

When pork is not on the menu: Assessing trophic competition between large carnivores and poachers



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ARTICLE INFO

Article history:

Received 11 July 2016

Received in revised form 4 January 2017

Accepted 19 February 2017

Available online xxxx

Keywords:

Dietary niche breadth

Exploitation

Panthera pardus

Poaching

Predator-prey relationship

Prey preference

ABSTRACT

Overexploitation of wildlife for meat is a widespread phenomenon, which drives populations of many species toward extinction and may in turn affect large carnivores. Therefore, human hunters may compete with large carnivores over food resources and threaten their survival. In this study, we assessed the trophic competition of endangered Persian leopard with local poachers in Golestan National Park, Iran, where poaching has depleted populations of three ungulate species by 66–89% in the past decades. We compared leopard diet (77 scats) with prey offtake by poachers (75 poacher seizure records). In addition, we estimated prey abundance by line transect sampling (186 km), camera trapping (2777 camera days), double-observer point-counts (64 scans) and dung counts (38 km). Using interview surveys with local poachers, we also quantified their stated hunting preference. We documented a narrow hunting specialization of leopard (niche breadth 0.24) and poachers (niche breadth 0.19), and exclusivity (niche overlap 0.31) of their dietary/hunting niches, which suggest no exploitative competition between these two apex predators. This pattern likely results from the major role of wild boar in leopard diet. Due to religious beliefs, poachers avoid hunting this species and its population has increased in contrast to other ungulates. Considering the general avoidance of Suidae species across leopard range, depletion of alternative prey species may have resulted in a prey-switching strategy by leopard. The influence of religious beliefs and taboos on hunting preference and, consequently, on prey populations and predators' trophic niches shows the importance of incorporation of cultural beliefs in conservation practices.

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1. Introduction

Overexploitation of wildlife for meat is a widespread phenomenon, which drives populations of many species toward extinction (Milner-Gulland et al., 2002). This pattern in form of pursuit hunting or trapping is known to also affect natural food webs (Rowcliffe et al., 2003) as species targeted by humans may play important roles in the diet of large carnivores (Henschel et al., 2011). A recent study revealed that humans exploit shared prey at 1.9 times higher rates than all other predators combined within the human-predator-prey communities studied

(Darimont et al., 2015). Therefore, human hunters may compete with carnivores over food resources, acting as an unsustainable “super predator” (Darimont et al., 2015).

Large carnivores are especially vulnerable to low density and biomass of their preferred prey (Carbone et al., 2011) and prey depletion is one of their major threats worldwide (Wolf and Ripple, 2016). When prey is scarce, large carnivores may expand their hunting effort by increasing home ranges or changing activity patterns (Schmidt, 2008). However, if competition reaches exploitative levels, switching to other prey species or extermination from habitats may be observed (Henschel et al., 2011; Rosenblatt et al., 2016). Additionally, prey depletion may force carnivores, such as big cats, to shift toward livestock depredation and trigger retaliatory persecution by humans (Khorozyan et al., 2015). Therefore, prey depletion is a vitally important factor for the survival of large carnivores, which requires further attention by conservationists (Chapron et al., 2008).

Dietary competition between different carnivores is well-studied in ecology (see Caro and Stoner, 2003). Within the large carnivore guilds, species exploit different resources if sufficient prey is available or compete when prey is limited (Karanth and Sunquist, 2000; Odden et al., 2010; Harihar et al., 2011; Jumabay-Uulu et al., 2014). The degree of

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dietary niche overlap may indicate exploitative competition among predators (Caro and Stoner, 2003). However, the role of humans as an apex predator in the trophic niche of animal predators has been rarely studied (Henschel et al., 2011; Darimont et al., 2015; Foster et al., 2016). Conservation of large carnivores in a changing world requires ‘coexistence’ of human and animal predators, and understanding differences in their ecological niche in local context is increasingly necessary (Chapron and López-Bao, 2016).

All these aspects are relevant to preservation of big cats, such as the globally endangered Persian leopard (*Panthera pardus saxicolor*). The largest protected population of this felid (23–42 individuals) is known to exist in Golestan National Park (GNP), Iran (Hamidi et al., 2014). The main threat to leopards in GNP is thought to be road kills (Kiabi et al., 2002). However, the rapid population decline of at least three ungulate species in GNP since the 1970s may indicate that poaching of prey species is another important threat (Ghoddousi et al. in press). Such hunting pressure is targeted on ungulates, but not on leopards (Ghoddousi et al., 2016a). Understanding responses of leopards to declining prey species may help develop appropriate conservation measures for this endangered large carnivore (Lovari et al., 2013). In this study, we quantified the dietary niche overlap of leopard and poachers to assess the threat of prey depletion to leopard. We hypothesize that given high ungulate poaching rate in GNP (Ghoddousi et al. in press), prey depletion may threaten the survival of leopards in case of high dietary niche overlap between leopards and poachers.

