfills, as is the case in the US and Canada (Halter, 1972).

Beside these, additional nourishment of wild carnivores is also used for population control, considered hunting, research of nourishment quality, estimation of trophy value, prevention of migration, scientific research, reduction of poaching... Construction of feeding grounds for carnivores must account for a series of factors in order to ensure peace for these animals and simultaneously keep them as far from human habitats as possible (Dečak et al. 2005).

CONCLUSION

Foxes and, as of recent, jackals, may cause most damage in hunting grounds primarily thanks to their large numbers. Damage is generally inflicted through destruction of game offspring. Wolves and lynxes are present in lesser numbers but may pose a serious problem for both game and livestock. As an omnivore, brown bear may cause most damage on farming crops, orchards and beehives, while only some specimens may pose a threat for domestic animals and even people. Particular form of damage is spreading of diseases. Beneficial influence of carnivores, such as reduction of rodent vermin and sick, old and out-of-shape animals is also to be considered. Most important measures focused on reduction of damage caused by carnivorous wildlife Population control are considered hunting and additional nourishment.

REFERENCES

- BALLARD, W. B., SPARKER, T. H., TAYLOR, K. P.: Causes of neonatal moose calf mortality in southcentral Alaska. *Journal of wildlife management*, 45: 335-342, 1981.
- BEUKOVIĆ, M., POPOVIĆ, Z., GAČIĆ, D., STANAČEV, V., NOVAKOVIĆ, N.: Efekat strukture smeša za prehranjivanje divljih svinja (*Sus scrofa* L.) na telesnu masu prasadi u lovištu Crni Lug. *Savremena poljoprivreda*, 52, 3-4: 107-109, 2003.
- BEUKOVIĆ, M., POPOVIĆ, Z., ĐORĐEVIĆ, N., PLUŽAREVIĆ, K.: Situation of wildlife in national parks and other protected areas. Jahorina-Tjentište, July, 05.-08., 2006. *Proceedings*, 419-423, 2006.
- BEUKOVIĆ, M., POPOVIĆ, Z., ĐORĐEVIĆ, N., PLUŽAREVIĆ, K., ZEREMSKI, M.: Situation and perspectives of hunting in national park Fruška Gora. International Symposium: Sustainable forestry-Problems and challenges perspectives and challenges in wood technology. Faculty of forestry, Macedonia. *Proceedings*, 13-16, 2007.
- BEUKOVIĆ, M., POPOVIĆ, Z., MALETIĆ, V., BEUKOVIĆ, D., ĐOKOVIĆ, D.: Vlijanje na klimatske faktori vrz procentot na mladi vo populacijata na zajakot (*Lepus Europeanus* Pall.) vo Vojvodina. IV International Symposium of Livestock Production. Struga, Macedonia, 09-12.09.2009. *Proceedings*, 232, 2009.
- ĆIROVIĆ, D., MILENKOVIĆ, M., PAUNOVIĆ, M., PENEZIĆ, A.: Aktuelno rasprostranjenje i faktori širenja šakala (*Canis aureus* L. 1758) u Srbiji. Međunarodno savetovanje o krupnim zverima i tragačima po krvi, Žagubica, april 2008. *Zbornik radova*, 93-102, 2008.
- DEČAK, Đ., FRKOVIĆ, A., GRUBEŠIĆ, M., HUBER, Đ., MAJNARIĆ, D., MAJIĆ, A., ŠTRBENAC, A., LAGINJA, R., ĐODAN, M., JAKŠIĆ, Z., ĐURINAC, D.: Brown bear management plan for Republic of Croatia. *Ministry of agriculture, forestry and water management, department for hunting. Ministry of culture, Department for nature protection. 2005.*
- ĐORĐEVIĆ, N., POPOVIĆ, Z., BEUKOVIĆ, M., GRUBIĆ, G.: Specifičnosti hraniva koja se koriste za dodatnu ishranu srne (*Capreolus capreolus* L.) na različitim terenima. *Savremena poljoprivreda*, 55. 3-4: 6-11, 2006.
- ĐORĐEVIĆ, N., POPOVIĆ, Z., GRUBIĆ, G., BEUKOVIĆ, M.: Ishrambeni potencijal lovišta Srbije. *Biotehnologija u stočarstvu*, 24: (poseban broj), 529-537, 2008.
- ĐORĐEVIĆ, N., GRUBIĆ, G., POPOVIĆ, Z., PERIŠIĆ, P., BEUKOVIĆ, M.: Procena štete od divljači na osnovu analize sadržaja digestivnog trakta. XIV Savetovanje o biotehnologiji, 27-28.03.2009, Čačak. *Zbornik radova*, 14 (15): 331-337, 2009.
- ĐURĐEVIĆ, V.: Uređivanje lovišta (praktikum). *Lovački savez Srbije, 2004.*
- HALTER, D. F.: Food habits of black bears in interior Alaska. *Can. Field-nat* 86, 17-31, 1972.
- KUSAK, J.: Uvjeti za život vuka (*Canis lupus* L.) u Hrvatskoj. *Doktorska disertacija*, str. 247, 2002.
- LANSZKI, J.: Diet composition of red fox during rearing in a moor: a case study. *Folia zoologica*, 54 (1-2): 213-216, 2005.
- LINNELLA, J.: The European Roe Deer - The Biology of Success. *Lovec*, 11, Ljubljana, 2007.
- MALIK, V., KARNET, P.: Game damage to forest trees. *Journal of forest science*, 53 (9): 406-412, 2007.
- MARINOVIĆ, LJ.: Istoriografija i stanje populacije risa u Istočnoj Srbiji. Međunarodno savetovanje o krupnim zverima i tragačima po krvi. Žagubica, april 2008. *Zbornik radova*, 136-146, 2008.
- MIHIĆ, M.: Mrki medved (*Ursus arctos*) u arealu nacionalnog parka Plitvička jezera. *Diplomski rad, Poljoprivredni fakultet Zemun, 1996.*
- PANTELIĆ, A.: Dinamika širenja areala šakala (*Canis aureus* L. 1758) na bazi ulova od 1990. godine. *Skupština – redovna sednica, 28.06.2008, Prijepolje. Str. 34, Lovački savez Srbije, 2008.*
- PEKEČ, S., POPOVIĆ, Z., BEUKOVIĆ, M., KOVAČEVIĆ, B.: Proizvodnja fazana u periodu od

