



Distribution of two Andean small cats (*Leopardus jacobita* and *Leopardus colocolo*) in Bolivia and the potential impacts of traditional beliefs on their conservation

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ABSTRACT: We conducted field research in 1998–1999 and 2001–2002 in the high Andean and Puna eco-regions of Bolivia to estimate the distributions of Andean cat *Leopardus jacobita* and a similar species, the pampas cat *Leopardus colocolo*, and to evaluate the attitude of local people towards these species to determine potential conservation threats. Field interviews were conducted with local villagers, in parallel with an intensive search for direct and/or indirect signs of the 2 species. Confirmed records for the Andean cat suggest that the species is mainly restricted to the high Andean region of Bolivia (elevations above 4100 m), whereas the pampas cat can be found both in this region and at lower elevations. Most of the confirmed records were for the pampas cat, suggesting that it is more abundant than the Andean cat. Both species are generally referred to by local people as 'titi' and are culturally associated with Earth's abundance and fertility. The skins or stuffed specimens of both of these cats are used in ceremonies associated with agriculture and native livestock activities. Killing these cats for traditional purposes may represent a significant threat to both species, especially to the Andean cat, but reverence for both species should form the foundation for a conservation education campaign.

KEY WORDS: Bolivia · Andean cat · Pampas cat · Distribution · Traditional beliefs · Threats

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INTRODUCTION

The Andean cat *Leopardus jacobita* is one of the few small felids classified as Endangered on the IUCN Red List of Threatened Species and is the most threatened cat species in the Americas (IUCN 2010). In Bolivia, it is listed as Critically Endangered (Villalba et al. 2009). It is also amongst the least known of the Felidae, although recent research is improving the knowledge base, as evidenced by the growing collection of publications on the website of the Andean Cat Alliance, a network of specialists focus-

ing on its conservation (www.gatoandino.org).

Before our research began in the late 1990s, all that was known about the Andean cat was that it is restricted to the high Andean regions of Peru, Bolivia, Chile and northeast Argentina (Cabrera 1961, Scrocchi & Halloy 1986, Nowell & Jackson 1996). Few records of the species were available for Bolivia, where a large portion of its geographic range lies. The Andean cat can easily be mistaken for the smaller and similarly little-known pampas cat *Leopardus colocolo*. The geographical range of the pampas cat is much more extensive, encompassing an area ranging from

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00° 30' S (Ecuador) to 51° S (throughout Argentina) as well as the southeastern parts of Brazil, Paraguay and Uruguay (García-Perea 1994). Outside its Andean range, the external appearance of the pampas cat is quite different, but in the Andes, it is so similar in appearance to the Andean cat that a diagnostic key was developed to distinguish the 2 species (García-Perea 2002, Cossíos et al. 2007a).

Concern for the conservation of the Andean cat arises because of its rarity, the reduced high mountain range it occupies, and the high degree of habitat fragmentation. The pampas cat may also be at risk in the high Andes because of its habitat characteristics. Data on the ecology, distribution and status of both these species are urgently needed to inform their conservation. We contribute here with the results of the first systematic surveys on Andean cat and Pampas cat presence in Bolivia.

MATERIALS AND METHODS

During the 2 field research periods 1998–1999 and 2001–2002, we (M.L.V. & N.B.) conducted research to determine the distribution of the Andean and pampas cats in 6 of the 9 Bolivian Departments (La Paz, Potosí, Oruro, Chuquisaca, Cochabamba and Tarija) where there was potential habitat for these species.

Research during 1998–1999 consisted of interviews with local people and the staff of protected areas. The interviews were supported by a set of photographs of both species and were conducted in Spanish, Aymara and/or Quechua with the help of park guards or local guides. First, each interviewee was asked to describe the cat species they knew about, and to give the number and age estimates (adult or kittens) of the cats they had seen. Later each interviewee was asked to browse through the set of photos to indicate whether they depicted the cat(s) they had seen.

