ISSN 1027-2992

Special Issue

N° 15 | Summer 2022

CAT news

The Persian Leopard

SPECIES SURVIVAL COMMISSION

CAT SPECIALIST GROUP

CATnews is the newsletter of the Cat Specialist Group, a component of the Species Survival Commission SSC of the International Union for Conservation of Nature (IUCN). It is published twice a year, and is available to members and the Friends of the Cat Group.

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Original contributions and short notes about wild cats are welcome
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This **Special Issue of CATnews** has been produced with support from the Foundation Segré.

Design: barbara surber, werk'sdesign gmbh
Layout: Eline Brouwer and Tabea Lanz
Print: Stämpfli AG, Bern, Switzerland

ISSN 1027-2992

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Cover Photo: Persian Leopard in Kazakhstan © USNR/CADI/ACBK, camera trap picture taken 1 January 2020, photo was provided by Tatjana Rosen

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Biology, ecology and taxonomy of the Persian leopard

Among large felids, the Anatolian/Persian leopard *Panthera pardus tulliana* is the only extant felid that still occurs in Anatolia, Caucasus, Middle East and Central Asia. The Caspian tiger *P. tigris vigrata*, and the Asiatic lion *P. leo persica* have already gone extinct and the Asiatic cheetah *Acinonyx jubatus venaticus* is Critically Endangered. Persian leopard populations are significantly reduced in size however they continue to survive in fragmented populations.

Description, characteristics and morphology

Head and body length: 126–171 cm. Tail length: 94–106 cm. Shoulder height: 50–80 cm. Weight: 40–91 kg (male), 26–60 kg (female). Skull Length: 20.6 cm (male), 18.7 cm (female). Skull width: 15.6 cm (male), 12.8 cm (female). Dental formula: 30. Chromosome Number: 38.

The Persian leopard (Figs 1 & 2) is considered to be the largest of all the subspecies of leopards. It is a large spotted cat, with slender hindquarters and a long thick tail. The coat varies from light grey to pale yellow (Figs. 2 and 3). Hair cover of a single individual can vary across the seasons (Figs. 1 & 2). Spots and rosettes are few, black, with a brownish colouration. The ears are round. Females are smaller than adult males but can be often confused with sub-adult males. At birth, cubs are light brown, speckled with tiny dark brown and black spots (Castello et al. 2020).

Behaviour and reproduction

Persian leopards are more active during the night, but during cold season, they may be also active during the day (Fig. 1 and 2). They are very territorial and both male and female patrol their home ranges and scent-mark trees, shrubs, and rocks with urine mixed with anal gland secretions. Persian leopards use a variety of marking behaviours to communicate with each other, set territorial boundaries, and find mates. Urine spraying, scraping, claw marking and faeces are used as means of inter-individual communication (Ghoddousi et al. 2008).

In contrast to some other leopard populations (Balme et al. 2013), data suggest that Persian leopards might be seasonal breeders with a mating peak between January and March (Farhadinia et al. 2009). Both male and female leopards are solitary animals, however, during this period both sexes call (sawing) to attract mates and come together, which can last between 2–7 days. The gestation is typically 90–106 days and leopards are known to have 1–4 cubs, which are typically weaned after 70 to 100 days. Leopards reach sexual maturity at 24–28 months and are known to live 12 years in the wild. Young siblings, who leave their mother after two years, may often travel together for some time (Castello et al. 2020, Hunter 2020).

Fig. 1. A Persian leopard captured on camera (Photo Team Bars Turkmenistan).

Diet and prey preferences

Depending on the region, Persian leopards' diet may include urial sheep *Ovis vignei*, mouflon *O. gmelinii*, bezoar goat *Capra aegagrus*, East *C. cylindricornis* and West Caucasian tur *C. caucasiaca*, chamois *Rupicapra rupicapra*, wild boar *Sus scrofa*, red deer *Cervus elaphus*, fallow deer *D. dama*, roe deer *Capreolus capreolus*, goitered gazelle *Gazella subgutturosa* and porcupine *Hystrix indica*; they also feed on chukar *Alectoris chukar* and snowcock partridges *Tetraogallus* spp., hare *Lepus* spp. and pika *Ochotona rufescens* (Taghdisi et al. 2013, Farhadinia et al. 2014, Sharbafi et al. 2015, Ghoddousi et al. 2016, Farhadinia et al. 2018a). Opportunistically they will also prey on domestic livestock and dogs. Where available, caprid species are the most preferred prey due to their suitable size (Taghdisi et al. 2013, Farhadinia et al. 2014, Sharbafi et al. 2015, Ghoddousi et al. 2016, Farhadinia et al. 2018a) and leopard distribution is also influenced by the favourite prey species (Ebrahimi et al. 2020).

