Short Communication

Saharan cheetah *Acinonyx jubatus hecki*, a ghostly dweller on Niger's Termit massif

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Abstract The Saharan cheetah *Acinonyx jubatus hecki*, once broadly distributed across north-western Africa, now occurs in only 9% of its former range and is categorized as Critically Endangered on the IUCN Red List. The Saharan cheetah is rare and threatened but there is a lack of reliable data on its population status and distribution. We report sightings of cheetahs in the Termit & Tin Toumma National Nature and Cultural Reserve of Niger, recorded using three methods: camera-trap surveys, sign surveys and interviews with local people. We recorded three individuals in camera-traps, three direct sightings of lone individuals, 43 distinct cheetah tracks, and one cheetah scat, which suggest a resident population. Most respondents had negative attitudes towards carnivores, including the cheetah. Paradoxically, local nomads reported no conflict with the cheetah and perceived that the number of cheetahs was declining. Attitudes towards carnivores were correlated with respondents' age and level of education. Efforts to reduce killing of carnivores and their prey are needed but it is equally important for conservation initiatives to focus on increasing local knowledge about wildlife through education, particularly targeted at the younger generation. Our findings highlight the benefits of using various techniques for recording the presence of a rare carnivore.

Keywords *Acinonyx jubatus hecki*, attitudinal survey, camera-trapping, Critically Endangered, north-west African cheetah, sign survey

Once broadly distributed across north-western Africa (Nowell & Jackson, 1996), the Saharan or north-west African cheetah *Acinonyx jubatus hecki* is categorized as Critically Endangered on the IUCN Red List (Belbachir, 2008) and occurs in only 9% of its former range (Fig. 1; IUCN SSC, 2012), with an estimated population of < 250 mature individuals (Belbachir, 2008). The Saharan cheetah differs morphologically from the sub-Saharan cheetah, the former being somewhat smaller, with shorter and paler fur (Dragesco-Joffé, 1993; Hunter & Barrett, 2011). Compared to cheetahs elsewhere, the skull of the Saharan subspecies is smaller (Saleh et al., 2001) and the face has few or no spots, with the black tear stripes often faint or absent, and tail rings muted (Dragesco-Joffé, 1993). Overall levels of genetic differentiation together with mitochondrial DNA monophyly support the distinctiveness of the north–east African subspecies (Charruau et al., 2011).

The Saharan cheetah persists only in Algeria, Benin, Burkina Faso and Niger (Belbachir, 2008). It is known to be rare and threatened but there is a lack of reliable data on its population status and distribution (Caro, 2013). Surveys to confirm presence and numbers, based on camera trapping and scats, have been carried out only in Algeria (Busby et al., 2009; F. Belbachir, pers. comm.), and similar surveys elsewhere are a priority. However, it is difficult to gather baseline information on the Saharan cheetah because of its low density and elusive nature. Camera traps have been used successfully for detecting rare and cryptic species, including wild felids (e.g. Balme et al., 2009), but are used infrequently to study cheetahs because their large ranges make it difficult to find suitable sites to place cameras (e.g. southern Africa, Marnewick et al., 2008; Iran, Farhadinia et al., 2013; Algeria, F. Belbachir, pers. comm.). In northern Africa, cheetah densities are estimated to be 0.25–1.0 per 1,000 km² (IUCN SSC, 2012), making detection difficult.

The Saharan cheetah has been recorded in the Sahelo–Saharan areas of north and central Niger (Belbachir, 2008), including the Air mountains (Giazzi, 1996). A strategic planning exercise identified Niger as potentially significant for cheetah conservation (IUCN SSC, 2012). Here we present results from camera-trap surveys, sign surveys, and interviews with local people in a new reserve in south-eastern Niger.