Interviewees were also asked whether they knew of any pelts or stuffed specimens and where these had been obtained (location where both types of specimen were obtained was required as confirmation of the species presence). To confirm the original location of the skin or sighting, details on the place name, site/habitat features, estimated year and month were sought. Finally, we explored the attitudes and opinions that prevailed regarding these 2 felid species. We used semi-structured interviews to collect this information.

Between March and May of 2001, 3 protected areas were surveyed (Sajama, Apolobamba and Cotapata), and later in 2001 and 2002 surveys were conducted

inside the Eduardo Avaroa Reserve and surroundings. These surveys involved local interviews and additional complementary techniques; in Apolobamba, for instance, scent stations were placed following Roughton & Sweeny (1982), and in Cotapata and Eduardo Avaroa, 3 camera traps were activated for a 24-h period together with scent stations in a single transect (Cossíos et al. 2007a). Transects were active for 3 operative transect nights at each site, and 5 types of attractants were used (tuna, and the commercial lures bobcat urine (J.R. and Sons), bobcat gland lure (John Grahams'), wildcat #1 and #2 (Hawbakkers)).

Special effort was made to conduct interviews with people over the age of 60, who we identified as the demographic sector most likely to have information about the cats, particularly historical information relating to the cat's presence over the last 40 yr or more, and still maintain traditional cultural practices.

Types of records of both cat species were classified as follows. A confirmed record was one for which the presence of the species was confirmed by researchers' sightings, camera trap photos, evaluations of museum specimens and inspection of pelts or stuffed specimens in the field. An unconfirmed record was one in which interviewees reported to know of or have seen an Andean cat and/or a pampas cat, and were able to identify it from the set of photographs presented to them, but in which the species identification could not be verified as above. An undetermined record was when reports or records consisting of faeces, tracks or sightings of small native felids could not be clearly attributed to 1 of the 2 species.

Study area

The Bolivian Andean region covers one-third of Bolivia and is home to much of the country's human population, of whom approximately 70% reside in the high Andean plateau and in the valleys of the eastern flanks of the Andes (Donoso 1992). Our survey was mainly restricted to 2 eco-regions—the Puna, which lies between the Western and Eastern Andean range (3600–4200 m), and the high Andean ('Altoandino'), which lies above 4200 m (Ellenberg 1981, Ribera 1992)—given the fact that the Andean cat has been reported to primarily inhabit the Altoandino, and probably also occurs rarely in the Puna (Scrocchi & Halloy 1986).

The Altoandino comprises high flat plains and the steep escarpments of glacial valleys or volcanic hillsides, with extreme climatic conditions with nocturnal frosts almost throughout the year, and tempera-

tures ranging from -15 to 25°C . Mean annual precipitation, falling mainly as snow and hail, is less than 700 mm and decreases in a gradient from north to south (Beck 1988, Ribera 1992).

The Puna, in contrast, consists mainly of a high flat plain surrounded by the Andean mountains, with a northern semi-humid zone around Lake Titicaca, and a southern, more arid zone in Potosi and Tarija. In the north, there is 500 to 700 mm of rainfall annually during 8 humid months and an average temperature between 5 and 7°C , whereas in the south there is a single humid month and an average temperature of 8 to 11°C (Ribera 1992).

Both eco-regions share similar plant formations comprised of siliceous tussock grasses dominated mainly by *Festuca* spp., *Stipa* spp. and *Calamagrostis* spp. and the typical 'tholares' composed of shrubs of *Baccharis* spp. and *Parastrephia* spp. The tall grasses are mixed with short graminoid species and small cushion herbs (*Azorella* spp., *Pycnophyllum* spp. and *Lachemilla* spp). Characteristic of the central and southern parts of the Altoandino is the presence of low forests of Queñoa (*Polylepis* spp.), which grow on soils of volcanic origin.

High mountain peat bogs with stagnant water or 'bofedales' occur in both study areas, and are composed of plant species that form cushions such as *Distichia* and *Oxychloe* and other Juncaceae and Cyperaceae species, which are an important forage resource for livestock and wildlife, particularly in the dry season (Beck 1988).

