Is trophy hunting of bharal (blue sheep) and Himalayan tahr contributing to their conservation in Nepal?

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Abstract

Dhorpatan Hunting Reserve (DHR), the only hunting reserve in Nepal, is famous for trophy hunting of bharal or “blue sheep” (Pseudois nayaur) and Himalayan tahr (Hemitragus jemlahicus). Although trophy hunting has been occurring in DHR since 1987, its ecological consequences are poorly known. We assessed the ecological consequences of bharal and Himalayan tahr hunting in DHR, and estimated the economic contribution of hunting to the government and local communities based on the revenue data. The bharal population increased significantly from 1990 to 2011, but the sex ratio became skewed from male-biased (129 Male:100 Female) in 1990 to female-biased (82 Male:100 Female) in 2011. Similarly, a recent survey of Himalayan tahr showed that there was a total population of 285 tahr with a sex ratio of 60 Male: 100 Female. Bharal and Himalayan tahr trophy hunting has generated economic benefits through generation of local employment and direct income of $364072 during the last five years. Government revenue collected from 2007-08 to 2011-12 totalled $184372. Male-focused trophy hunting as practiced in DHR may not be an ecologically sustainable practice, because its effect on the sex ratio that lead to negative consequences for the genetic structure of the population in the long term. Therefore, the population dynamics and sex ratios of the bharal and tahr must be considered while setting harvest quotas.

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Introduction

Dhorpatan Hunting Reserve (DHR), gazetted in 1987, is the only hunting reserve in Nepal (Fig. 1). Since the establishment of DHR, species such as bharal or “blue sheep” (Pseudois nayaur), Himalayan tahr (Hemitragus jemlahicus), barking deer (Muntiacus muntjak), and wild boar (Sus scrofa) have been hunted for trophies and game meat. Among the hunted species, the bharal and the tahr are the main targets of international trophy hunters (Karki and Thapa, 2007; Aryal et al., 2010). The bharal, which was the first preferred species for hunting in DHR, is listed as “least concern” in the IUCN Red list of threatened species (Harris, 2014). By contrast, the tahr, the second most prioritised hunting species, is listed as “near threatened” in the IUCN Red list of threatened species (Bhatnagar and Lovari, 2008).

The Government of Nepal generates national revenue through selling hunting permits, and locally hunting creates employment opportunities. The collected revenue is used for management activities of the DHR and redistributed to DHR buffer zone communities for socio-economic development (DNPWC, 2012).

Trophy hunting as a means to generate revenue for species conservation as well as a source of local income has also been practised in other regions of world (e.g., Bond et al., 2004; Leader-Williams and Hutton, 2005; Leader-Williams et al., 2005). However, the potential conservation benefits of trophy hunting are debatable and often controversial. One potential negative consequence of selective harvesting of trophy males is that it could change the sex ratio of the population leaving disproportionately more females than males (Milner et al., 2007). A skewed sex ratio may create long-term problems for the maintenance of genetic diversity and population health of species. Selective hunting could also cause species decline and possible local extirpation (e.g., Tuyttens and McDonald, 2000; Frank and Woodroffe, 2001; Harris et al., 2002; Colman et al., 2003; Adams, 2004; Lindsey et al., 2007; Caro et al., 2009).

In DHR trophy hunting that targets male bharal started in 1987 and is still ongoing. Trophy hunting quotas should be “expert-based” (Baldus and Cauldwell, 2004; Baldus, 2006; Caro et al., 2009), but in DHR they have been based on scientifically unfounded guesses by the DHR management that often ignores information obtained from field surveys. For example, both in 2007 (Karki and Thapa, 2007) and in 2011 (Kandel et al., 2011), field surveys were conducted to obtain population estimates of bharal and tahr, but the hunting quotas for those years were not based on those estimates.

For trophy hunting to be ecologically sustainable, regular monitoring of population dynamics is required, and scientifically-based harvest quotas to minimize the impacts on population dynamics and trophy quality should be adopted (Caro et al., 2009). In this context, we addressed the question of whether existing trophy hunting practices in DHR were contributing to the conservation of the bharal and tahr. To answer that question, we evaluated the impact of trophy hunting on population size and sex ratio of the bharal and the tahr in the DHR.
We also quantified the revenues generated from hunting permits and assessed how this revenue was used in various sectors.