Taxonomy and population genetics

According to studies, the Western Asian population, from Afghanistan through Iran to Iraq and the Caucasus is distinctive phylogenetically (Miththapala et al. 1996, Uphyrkina et al. 2001), as supported by subsequent craniometric analysis (Meijaard 2004). One of the conclusions was that no significant geographical barriers are present leading to morphogenetic isolation of the subspecies in this region (Uphyrkina et al. 2001), with the exception of the population of the Arabian Peninsula (Uphyrkina et al. 2001, Khorozyan et al. 2006, Farhadinia et al. 2015, Farhadinia et al. 2020). Subsequent genetic studies have shown that there are three closely related haplotypes in Iran: one commonly found throughout Iran, south Caucasus and Turkmenistan and two localised haplotypes from southern Zagros and eastern Alborz, suggesting that the Persian leopard population in Iran as well as in neighbouring countries should be considered a single evolutionarily significant unit and thus can be protected as a large management unit through large-scale conservation planning (Farhadinia 2015). There is currently a genetic study in progress relying on microsatellite markers aimed at comparing population genetic diversity indices of leopards from Iran, Turkmenistan, Kazakhstan, Iraq and the Caucasus (T. Rosen, pers. comm.).

Distribution and habitat

The Persian leopard is found in Iran, Armenia, Azerbaijan, Georgia, Turkey, Iraq, Russia, Afghanistan, Pakistan, Turkmenistan, Kazakhstan (until 2021), and historically in Tajikistan. The presence in Uzbekistan has been anecdotally reported. The largest population is in Iran followed by Turkmenistan. In addi-tion to records from the south east and Lesser Caucasus region, there are recent leopard records from Taurus Mountains in southern Turkey (Karataş et al. 2021, D. Mengüllüoğlu pers. comm.).

The leopard inhabits a wide variety of habitats and ecosystems: from mountain areas up to 3,000 m in elevation, to grasslands and cold desert ecosystems, with a preference for cliff and rocky areas as well as juniper and pistachio woodlands that provide cover during hunting (Fig. 3). Occupied habitats are mainly prey driven. Persian leopards tend to avoid areas with deep and long snow cover, though (Castello et al. 2020).

Spatial requirements

Persian leopards have spatial requirements generally influenced by density and the availability of prey (Farhadinia et al. 2018a). A study conducted in three protected leopard habitats in north-eastern Iran revealed high popula-tion densities varying between 3.1 ± 1.8 and 8.9 ± 3.6 individuals/100 km² (Farhadinia et al. 2019). Another study from North-eastern Iran reported a leopard population density of 2.6 individuals/100 km² (Hamidi et al. 2014). Persian leopard density in Bamou National Park in southern Iran was lower than these, and 1.9 individuals/100 km² (Ghoddousi et al. 2010). However, leopard population densities in the Caucasus and adjacent countries to Iran assumed to be much lower (i.e. Armenia: 0.5 individuals/100 km²; Khorozyan et al. 2008). The highest leopard density in the Caucasus region occurs in Nakhchivan, southern Caucasus where continuous breeding has been registered since 2014 (Askerov et al. 2020).

The study conducted in Tandoureh, Iran showed remarkable individual variation in leopard home range sizes, but also that leopards there occupied the largest mean home ranges (103.4 ± SE 51.8 km²) recorded to date for Asian landscapes with the exception of an adult male tracked in an arid montane habitat in central Iran (670 km²). The home ranges of predators correlated with body mass and habitat productivity: the large body masses of Persian leopards and the low primary productivity of the landscapes appeared to be the key determinants of their larger home range sizes (Farhadinia et al. 2018b).

Fig. 2. A Persian leopard caught on camera in Armenia on 18 February 2022 (Photo WWF Armenia).

Fig. 3. A Persian leopard captured on camera (Photo Team Bars Turkmenistan).

Age, gender and reproductive status also impact ranging behaviour, with typically sub-adult males dispersing the furthest. Anthropogenic threats also influence ranging behaviour and spatial patterns for leopards (e.g. see Marker & Dickman 2005) although few data are available for Persian leopards.

Conflicts, threats and diseases

The key threats Persian leopards face are human-driven. Habitat fragmentation, loss of prey base and conflict with livestock have caused steep declines throughout the range. Leopards are killed in retaliation for harming livestock. They are also trapped and persecuted because of fear or the intention to illegally trade their skins and paws (Khorozyan 2008). Linear infrastructure, especially border fences, severely hamper the movement of leopards as well, as does armed conflict. The presence of landmines along some of the borders in the region, might deter some poachers but kill or maim leopards (Avgan et al. 2016).

Diseases in Persian leopards are poorly studied. In 2018, a young and sick female Persian leopard was captured, treated and subsequently released, but the causes of the illness were never ascertained (M. Farhadinia, pers. comm.) and the cat tested negative for canine distemper, despite an outbreak in herders' dogs nearby. Two Persian leopards killed by vehicles in Golestan National Park tested positive for *Toxoplasma gondii* although whether Toxoplasmosis affects leopards is unknown. Drawing from research on snow leopards (Ostrowski & Gilbert 2016), it is known that tuberculosis, parvovirus, sarcoptic mange, canine distemper and most recently coronavirus have been identified as the culprit in several illnesses and deaths of captive snow leopards. Plague, anthrax and rabies are other diseases known to occur in Persian leopard range (i.e. large population of feral dogs exist in Iran, Nayeri et al. 2021) that could potentially be fatal for the cats.

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