The 2 eco-regions also share similar fauna, although the Puna is less rich in species than the Altoandino (DNCB 1996). Representative fauna are vicuña *Vicugna vicugna* and their domesticated relatives, llama and alpaca; smaller herbivorous mammals such as the mountain vizcacha *Lagidium viscaccia*, ashy chinchilla rat *Abrocoma cinerea*, chinchilla rat *Chinchillula sahamae* and various species of smaller rodents; as well as a great diversity of birds. Carnivores, in addition to the Andean cat and pampas cat, include puma *Puma concolor*, Andean fox *Pseudalopex culpaeus*, Andean skunk *Conepatus chinga* and lesser grison *Galictis cuja*.

RESULTS

Distribution

A total of 136 localities were surveyed, including 6 protected areas. Additionally, 184 people were interviewed, of whom 42.9% were from the Altoandino,

43.5% from the Puna and 13.6% from the valleys. Small towns, villages and/or ranches were visited, so the number of interviewees within each locality varied from 1 to 6, ranging from 10 to 20 interviewees within a particular area.

From the interviews and fieldwork, 211 records were obtained, including 3 Andean cat and 5 pampas cat specimens from museum collections (Table 1). Of 211 records, 37 were confirmed, 125 were unconfirmed and 49 were undetermined (Table 2). Of the unconfirmed records, the Andean cat represents 57.6% and the pampas cat represented the other 42.4%. Of the confirmed records, only 27% were for the Andean cat; the rest (73%) were for the pampas cat.

When both confirmed and unconfirmed records were considered together, approximately the same quantity of records was obtained for both species (Table 2). We were shown 23 pampas cat skins, of which 9 (39%) had previously been wrongly identified as Andean cat. This evidence leads us to consider unverified reports of cat sightings as of dubious accuracy; therefore, we have classified them as unconfirmed records.

Andean cats were confirmed in 2 of the 6 surveyed Departments (Potosi and Cochabamba), whereas pampas cats were confirmed in 5 of the 6 Departments (La Paz, Oruro, Potosi, Cochabamba and Tarija) (see Table 1). Neither species was found in Chuquisaca. The distribution of the 2 species was mapped using only confirmed records and data obtained from museum collections (Fig. 1, Table 1).

All the confirmed records for the Andean cat ($n = 10$) came from the Altoandino: 9 from Potosi (south-west Bolivia) and 1 from Cochabamba (Central Bolivian Andes). In comparison, the pampas cat was recorded in both regions ($n = 27$): 17 (62.9%) in the Puna and 10 (37.1%) in the Altoandino.

Only one record of the Andean cat was within a protected area, the Tunari National Park in Cochabamba. The remaining 9 were outside a protected area and 5 of these were in the same locality, Khastor (South Potosi), which is 65 km from the northeastern border of the Eduardo Avaroa Reserve. Two of the records were of live Andean cats in 2001 and 2002. The first record was a direct sighting, and the other was recorded on a camera trap (Villalba 2002). In 2001 another Andean cat was killed close to Khastor by a llama shepherd dog.

In contrast, 8 out of 27 confirmed records for the pampas cat were within protected areas (Apolobamba, Sajama and Tunari), although 3 records (of

Table 1. Locality details and type of record for the confirmed records of Andean cat *Leopardus jacobita* and pampas cat *Leopardus colocolo*. CBF: Colección Boliviana de Fauna, La Paz, Bolivia; EBD: Estación Biológica Doñana, Seville, Spain