**Materials and methods**

The study was conducted in Dhorpatan Hunting Reserve, the only hunting reserve in Nepal (Fig. 1). For ease of hunting, the total area of the reserve (i.e. 1325 km²) has been divided into seven blocks: Sundaha, Seng, Dogadi, Ghustung, Fagune, Barse and Surtibang (Fig. 1). The reserve lies between 2000 and 7246 m altitude and is covered by forest at lower elevations and grassland at elevations above the tree line (Kandel et al., 2011). The dominant trees at higher elevation were fir (Abies spectabilis), birch (Betula utilis) and rhododendron (Rhododendron campanulatum), and at lower elevations oak (Quercus semecarpifolia), blue pine (Pinus excelsa) and rhododendron (Rhododendron arboreum) (Aryal et al., 2010; Kandel et al., 2011). Although DHR is famous for blue sheep and Himalayan tahr, the hunted species, there are many other mammal species such as goral (Nemorhaedus goral), wild boar (Sus scrofa), Himalayan musk deer (Moschus chrysogaster) serow (Capricornis sumatraensis) and Indian muntjac (Muntiacus muntjak), leopard (Panthera pardus), lynx (Felix lynx), wild dog (Cuon alpinus), red fox (Vulpes vulpes), wolf (Canis lupus) and red panda (Ailurus fulgens) (Aryal et al., 2010; Panthi et al., 2012; Aryal et al., 2015).

This study was based on secondary information collected from official data sourced from the Government of Nepal. We extracted data on annual numbers of bharal and tahr hunted and revenues collected by the government for the period between 2007–2012 from various sources such as records and reports of the DHR office and the Department of National Park and Wildlife Conservation (DNPWC). The most recent survey data available for this species (year 2011) reported 285 tahr in the reserve with a sex ratio of 62 males:100 females (Fig. 3). To compare this value with the survey in 2007, conducted only in the hunting block of Sundaha, we broke down the 2011 figures according to hunting blocks (39 tahr with a sex ratio of 62 males:100 females in 2011 vs 53 tahr with a sex ratio of 214 males:100 females in 2007; Fig. 3). It showed that the sex ratio is highly skewed with a decreased number of males.

**Results**

**Population size of bharal and tahr in DHR (1990–2011)**

The bharal population in DHR has increased significantly from about 400 in 1990 to over 1500 in 2011 ($\chi^2 = 1.03$; df=2; P=0.042) (Fig. 2). However, the sex ratio in the same period has significantly decreased from 129 males to 100 females in 1990 to 82 males to 100 females in 2011 ($\chi^2 = 1.74$; df=2; P=0.036) (Fig. 2). The maximum increase in the bharal population occurred in the period from the year 2008 to 2011.

There were no records of systematic surveys available for population size of the Himalayan tahr despite being the second preferred hunting species in DHR. The most recent survey data available for this species (year 2011) reported 285 tahr in the reserve with a sex ratio of 60 males:100 females (Fig. 3). To compare this value with the survey in 2007, conducted only in the hunting block of Sundaha, we broke down the 2011 figures according to hunting blocks (39 tahr with a sex ratio of 62 males:100 females in 2011 vs 53 tahr with a sex ratio of 214 males:100 females in 2007; Fig. 3). It showed that the sex ratio is highly skewed with a decreased number of males.
Assessment of revenue and local income generated by trophy hunting

Two types of revenue have been generated through trophy hunting in DHR: (1) the revenue collected by DNPDWC, a government body; and (2) money collected by the local communities from successful hunters. The money accrued by the local communities is not substantiated on a legal basis, and the figures are not known to government authorities. Each community has set its own local rules for charging hunters and there is no fixed rate across them: the charge can vary from 65000 to 150000 Nepalese rupees ($867–2000) for a bharal and from 40000 to 100000 Nepalese rupees ($533–1333) for a Himalayan tahr. Local communities used the money collected for community development activities. For example, in Ranmaikot VDC, the money funded the salary of a school teacher in the local school, upgrading facilities of the local health post, and constructing trails. In Bobong VDC, the money was used to establish a community lodge and maintain a bridge whereas in Gurjakhani VDC, it was used to assist a small hydroelectricity project. During our discussion with local community members, it was revealed that local communities have not used the money for conservation programs and community members expressed their concern that local elites might have misused the funds.

Government revenue collected from 2000–2008, 2008/09 to 2011–12 totalled $184372, with the maximum revenue collected in 2011–12 ($84627). Government revenue has significantly increased from 2007–08 to 2011–12 ($179700 to 214000; Tab. 1). Similarly, the revenue obtained by local communities increased significantly (χ²=2.4, df=4, p=0.032) (Tab. 1). In total, the trophy hunting of bharal and tahr has generated $364072 over the past five years (Tab. 1).

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Number Harvested</th>
<th>Revenue Generated (in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bharal</td>
<td>Tahr</td>
</tr>
<tr>
<td>2011/12</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>2010/11</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>2009/10</td>
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<td>8</td>
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<tr>
<td>2008/09</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>2007/08</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>86</td>
<td>48</td>
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</tbody>
</table>

Discussion

Trophy hunting programs exist in many countries and can provide a long-term economic benefit to national governments and local communities without causing population declines or extinction if they can be managed sustainably (Bond et al., 2004; Leader-Williams and Hut-
the long-term viability of the population. Further studies on the carrying capacity of the DHR and interactions of bharal, tahr and their predators are necessary in order to design scientifically sound hunting quotas that are ecologically sustainable for bharal and tahr.

References