The surveys were conducted in the Termit & Tin Toumma National Nature and Cultural Reserve (97,000 km²; Fig. 2), which was established in March 2012. The landscape is dominated by sand dunes, with sparse grasses and shrubs in the Tin Toumma area, and patches of grass, shrubs and scattered trees dominated by *Acacia raddiana* in the Termit massif (Wacher et al., 2004). Ground cover in the massif area, where most of the surveys were conducted, was

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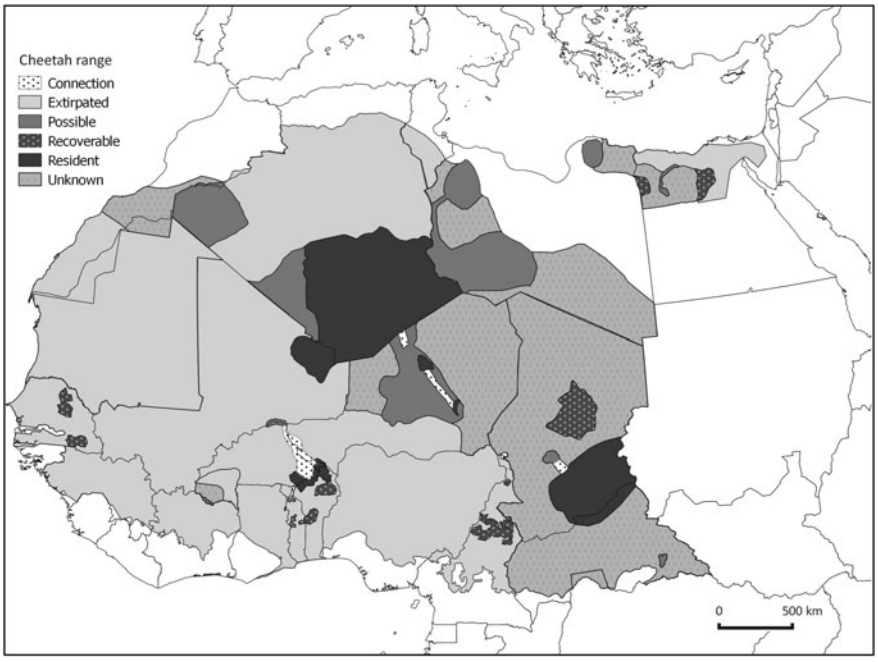

FIG. 1 Historical and current range of the Saharan cheetah *Acinonyx jubatus hecki* in north-western Africa (modified from IUCN SSC, 2012, and Belbachir, 2008).

unvegetated dune fields, peneplains and washes, sand sheet, or rock. The Reserve is inhabited by five ethnic groups: the Toubou Teda, Toubou Daza, Tuareg, Arab and Peul, all primarily nomadic pastoralist communities located near wells throughout the area, where they raise camels, sheep and goats. The region is home to > 20 mammal species (Claro & Newby, 2005) and is considered a stronghold for several threatened species, including the Critically Endangered addax *Addax nasomaculatus* (Rabeil et al., 2008).

The status of the cheetah in the Reserve was assessed using three methods: camera-trap surveys, sign surveys, and interviews with local people. We used 10 Reconyx cameras (PC800 and RC60; Reconyx Inc., Holmen, USA) mostly baited with sardines and/or commercial lures (S. Stanley Hawbaker & Sons, Fort Loudon, USA). Cameras were set at 111 locations in the Termit massif, distributed throughout each ground cover class, for c. 1 month each (mean number of nights deployed 29 ± SD 13.9). Each camera was placed opportunistically in one of 306 2 × 2 km grid cells, mounted 40 cm off the ground. Security concerns and associated logistical challenges made complete randomization of camera placement difficult, and therefore some cells in the grid were missed. Sign surveys, initially consisting of three transects bordering the northern block of the Termit massif and later covering the northern, centre and southern blocks, were conducted during 2006–2011. Off-road transects were surveyed in 4 × 4 vehicles travelling at 5–10 km h^{-1}, with the observer positioned at the front of the vehicle to maximize track detection. Data were recorded with *CyberTracker* (CyberTracker Conservation, Cape Town, South Africa). Presence data were plotted using *QGIS v. 1.8.0*.