Department	Locality	Province	Type of record	Source
Verified records for <i>Leopardus jacobita</i>				
Cochabamba	Janko kala, El Paso region	Cercado-Quillacollo	Skin	Present study
Potosí	Campamento Khastor	Sud Lipez	Skull	CBF 00445
Potosí	Campamento Castor	Sud Lipez	Skin	CBF 02018
Potosí	3 km NE of Estancia Khastor	Sud Lipez	Skin	CBF 02227
Potosí	Khastor Hill, rocky tableau	Sud Lipez	Sighting	Present study
Potosí	Khastor Hill, rocky tableau	Sud Lipez	Photo trap	Present study
Potosí	Quebrada Torquis	Sud Lipez	Remains of skin and skeleton	Present study
Potosí	Quebrada near Galeras ranch	Sud Lipez	Skin	Present study
Potosí	Quebrada Tioj, Galeras	Sud Lipez	Remains of skin	Present study
Potosí	Guadalupe	Sud Lipez	Skin	Present study
Verified records for <i>Leopardus colocolo</i>				
Cochabamba	San Miguel, west border Tunari National Park	Quillacollo	Skin	Present study
La Paz	Coro Coro	Pacajes	Skull	CBF 6144
La Paz	Comanche	Pacajes	Skin	EBD 8366
La Paz	Quinhui, Kaluyo <1 km from Cotapampa, Apolobamba Protected Area	B. Saavedra	Skin	Present study
La Paz	Huanacollo, Comanche	Pacajes	Skin	Present study
La Paz	Callapa, Chaguada	Pacajes	Skin	Present study
La Paz	Collana	Ingavi	Skin	Present study
La Paz	Choque	Ingavi	Skin	Present study
La Paz	Levita	Ingavi	Skin	Present study
La Paz	Peninsula de Cocotani, Caqueña	Omasuyos	Skin	Present study
La Paz	Ocata, 5 km SE of Santiago de Machaca	J.M. Pando	Skin	Present study
Oruro	8 km NW of Sajama, Sajama National Park	Sajama	Skin	CBF 2224
Oruro	8 km ESE of Sajama, Sajama National Park	Sajama	Skin	CBF 2229
Oruro	Sajama, Sajama National Park	Sajama	Skin	Present study
Oruro	Cerro Jitiri, Cosapa	Oruro	Skin	Present study
Oruro	9 km from Sajama, Sajama National Park	Sajama	Skin	Present study
Oruro	Huaña khota, Sajama National Park	Sajama	Skin	Present study
Oruro	Tholawata, Sajama National Park	Sajama	Skin	Present study
Oruro	Pairumani, 165 km from Oruro	Litoral	Skin	Present study
Oruro	Escara	Litoral	Skin	Present study
Potosi	Coruto	Sud Lipez	Skin	Present study
Potosi	Quebrada Torquis	Sud Lipez	Skin	Present study
Potosi	Kamincha	Sud Lipez	Skin	Present study
Potosi	Quebrada Oslaka, Vila Vila	Nor Lipez	Skin	Present study
Potosi	Animas, San Cristobal	Nor Lipez	Skin	Present study
Tarija	Condor Huasi, 40 km N of Iscayachi	Méndez	Skin	Present study; CBF 6142
Tarija	Ñoquera	Avilés	Skin	Present study

