



## Is local ecological knowledge a useful conservation tool for small mammals in a Caribbean multicultural landscape?



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### ABSTRACT

Local ecological knowledge is an increasingly used, cost-effective source of data for conservation research and management. However, untrained observers are more likely to provide meaningful information on species that are charismatic and easily identifiable (e.g. large-bodied vertebrates) or of socio-economic importance, and may ignore or misidentify smaller-bodied, elusive and non-charismatic species. These problems may be further exacerbated by variation in environmental awareness and perception between different socio-cultural and ethnic groups often present across the range of threatened non-charismatic species. A community-based interview survey was carried out in southern Hispaniola on both sides of the Dominican Republic–Haitian border, to investigate the usefulness of local ecological knowledge for assessing status and threats to the Hispaniolan solenodon (*Solenodon paradoxus*) and Hispaniolan hutia (*Plagiodontia aedium*). These two small-bodied nocturnal endemic mammals are rarely targeted for bushmeat or encountered by rural community members, and may be confused with each other and with non-native small mammals. We demonstrate that, despite their elusive nature, both solenodons and hutias can be accurately identified by substantial numbers of respondents in rural communities. New quantitative data on levels of anthropogenic mortality also indicate that predation by free-roaming village dogs is responsible for numerous solenodon and hutia deaths. However, patterns of awareness and experience may be influenced by variation both in species status, ecology and distribution and in socio-cultural factors, and Dominican and Haitian respondents from the same landscapes have very different levels of awareness and experience of Hispaniolan native mammals, demonstrating an important distinction between local ecological knowledge and traditional ecological knowledge.

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### 1. Introduction

Most conservation field research is based on ecological data collected directly by trained scientists, but information about the status of species of conservation concern is often also available from untrained local people utilizing the same environments (Newing, 2011). Community interview surveys can represent a relatively inexpensive approach for collecting data across wide geographic areas, especially for rare or elusive species that may otherwise be difficult to study or monitor, and can provide both historical and recent data with a single collection effort. Knowledge obtained during such surveys can be subdivided into local ecological knowl-

edge (LEK, representing experiential knowledge derived from lived interactions with the local environment, and able to provide information about the contemporary status of target species and ecological resources) and traditional ecological knowledge (TEK, representing the cumulative body of ecological knowledge and belief passed down between generations by cultural transmission). These social science terms are often used interchangeably but in fact refer to different histories of knowledge acquisition, and can provide information on different areas of local community interaction with the environment (Berkes et al., 2000). LEK in particular has become increasingly recognized as an important source of data for conservation research and management, and can often provide more extensive information than available from standard ecological surveys on various aspects of the status, extinction drivers, or last occurrence of threatened or recently extinct species (Burbidge et al., 1988; Turvey et al., 2010b).

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However, there are many problems preventing the straightforward integration of LEK into conservation research. There is considerable potential for error and bias in the collection, interpretation, and quantification of LEK, with community-based fieldwork requiring particular sensitivity to local anthropological and socio-economic environments (McKelvey et al., 2008). Untrained local observers are more likely to provide meaningful information on charismatic and easily identifiable species, typically large-bodied or otherwise distinctive vertebrates (Mallory et al., 2003), or species with significant socio-economic or other cultural importance (Jones et al., 2008; Karst and Turner, 2011), with LEK of particular usefulness in studying the status of regional fisheries (Johannes et al., 2000; Drew, 2005). LEK can also provide quantitative data on levels of human–wildlife conflict, although it may represent an exaggerated or otherwise inaccurate assessment of the actual threat posed by species thought to compete for community resources such as domestic animals or crops (e.g. Paddle, 2000).

Conversely, smaller-bodied and non-charismatic species, even in groups such as mammals, are much more likely to be unreported or misidentified by respondents (Nyhus et al., 2003; Starr et al., 2011). Indeed, whereas ethnozoological classification systems often correspond with scientific taxonomies for large charismatic species (Telfer and Garde, 2006; Majnep and Bulmer, 2007), these semantic domains may not accurately discriminate species that are not culturally important or regularly encountered (Sillitoe, 2002). Within mammals alone, the generally small-bodied, “non-charismatic” (cf. Entwistle and Stephenson, 2000) rodents, lipotyphlan insectivores and bats comprise >70% of the group’s total species diversity (Wilson and Reeder, 2005), so that LEK may be of limited use for research or management in such taxa. These problems may be further exacerbated by variation in environmental awareness and perception between different socio-economic, cultural and ethnic groups present across the range of species of conservation concern. Further investigation of the usefulness of LEK for assessing status and threats to small-bodied, non-charismatic species under such conditions is therefore an important conservation necessity.