šest nedelja zatvorenim načinom gajenja. *Savremena poljoprivreda*, 57, 1-2: 213-218, 2008.

POPOVIĆ, Z., BOGDANOVIĆ, V., GAJIĆ, I.: Analiza promene brojnosti zeca u našoj zemlji. Savetovanje u Prokuplju i Kikindi 1995. godine. *Zbornik radova*, 121-132. *Lovački savez Jugoslavije*, 1996.

POPOVIĆ, Z., BOGDANOVIĆ, V.: Uzroci gubitaka i njihov uticaj na gazdovanje populacijom srneće divljači. *Savremena poljoprivreda*, 3-4: 243-245, 2001.

POPOVIĆ, Z., BOGDANOVIĆ, V.: Uticaj tipa lovišta na varijabilnost trofejne vrednosti kod srndaća (*Capreolus capreolus* L.). *Savremena poljoprivreda*, 3-4: 199-201, 2002.

POPOVIĆ, Z.: Štete od divljači na šumskim i poljoprivrednim kulturama. *Glasnik šumarskog fakulteta Univerziteta u Banjoj Luci*. 6: 51-64, 2006-a.

POPOVIĆ, Z.: Gazdovanje populacijama divljači u u lovištima Lovačkog saveza Srbije. *Biotehnologija u stočarstvu*, 22 (poseban broj), 113-128, 2006-b.

POPOVIĆ, Z., GAČIĆ, D.: Trofejna vrednost i starost srndaća u različitim tipovima lovišta. *Savremena poljoprivreda*, 55, 3-4: 1-5, 2006-c.

POPOVIĆ, Z., ĐORĐEVIĆ, N., PERIŠIĆ, P., BEUKOVIĆ, M.: Plodnost, gubici i realni prirast populacije srna. *Savremena poljoprivreda*, 1-2: 218-223, 2007.

POPOVIĆ, Z., BEUKOVIĆ, M., ĐORĐEVIĆ, N.: Brojnost i stepen korišćenja populacija divljači u lovištima lovačkog saveza Srbije. *Biotehnologija u stočarstvu*, 24 (poseban broj), 11-23, 2008-a.

POPOVIĆ, Z., MAUNAGA, Z., KUNOVAC, S., RAPAJIĆ, Ž.: Gazdovanje i štete od vuka (*Canis lupus*) u BiH. Međunarodno savetovanje o krupnim zverima i tragačima po krvi. Žagubica, april 2008. *Zbornik radova*, 17-24, 2008-b.