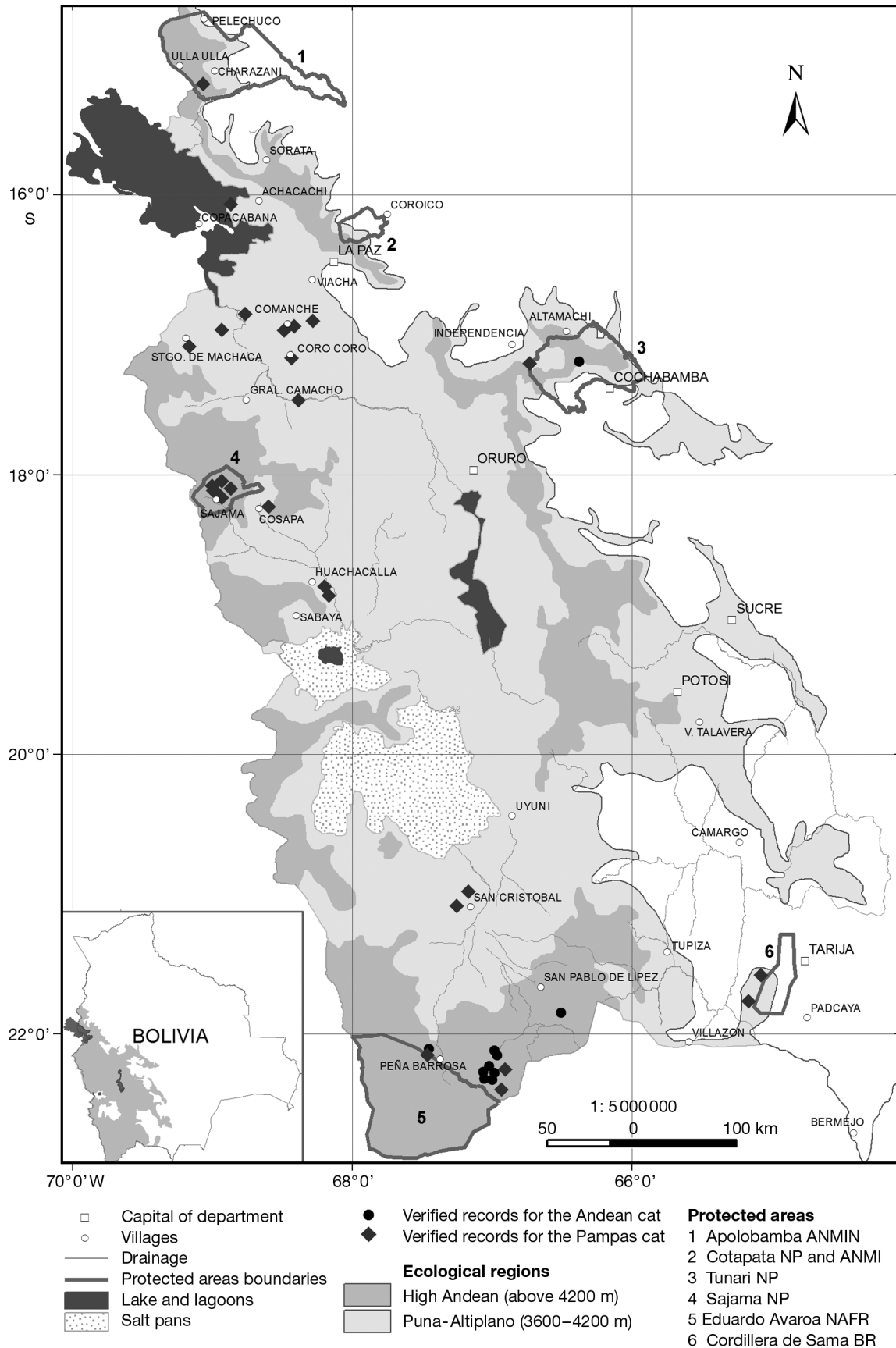
Table 2. Type of record by species (number of records is shown in parentheses). na: not available

Record type	Andean cat (% total)	Pampas cat (% total)	Total (%)
Confirmed	27 (10)	73 (27)	17.5 (37)
Unconfirmed	57.6 (72)	42.4 (53)	59.2 (125)
Undetermined	na	na	23.2 (49)
Total	50.6 (82)	49.4 (80)	100 (211)

27) were near the Eduardo Avaroa Reserve (1 record 20 km from the north border and 2 records 20–40 km from the east border); one of these was from a cat killed in 2001.

Most (n = 20) of the confirmed records of both species were from skins of animals caught by local people before 2001. As described in 'Beliefs and traditions', in the region Andean cats are considered as sacred animals, and traditional custom

Fig. 1. Preliminary distribution map of Andean cat *Leopardus jacobita* and pampas cat *Leopardus colocolo* in Bolivia based on confirmed records. The map shows 6 of the 8 protected areas where presence of the Andean cat is expected. ANMI: Area Natural de Manejo Integrado; ANMIN: Area Natural de Manejo Integrado Nacional; BR: Biological Reserve; NAFR: National Andean Fauna Reserve; NP: national park. Cartography based on Ribera et al. (1994) and IGM (1994)



calls for keeping a stuffed skin in the home as a source of luck and progress.

Local names for the Andean and the pampas cat

Interviews also highlighted people's perceptions of the cats and their local names. The most common local name given to both species is the Aymara word 'titi', with 2 variants: 'titi misi' or 'titi phisi'. Quechua people know the cats as 'Osqhollo', giving the same name to another small South American cat, Geoffroy's cat *Leopardus geoffroyi*, although they do distinguish the 'Osqhollo' which live in the mountains and eat vizcachas from the 'Osqhollo' which inhabit lower areas and have a more yellowish coat with dark spots and are accused of stealing chickens. All these common words mean 'wild cat', although some respondents in Chuquisaca (Quechua origin) also referred to the weasel *Mustela* sp. as 'Osqhollo'. In the surroundings of the Eduardo Avaroa Reserve (southwest Bolivia), both cat species are known as 'Q'uita gato', a combined Quechua and Spanish term, which means 'cat that runs away'.