2. Material and methods

2.1. Study area

GNP is located in northeastern Iran covering an area of 874 km² (Fig. 1). Elevation ranges from 450 to 2411 m above sea level and precipitation from 866 to 142 mm from west to east, respectively, creating a

variety of different habitats (Akhani, 2005). The park has a mountainous terrain covered by sub-humid Hyrcanian forests in the west, and steppes and semi-deserts to the east (Akhani, 2005). GNP is the oldest national park of Iran, established in 1957, and a UNESCO Biosphere Reserve. GNP is home to six species of ungulates, most of which are affected by poaching (Ghoddousi et al. in press). Despite a long history of protection and sufficient law enforcement resources (Ghoddousi et al., 2016a), lack of acceptability of conservation laws, poverty and inefficient enforcement practices have resulted in rampant poaching in the park (Ghoddousi et al. in press). No villages exist within GNP, however, around 8660 inhabitants from different ethnicities including Turkmens, Persians, Balochs and Kurds live in 15 villages <2 km away from its boundaries. The main occupation of local communities is farming crops or livestock.

2.2. Leopard diet analysis

We collected leopard scats opportunistically from all around GNP, especially alongside main trails and near scrapes, from 2011 to 2014 and analyzed prey hair remains for assessment of leopard dietary profile (Klare et al., 2011). Additionally, other undigested remains in scats such as bones, hooves, claws and feathers were used to assist identification of prey species (Lumetsberger, 2014). We estimated consumed prey numbers using the non-linear correction factor CF_2 (Wachter et al., 2012):

$$CF_{2,i} = 3.094 \exp\left(-0.5\left(\ln(x/16.370)\right)/2.584\right)^2$$

where $CF_{2,i}$ is the number of scats produced from consuming an individual of the i -th prey species against the average body mass of the species x (kg). Therefore, the number of individuals of the i -th consumed prey was equal to the number of leopard scats containing the i -th prey

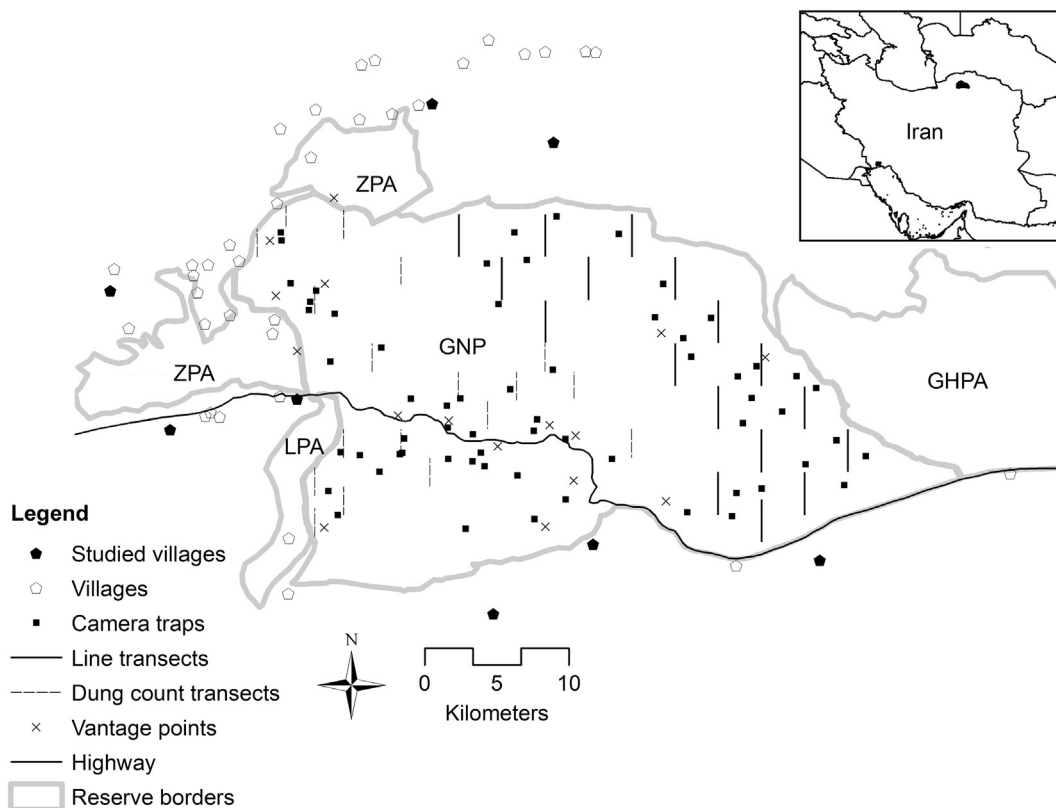


Fig. 1. Map of Golestan National Park (GNP) showing the location of line transects, camera traps, vantage points, studied villages and neighboring reserves (LPA: Loveh Protected Area; ZPA: Zav Protected Area; GHPA: Ghorkhod Protected Area).

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