Interview surveys, administered during May–July 2010, focused on households in 38 settlements in the Tasker area (south-west of the massif) and comprised two questionnaires, one examining levels of livestock losses and husbandry methods used by local people, and another exploring their attitudes and perceptions towards carnivores and human–wildlife conflict. We met with local leaders to gain access to these communities and carry out the interviews. Full details of the interview methodology are in Sillero-Zubiri et al. (2013).

The 306 cells surveyed covered c. 1,220 km^2. A trapping effort of 3,258 trap nights yielded two independent records of lone adult cheetahs, photographed at dawn (05.00–06.00) on 22 July and 19 August 2010. In a subsequent camera-trap survey by the Sahara Conservation Fund a third individual was recorded on 30 October 2011. The individual photo-captured on 19 August was identified as male (Plate 1); the sex of the other two could not be identified because of the poor quality of the images. It is possible that our decision to bait camera sites may have repelled cheetahs, which are averse to scavenging, thereby reducing the likelihood of detection (S. Durant, pers. comm.); this could partly explain why trap success was significantly lower in the Reserve than in Ahaggar in Algeria.

Although Krausman & Morales (2005) assigned the cheetah of this region to the subspecies *Acinonyx jubatus soemmerringii*, reported for South Niger (Rabeil, 2003; Claro et al., 2006; Caro, 2013), the photographed individuals displayed lighter tear stripes on the face, faint spots, a pale coloured coat and a skull morphology (Plate 1) resembling the Saharan cheetah. Similarly, Claro & Sissler (2003) reported a free-ranging female cheetah in this region showing the characteristic pale tear streaks and coat of the Saharan cheetah photographed by Dragesco-Joffé (1993). Our images are among the few photographs of the Saharan cheetah in

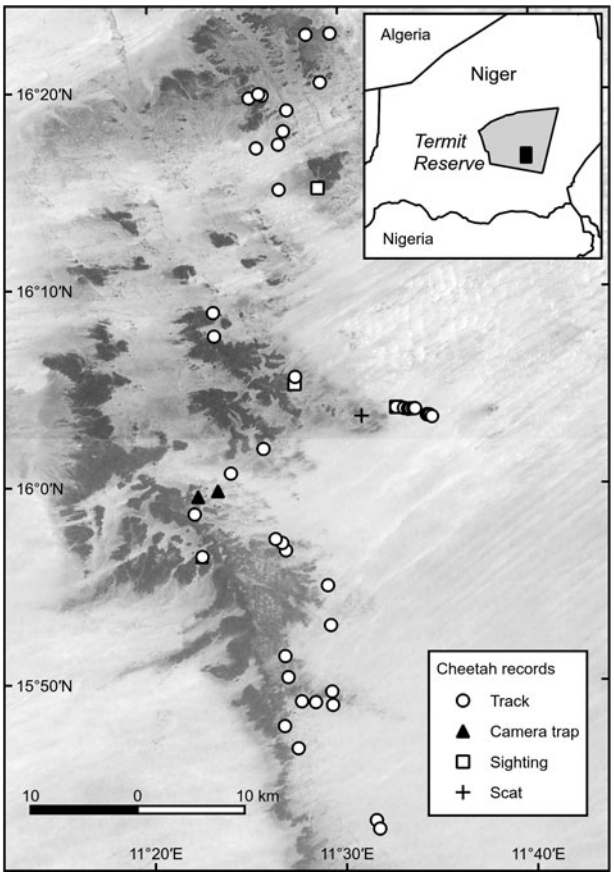

FIG. 2 Detections of the Saharan cheetah in the Termit massif during 2006–2011 based on camera-trap surveys, direct sightings, and records of scat and tracks. The shaded rectangle on the inset indicates the location of the main map within Termit & Tin Toumma National Nature Reserve in south-eastern Niger.

PLATE 1 Male Saharan cheetah recorded by a camera trap on 19 August 2010 in the Termit & Tin Toumma National Nature Reserve, Niger (Fig. 1).