Of all interviewees, 17.4% were able to describe the differences between the 2 cats and referred to them with different names. The differences they described included the colour and spot patterns in their coat, tail length, behaviour and habitat type. They described 1 type of cat in their area as being reddish with spots, having a short tail and small ears and being elusive and difficult to observe. Some named this cat 'gato chaskoso', meaning a woolly or unkempt cat. We assume that this name is given because of the presence of the mane on the animal's back. These descriptions correspond well to the pampas cat's features. In comparison, the Andean cat was described as greyish with stripes and a long tail; some people called this species 'silly cat' and mentioned that it was rather tame. Regarding habitat type, they distinguished between the cat from the hills, which is known as 'huaña titi', meaning cat from dry places, and the cat from 'bofedales', which is known as 'uma titi', meaning cat from the water. Most people described the Andean cat as 'huaña titi' and the pampas cat as 'uma titi'.

Interviewees also distinguished between the cats according to the kind of luck they bring them, indicating that 2 classes exist: (1) the silver cat or 'colque-titi', which has rounded coin-shaped spots or dots (i.e. the pampas cat), brings them wealth ('colque' is a Quechua word meaning silver and money); and (2)

the striped cat (the Andean cat) which brings them good crop yields and/or livestock.

Beliefs and traditions

In general, the 'titi' (both Andean and pampas cats) are respected sacred animals. Some people regard them as the cat of the 'Achachilas' (the guardian gods of the region) or the cat of the 'Pachamama' (Mother Nature). Seeing a cat is believed to bring good luck, and some interviewees believed that their encounters with the 'titi' had special meaning and were not mere chance. Hunting the cat is believed to bring misfortune and death to the hunter and his family, and some interviewees believed that killing a 'titi' means that the hunter incurs a debt with the 'Pachamama', who then has to be 'paid' by means of certain rituals conducted by a 'Yatiri', a wise man or leader that presides at religious ceremonies (Yapu 2001). The ritual involves filling the animal's body with wool, adorning it with coloured woollen threads in its ears and colour paper streamers around its neck, mixed with banknotes and coca leaves. The preserved animal is then called 'Tejeta' (meaning 'stuffed with wool') and must be worshipped annually. The remains of the animal must be buried in the place where it was hunted and the hunter must also make an annual offering to the 'Pachamama'.

The local people also use the stuffed skins in family celebrations for marking their cattle (alpacas, llamas and/or sheep), or for the start of the crop-growing season, in the belief that it will bring them luck with their livestock and a good harvest. During these celebrations, people carry a stuffed 'titi' on their backs when they dance. The celebrations have different names according to the region: in Oruro they are called 'ticanchara', and in other regions, 'k'illpa' or 'markancha'.

In the Sajama region (Oruro), people say that the 'titi' is 'samiri', which means that it protects and gives encouragement to the community, and during the 'k'illpa' they fill the skin of the 'titi' with wool and small pieces of the skin of the llama or alpaca that they take from the ears of these animals while they are being tagged. When they place these pieces of skin inside the cat's body, they blow on them and make a wish for the well-being or prosperity of the herd.

We have evidence of instances of whole skins or parts of the cat skins being sold for ritual purposes in markets where herbs, skins or parts of other animals are available for similar purposes. Of the 23 skins or

stuffed skins of pampas cat observed, only one was found in a rural store as an ornament. Those who feel more reverence for the 'titi' keep it respectfully with the material used for the 'ch'alla' (an indigenous ritual offering and blessing ceremony) and cover it with an 'aguayo' (multi-coloured woollen cloth). The specimen is passed down within the family.