POPOVIĆ, Z., ĐORĐEVIĆ, N.: Ishrana divljači (5. Štete u poljoprivredni i šumarstvu nastale ishranom divljači). *Monografija. Poljoprivredni fakultet Univerziteta u Beogradu*. Str. 43-64, 2009.

POPOVIĆ, Z., STANKOVIĆ, I.: Uticaj načina gajenja na mortalitet fazančića. 18. savetovanje agronoma, veterinara i tehnologa, 25-26.02.2009, Institut PKB Agroekonomik, Beograd. *Zbornik radova*, 15, 3-4: 163-172, 2009.

POPOVIĆ, Z., STANKOVIĆ, I., MALETIĆ, V., ĐORĐEVIĆ, N.: Mortalitet na fazanski pilinja vo prvite 40 dena od životot vo zavisnost od sistemot i uslovite na ogleduvanjeteto. IV International Symposium of Livestock Production with International Participation. Struga, Macedonia, 09-12.09.2009. *Proceedings*, 233, 2009.

RISTIĆ, Z., MARKOVIĆ, V., MARINOVIĆ, LJ., TRIFUNOVIĆ, J.: Upravljanje populacijama lisica (*Vulpes vulpes* L. 1758) na savremenim principima. Međunarodno savetovanje o krupnim zverima i tragačima po krvi. Žagubica, april 2008. *Zbornik radova*, 59-75, 2008.

SIDOROVICH, V.E., TIKHOMIROVA, L.L., JEDRZEJEWSKA, B.: Wolf *Canis lupus* numbers, diet and damage to livestock in relation to hunting and ungulate abundance in northeastern Belarus during 1990-2000. *Wildlife Biology*, 9: 103-111, 2003.

SILLINGS, J. L., TOMAS, T. N., FORBES, J.: Demonstration electric fences to control black bear damage to apiaries in New York state. Fourth eastern wildife damage control conference, Universiti of Nebraska, Lincoln. *Proceedings*, 142-146, 1989.

SLUŽBENI GLASNIK REPUBLIKE SRBIJE: Uputstvo o sprovođenju mera za sprečavanje šteta koje divljač može pričiniti imovini i ljudima. 33/94, 1994.

STAHL, P., VANDEL J, M., HERRENSCHMIDT, V., MIGOT, P.: Predation on livestock by an expanding reintroduced lynx population: long-term trend and spatial variability. *Journal of applied ecology*, 38, 3: 674-687, 2001.

ŠTRBENAC, A., HUBER, Đ., KUSAK, J., MAJIĆ-SKRBINŠEK, A., FRKOVIĆ, A., ŠTAHAN, Ž., JEREMIĆ-MARTINKO, J., DESNICA, S., ŠTRBENAC, P.: Plan upravljanja vukom u Hrvatskoj. *Državni zavod za zaštitu prirode*. 2005.

ISHRANA DIVLJAČI IZ REDA ZVERI – ŠTETE I KORISTI ZA LOVNU PRIVREDU, ŠUMARSTVO I POLJOPRIVREDU

ZORAN POPOVIĆ, NENAD ĐORĐEVIĆ, MILOŠ BEUKOVIĆ

Izvod

U radu je dat pregled različitih oblika šteta koju pravi divljač iz roda zveri, pre svega u lovištima, ali i u samoj poljoprivredi. Jedan od najvećih problema za lovišta predstavljaju predatori, koji u potrazi za hranom uništavaju pre svega podmladak i jaja divljači. Jednu od najvećih šteta na podmladku divljači čini šakal, koji je zadnjih godina u ekspanziji. Nasuprot tome, lisica se hrani pre svega mišolikim glodarima, a u manjem procentu i podmladak divljači. Štete od vuka mogu biti na divljači, ali i na svim vrstama domaćih životinja. Divlja svinja, u ograđenim lovištima, takođe, može da napravi velike štete uništavajući podmladak druge divljači. U pogledu šteta koje čini, jeste medved. Ova vrsta zveri je pre svega biljojed, pa pri ishrani pravi štete u usevima kukuruza i drugih žita, voćnjacima i pčelinjacima. U odnosu na sve pomenute vrste zveri, koje u ishrani rado koriste i lešine, ris se hrani isključivo živim plenom. Selektivni odstrel je jedna od mera za kontrolu brojnosti predatora. Planiranje i izgradnja mrciništa u lovištima omogućava dodatnu ishranu zveri, čime se smanjuju štete na lovnim vrstama divljači.

Ključne reči: divljač, zveri, štete, kontrola.

Received / *Primljen*: 07.10.2009.

Accepted / *Prihvaćen*: 05.11.2009.