



Protected species outside the protected areas: People's attitude, threats and conservation of the Yellow Monitor (*Varanus flavescens*) in the Far-western Lowlands of Nepal



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ABSTRACT

Although there is high potential for conservation of species outside protected areas, it is often neglected in researches and conservation programs. Protected species are legally protected even outside the protected areas and can be flagships for conservation in these areas, but their conservation aspects in these areas are poorly studied. We studied conservation aspects of a poorly known species, Yellow Monitor (*Varanus flavescens*), which is protected in most of its range countries, outside the protected areas in the Far-western lowlands of Nepal. We studied people's relationship, attitudes and threats to the species through questionnaire survey with adults and children in Parasan Village Development Committee of Kanchanpur District. We found that most of the adults were unaware about the protected status and importance of the species, and both adults as well as children killed the species. The study revealed that most of the killing occurred in agricultural land and children were more responsible for the killing than the adults. We found that monsoon vacation in schools increased the threat to the species. Our study revealed that fear from the species was the main reason and use of the species as food, medicine and hide were other reasons for killing of the species by adults. Low awareness was the major reason behind the killing by children as most of the killing was not related to any good reasons. We estimated that 87 individuals of the species could have been killed in the area in that year. Based on available evidences, we recommend further studies to predict the vulnerability of the species. Our study suggests that raising awareness among locals about its legal status and importance is the simple and efficient measure for the conservation of the species as well as for conserving other protected species outside the protected areas.

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Introduction

Protected areas (PAs) are one of the important bases for conserving the world's biodiversity (Defries, Hansen, Newton, & Hansen, 2005; Rodrigues et al., 2004), however, they are insufficient to represent and conserve the world's remaining biodiversity (Gaston, Jackson, Cantu-Salazar, & Cruz-Pinon, 2008; Miller & Hobbs, 2002; Rodrigues et al., 2004). As PAs are normally created on the basis of the umbrella species concept, they may not protect all species equally (Caro, 2001; Kerr, 1997). Numerous studies have emphasized the importance of the areas outside PAs (unprotected areas) for species conservation (e.g. Balme, Slotow, & Hunter, 2010; Galvez

et al., 2013; Rayner, Lindenmayer, Wood, Gibbons, & Manning, 2014). In addition, PAs do not effectively represent reptiles (Araujo, Lobo, & Moreno, 2007) and some reptile species are more abundant in unprotected areas in comparison to PAs (Smart, Whiting, & Twine, 2005). So, unprotected areas are of even greater importance for reptiles. However, despite their importance in faunal conservation, unprotected areas are often neglected and threatened (Rodrigues et al., 2004).

Wild faunas cross boundaries of PAs and usually inhabit locations outside them (Gaston et al., 2008), where they become unprotected. However, protected species are legally protected even in the unprotected areas. Despite threats on the unprotected areas, species do not avoid these areas (e.g. leopard in South Africa: Balme et al., 2010). In addition, species extinction in the unprotected areas increases their extinction probability even inside PAs (Mcdonald, Kareiva, & Forman, 2008; Gaston et al., 2008; Purvis, Gittleman, Cowlshaw, & Mace, 2000). Due to these reasons, if unprotected areas are not considered for conservation, it may threaten

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survival of a species. As importance of the protected species is already recognized by country, they can be useful for increasing awareness for biodiversity conservation in the unprotected areas.

Conservation has a higher probability of being successful if it is backed up by public support (Miller & Hobbs, 2002; Rosalino & Rosalino, 2012), and their support depends on people's perception. Negative attitudes about wildlife create difficulties in their conservation (Alves et al., 2014; Knapp, Iverson, Buckner, & Cant, 2011; Sarasola, Santillan, & Galmes, 2010). Most of the conservation efforts are focused on few charismatic species and unpopular animals are often decimated with little concern, and reptiles are among the unpopular animals (Ballouard et al., 2013; Ceriaco, Marques, Madeira, Vila-vicosa, & Mendes, 2011). Negative perception towards reptiles is widespread (Ceriaco et al., 2011) and children are no exception (Alves et al., 2014). Children's attitude is important for conservation as they can influence adults' behaviour (Damerell, Howe, & Milner-Gulland, 2013). So, it is important to study the relationship between human and reptile for the conservation of the reptile (Alves et al., 2012).

The Yellow monitor, *Varanus flavescens*, known as *Sun Gohoro* in Nepali language, is a legally protected reptile in its range countries including Nepal except Bhutan (Ghimire & Shah, 2014). Although it is listed as Lower Risk/Least Concern species in IUCN Red Data List (World Conservation Monitoring Centre, 1996), it is listed in Appendix I of CITES (2013). Despite the protected status, it is poorly studied (Auffenberg, Rahman, Iffat, & Perveen, 1989) and faces various threats in Nepal (Ghimire & Shah, 2014; Shah & Tiwari, 2004), but these threats to the species have not been intensively studied. Due to this, knowledge gaps exist for the species; in addition its IUCN status has not been updated since 1996 (World Conservation Monitoring Centre, 1996). As the monitor is often found in agricultural land (Ghimire & Shah, 2014), it is essential to study the conservation aspects of the species such as threats and people's attitude to the species in unprotected areas.