Local attitudes and threats

In some localities, families that are currently members of non-Catholic religions no longer practise the custom of the 'ch'alla' and we were told that the skins were burned or buried, but in some way they retained their beliefs about the 'titi'. Although none of the interviewed people blamed the cats for predation on domestic animals, in some places people kill them without reason and in others they sell or keep the skins for religious ceremonies. People do not discriminate between the 2 cat species for these purposes, although a number of pampas cat skins, and only a few Andean cat skins, were seen and photographed in local traditional markets (M. L. Villalba pers. obs.). No evidence of any other kind of commercial trade was found.

DISCUSSION

Distribution

Although confirmed records of Andean cats have been found in other countries at lower elevations (3326 m in Peru [Cossíos et al. 2007b]; 3714 m in Chile [Napolitano et al. 2008]; 3500 m in northern Argentina [Perovic et al. 2003]; and new records at 1800 m in Argentina's southern Andean steppe [Sorli et al. 2006] and at 650 m in Argentina's Patagonia steppe [Novaro et al. 2010]), confirmed records from Bolivia suggest that in this part of their range they are mainly restricted to the Altoandino (elevations of 4100 m and higher). No verified records were obtained for the Andean cat in the Puna, whereas nearly 75% of the confirmed records for the pampas cat are from the Puna.

Since the end of our field research in 2002, new records of the Andean cat in Bolivia have been obtained, 2 of which are from a transition zone between the Puna and the Altoandino eco-regions (4000–4100 m). All localities of these new records are in the Departments of La Paz, Oruro and Potosi and 6 of them are within 3 protected areas (Barbry & Gallardo

2006, Villalba et al. 2008, Viscarra 2008, Torrico 2009, J. C. Huaranca pers. comm., H. Ticona pers. comm.).

In the 2 'transition' localities where the Andean cat was recorded, local people were found to differentiate effectively between the 2 cat species, but in the same region in villages located in the plateau itself, people were not able to distinguish between the 2 species (J. C. Huaranca pers. comm.). The fact that several interviewees from the Puna considered the Andean cat to be the male of the pampas cat suggests that they are unfamiliar with the Andean cat, and it is likely that the species is not present in most of this eco-region. A similar result was obtained by Chapron (1999): an interviewee mentioned the presence of small cats at Salar of Uyuni (3660 m, Bolivia), but did not recognise the Andean cat from the photo and commented that the cats may have 2 colour phases.

Interviewees always mentioned that the cats are found in the mountains or in the hills. It is possible that the presence of humans at lower altitudes is a factor that contributes to restricting the Andean cats to higher elevations in the Bolivian Andes. The Puna is more densely populated than the Altoandino; although both eco-regions have a long history of occupation and of habitat alteration, the human impact in the Puna is widespread, whereas in the Altoandino it is more localized (Ribera 2008).

Nevertheless, current land use in both eco-regions is a threat to the Andean cat, particularly mining activities, which have multiple impacts at a landscape level (habitat destruction, air, soil and water pollution, water extraction, etc.). The Andean Cat Conservation Strategic Plan has identified habitat loss and habitat deterioration as the 2 main threats to the species. This plan proposes a set of actions to reduce these impacts, including research on threats to the Andean cat, support for protected area management, creation of new protected areas, promotion of community-based conservation and community capacity building, among others (Andean Cat Alliance 2011).

The new localities for the species reported in Potosi are situated approximately 50 km north and 100 km southwest of the localities where we obtained most of the confirmed records for Andean cats, and 11 of 30 of these new records are in the Eduardo Avaroa Reserve (Viscarra 2008, Torrico 2009). Consequently, southwestern Bolivia and the adjoining Argentinean territory (Perovic et al. 2003, Lucherini et al. 2004) could be an important trans-boundary conservation area for the Andean cat. The borders in the north-central Bolivian Andes could also be important, being close to areas where most records were ob-

tained in Chile (Napolitano et al. 2008) and southern Peru (Cossíos et al. 2007b). Both areas which straddle the 3 countries (Bolivia, Chile, Peru) are located within the most favourable climatic conditions for the Andean cat (Marino et al. 2010, 2011).