Niger, or anywhere in the Sahara (photographs by Dragesco-Joffé, 1993, and Claro & Sissler, 2003, and camera-trap photographs from Algeria in 2009, F. Belbachir, pers. comm.). In addition to the cheetah, several potential prey species were recorded, including dorcas gazelle *Gazella dorcas*, bustard *Chlamydotis* sp., hare *Lepus capensis*, hedgehog *Paraechinus* sp., and camel *Camelus dromedarius* (Caro, 2013). Other potential prey occurring in the Reserve include scimitar-horned oryx *Oryx dammah*, dama gazelle *Gazella dama*, and small livestock.

In addition to the photographed cheetahs we recorded three direct sightings of lone cheetahs of unknown sex, on 11 September 2007 (11.04), 31 August 2009 (09.35) and 15 September 2010 (09.31). Sign surveys recorded 43 distinct cheetah tracks and one cheetah scat.

The low number of cheetah sightings and sign recorded in the Reserve during the study period reflects the difficulties of detecting these rare animals. However, the findings also highlight the benefits of combining multiple techniques for detecting rare carnivores. Based on our observations and previous records in the area (Claro & Sissler, 2003; Wacher et al., 2004), the individuals recorded probably belong to a resident population.

The cheetah population in Termit, estimated to comprise < 10–40 individuals (Belbachir, 2008; Walker, 2010), is unlikely to be viable (IUCN SSC, 2012). Nonetheless, Niger was identified as being potentially significant for cheetah conservation because it contains a sizeable area of the cheetah's possible range, and supports connectivity among areas with resident or possible populations (IUCN SSC, 2012). Furthermore, there are only five extant populations of *A. jubatus hecki* at most, and therefore information on the Termit population is critically important for the conservation of the species (S. Durant, pers. comm.; IUCN SSC, 2012).

Sixty percent of the local people interviewed (n = 107) stated that they perceived a decline of cheetahs in the region, which is unsurprising given that illegal hunting of wildlife occurs in Termit (Rabeil et al., 2008), and 36% of respondents proposed retaliatory killing of carnivores as a mitigation measure to reduce loss of livestock. Paradoxically, livestock predation by cheetahs was not reported by any respondents. Most respondents had negative attitudes towards carnivores, with 12% claiming that the negative perception of cheetahs was associated with their attacks on people, although we could not find any evidence of such attacks having taken place, nor have they been recorded elsewhere (Hunter & Barrett, 2011). Respondents had a more positive perception of the cheetah than of other carnivores (e.g. golden jackal *Canis aureus*). The relative tolerance towards the cheetah may indicate some level of cultural importance for the species, which could provide a foundation for an educational campaign. Education and age were correlated with opinions about carnivores. Targeting education about wildlife at the younger generation (which had the most negative attitudes) could change attitudes

and possibly increase levels of tolerance towards Saharan carnivores. Educational efforts must be accompanied by effective anti-poaching strategies that reduce hunting pressure on carnivores and their prey. The future of the vulnerable biodiversity of the Reserve will depend on the management actions taken, and our findings could help conservation stakeholders to refine current conservation strategies. The Reserve could play a major role in cheetah conservation in the region if restored and protected sufficiently. Failing to protect the remaining Saharan cheetah in the Reserve will result in the further decline, and possible extinction, of this Critically Endangered carnivore, an important and charismatic member of Niger's fauna. However, since this study was completed the study site has been largely off limits because of the lack of security in the region.

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Biographical sketches

Claudio Sillero-Zubiri works on carnivore conservation and human–wildlife conflict and is the Chair of the IUCN SSC Canid Specialist Group. Susana Rostro-García is a conservation biologist with an interest in wild felid conservation. Dylan Burruss studied small carnivores in Termit for his MSc. Alkabouss Matchano, Abdoulaye Harouna and Thomas Rabeil were closely involved in the establishment of the Termit & Tin Toumma Reserve, and study the wildlife there.