As direct killing is a major threat to the reptiles (Smart et al., 2005) and to the Yellow Monitor (Ghimire & Shah, 2014), this study mainly focuses on direct killing due to different reasons. In the study, we studied human relation and attitudes towards the Yellow Monitor with the help of a questionnaire survey. We also analyzed the cause of the threat and way to minimize the threat to the species. As there is no any data about quantification of threats to the species such as killing, we tried to quantify the killing of the species in the study area. Although having limitations in quality, local knowledge can be very useful for quantification of threat in situation of constrained resources (Golden, 2009; Jenkins et al., 2011; Moore et al., 2010; Turvey et al., 2013) and we used children's and adults' knowledge for quantification of the killing. As a case study, it gives some insights for conservation of a protected species in unprotected areas.

Methods

Study area

The study was conducted in the Parasan Village Development Committee (VDC) of Kanchanpur District, Nepal that lies on the southeastern border of the district (see Ghimire & Phuyal, 2013; Ghimire & Shah, 2014). The VDC has an area of 37.90 sq km. (CBS, 2007) and roughly lies on 28°37'30"N and 80°30'00"E. The VDC lies more than 10 km away from the Suklaphanta Wildlife Reserve, the nearest PA of Nepal. Although, the study area is connected to the Dudhwa National Park (India) with its eastern border, it is far from the network of PAs of Nepal including corridors between PAs. No other conservation activities were conducted in the study area and

it is practically completely outside the network of PAs. Although, the study area was wholly forested as famous *Char Koshe Jhadi* (four mile bush), it was deforested after the 1960s and presently Jana Jagaran Community Forest is the only natural forest of the VDC.

Besides the Yellow Monitor, various nationally protected animals such as Asiatic Rock Python (*Python molurus*), Sarus Crane (*Grus antigone*), Asian Elephant (*Elephas maximus*) inhabit or visit the study area. Other globally threatened animals such as Marsh Crocodile (*Crocodylus palustris*), Smooth-coated Otter (*Lutrogale perspicillata*) inhabit the area; and Pyara Tal (lake) in the area contains three globally threatened species of turtle and is the only reported habitat for Crowned River Turtle (*Hardella thurjii*) in Nepal (Aryal, Dhamala, Bhurtel, Suwal, & Rijal, 2010). The important floral species of the study area are Sal (*Shorea robusta*), Simal (*Bombax ceiba*), Sindure (*Mallotus philipensis*) and Sissoo (*Dalbergia sissoo*). Major ethnic groups of the VDC are Brahmin, Chhetri, Kami, Damai, Sarki, Tamang, Rana Tharu and Chaudhary Tharu and at least five different languages are spoken in the area.

Questionnaire preparation

We used interview method by using structured questionnaire to understand the human relationship and attitudes towards the Yellow Monitor (Huntington, 2000; Smart et al., 2005; Turvey et al., 2013). We prepared structured questionnaires based on the data collected from preceding studies (Ghimire, 2012; Ghimire & Shah, 2014) regarding human relationship and threats towards the species. We prepared two separate questionnaires for adults and children containing 15 questions and 10 questions respectively. The reasons for these short questionnaires were to increase the reliability of data and decrease the non-response rate.

Questions related to the attitudes towards the species such as fear of the species, willingness to conserve the species were included in the questionnaire for adults. The questionnaire also included questions on whether adults tolerated the species in their vicinity i.e. they let the species thrive in their vicinity or tried to kill/remove species from their vicinity. In this study, we tried to get information about killing of the species such as reasons behind the killing, numbers of killing, place of killing, consumption of the meat of the species by both children and adults. The questions related to knowledge about the species such as the protected status and importance were included in adults' questionnaire. As it is a protected species, importance of the species means its ecological role such as agricultural pest control, and utility value such as consumption of meat (as food and medicine) and use of skin are not included. Hence, if respondent replied that he/she know about the importance of the species, we tried to know about the types of importance and if the importance was related to use as resources, we concluded that they did not know its importance. We did not include any questions likely to cause respondents to hesitate such as economic status, but it was calculated by using agricultural land, house type, and income sources. The lists of questions included in the questionnaires are in Appendices I and II.

Questionnaire survey

We conducted the survey in January–February 2012. For the questionnaire survey of adults, we randomly selected and interviewed a member (above 16 years) from each of the 209 households out of 2554 households in the VDC, among which 90 were female (43.1%). The interviews were conducted in the respondents' residence. The age of the respondents varied from 17 to 70 years (mean = 32.37, s.d. = 12.35). We also categorized the respondents according to their ethnicity, occupation, education and economic status. We categorized economic status into five classes according to their annual family income as very low ($\leq$ NRs 30,000), low (NRs

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