Most of the confirmed records of Andean cats have been from outside protected areas but near to them. The Bolivian government should consider protecting additional high-altitude habitats for the conservation of this species and, in the case of Eduardo Avaroa Reserve, an important contribution would be the expansion of its current limits; this was also suggested as an option for protecting important areas where relicts of queñoas trees exist as well as other important habitats for the Andean cat, vicuña and Andean wildlife in general (Tropico/Swedforest International 2000). This could enhance the protection of the Andean cat and its habitat, however, community involvement in the conservation of both the cat and its habitat is essential.

As was the case in surveys in Argentina (Perovic et al. 2003, Novaro et al. 2010), Chile (Napolitano et al. 2008) and Peru (Cossíos et al. 2007b), we obtained more confirmed records of the pampas cat compared with the Andean cat, suggesting that the pampas cat may be more abundant or common than the Andean cat. In surveys carried out in southwest Bolivia, based on faecal samples that were further identified at species level by faecal DNA analysis, the proportion of samples corresponding to the Andean cat versus those corresponding to the pampas cat ranged from 1:2 to 1:9 (Viscarra 2008, Torrico 2009). Pampas cats have been reported in northern Argentina at lower mean (\pm SE) elevations than Andean cats (pampas cat: 3567 \pm 67 m; Andean cat: 4236 \pm 140 m; Perovic et al. 2003); in Peru, the lowest elevation for the pampas cat has been recorded as 2777 m (Cossíos et al. 2007b). Accordingly, it is suggested that conservation actions should be prioritized for the Andean cat, although this would also benefit the pampas cat where they are sympatric.

Interviews and potential bias

Interviewees, particularly those from the Puna ecoregion, generally do not distinguish the Andean cat and the high-altitude pampas cat as separate species. Some of our respondents were unable to differentiate these cat species and were confused by the photographs of them. A methodological difference between our 2 surveys concerns the quality of the photographs we showed interviewees. In the earlier

surveys (1998–1999), the only photos then available of the pampas cat were of lower quality than those of the Andean cat. In our later surveys (2001 and 2002), we replaced both photographs with images that were more similar in quality and position of the cat, and local people tended to find these harder to differentiate.

Most of the people from the Altoandino recognise the existence of the 2 species, having 2 different local names for them; however, we were cautious about accepting unverified records of Andean cat in these localities until they were subsequently confirmed by other studies (Barbry & Gallardo 2006, Villalba et al. 2008).

In view of the similarities between the 2 cat species, unverified field observations by local people may be unreliable, so our results use only reliable, confirmed records of sightings and those where interviewees could provide proof, such as stuffed specimens or skins and evidence of their provenance.

At the time when we started this study very little was known of the Andean cat and pampas cat distribution in Bolivia. Under these circumstances, interviews were definitely useful in revealing diverse clues as to the species' biology and status.

Traditional beliefs and threats

In general, we found 2 broad categories of local attitudes to both cat species: (1) people who maintain the belief that these cats are sacred and who continue to perform, in some way, traditional ceremonies and (2) people who do not maintain such beliefs any more because of changes in religion and traditions between generations, and who pose a threat insofar as they would not hesitate to kill either species for the value of their skins or, indeed, for no apparent reason. Hunting, for whatever reason, is considered the third main threat to the Andean cat after habitat loss and degradation (Andean Cat Alliance 2011). It is important to direct appropriate educational campaigns towards both groups of people (Villalba et al. 2004, Lucherini & Merino 2006).

Both cat species are protected by a general and indefinite ban on wildlife hunting in Bolivia which has been in place since 1990 (Supreme Decree, D.S., 22641). However, law enforcement is difficult, particularly in remote areas. Thus, an educational programme is needed to increase awareness of the Andean cat situation, and to enhance the importance of its conservation in the minds of both the general public and the government. The species' association with the high Andes makes it a potentially important

emblematic image of regional pride, and the ecological role of the Andean cat and traditional reverence for the 'titi' should form the basis for a conservation education campaign to encourage the conservation of the species. In general, the goal of educational programmes should be to foster changes in peoples' attitudes, leading to improvements in the conservation of wildlife and the associated habitat.

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