The Caribbean island of Hispaniola, divided politically into the Dominican Republic and Haiti, has experienced high levels of recent human-caused extinction, and its endemic non-volant land mammal fauna now consists of only two species: the Hispaniolan solenodon (*Solenodon paradoxus*), a large venomous insectivore, and the Hispaniolan hutia (*Plagiodontia aedium*), a large, mainly arboreal rodent. Both species are classified as Endangered by IUCN (2011), and are high priorities for global conservation attention because they represent some of the last survivors of the insular Caribbean mammal fauna and are phylogenetically distinctive members of ancient lineages (Collen et al., 2011). However, very little is known about their current status and threats. They may be threatened by a range of different anthropogenic factors, including habitat loss, predation by introduced carnivores, and direct persecution by people for food or because of their perceived status as agricultural pests (Woods and Ottenwalder, 1992), but the relative significance and magnitude of these possible threats remains unknown and may vary across different communities or social groups. Both solenodons and hutias are rarely encountered by researchers and have been considered extinct in the past (Fisher and Blomberg, 2011), and few field surveys have been carried out for either species (Sullivan, 1983; Woods et al., 1985; Ottenwalder, 1999). Little is known about the ecological requirements, habitat associations, or landscape-level and regional distributions of these Hispaniolan land mammals; however, previous studies have suggested that solenodons may be more abundant and widely distributed than hutias across much of the island, with populations recorded in highly disturbed landscapes in both the Dominican Republic and Haiti, whereas hutias probably have a greater

requirement for tree cover (Sullivan, 1983; Ottenwalder, 1991; Rupp and Leon, 2009).

Because of the suggested threat faced by solenodons and hutias from local communities and their commensal animals, and the demonstrated difficulties in obtaining extensive data on their distribution, status and threats through standard ecological field techniques, it is possible that LEK may be able to contribute to conservation of Hispaniola’s native land mammals. However, although there are occasional reports of opportunistic exploitation of both species by local people for food (Turvey et al., 2008), they are not regularly targeted for bushmeat unlike large rodents in other parts of the world (Amori and Gippoliti, 2002), and they may only be encountered rarely even by rural community members living across their range. These relatively small (<1.5 kg) mammals are also referred to across Hispaniola by a variety of local names, and are confused both with each other and with non-native small mammals (e.g. rats, mongoose, guinea pigs; Verrill, 1907; Turvey et al., 2008); even official Dominican publications have referred to both species by the name *jutia* (Rímoli, 1972; de la Fuente, 1982). LEK of small mammals in rural Hispaniolan communities, as well as wider patterns of environmental resource use and awareness, is also likely to vary both qualitatively and quantitatively between Dominican respondents, Haitian Creole respondents in Haiti, and migrant Haitian respondents in the Dominican Republic, although the extent to which this will hinder the usefulness of respondent data for conservation is uncertain. In particular, problems of accurate species identification may be greater in Haitian communities; although Haitian farmers living adjacent to the country’s few remaining forests can have good knowledge of these habitats and their importance for wild animals in general (Dolisca et al., 2007), people in many areas of rural southwest Haiti reportedly use the same word (*zagouti*) to refer not only to both solenodons and hutias but also to the morphologically dissimilar rhinoceros iguana (*Cyclura cornuta*) (Woods and Ottenwalder, 1992).

As part of a wider conservation programme investigating the status and distribution of Hispaniolan land mammals, a community-based interview survey was carried out in communities in the Sierra de Bahoruco–Massif de la Selle region of southern Hispaniola on both sides of the Dominican–Haitian border, to investigate the usefulness of LEK as a conservation tool for non-charismatic small mammals.

## 2. Materials and methods

Fieldwork was conducted from 5 May to 23 June 2010 in nine small rural communities along the Dominican–Haitian border, situated north and south of Sierra de Bahoruco National Park (Fig. 1). Study communities in the Dominican Republic ( $n = 6$ ) are situated in landscapes comprising a mosaic of primary and secondary forest patches, pasture and cropland, whereas study communities in Haiti ( $n = 3$ ) are all situated in much more anthropogenically degraded landscapes with little nearby forest cover. Most families in all study communities engage in low-income subsistence agriculture, with cash crops (e.g. coffee) also grown in Dominican Republic communities. Solenodons and hutias are known to occur across the area of the Dominican Republic covered by the survey (Sullivan, 1983; Ottenwalder, 1999), and indirect signs and live individuals of both species were encountered across this region during wider survey work in 2010. However, there are no recent records to confirm the continued presence of either species in the border region of Haiti covered by the survey due to the limited history of mammal field research in this region, and both species have been considered functionally extinct across most of Haiti due to

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