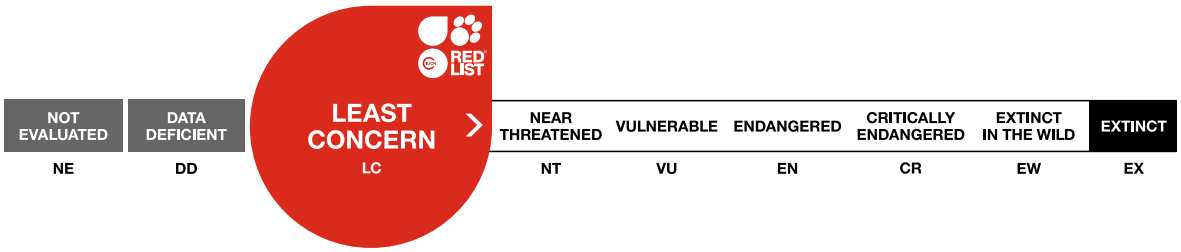
The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T15640A180145377
Scope(s): Global
Language: English

Otocolobus manul, Pallas's Cat

Errata version

Assessment by: Ross, S., Barashkova, A., Dhendup, T., Munkhtsog, B., Smelansky, I., Barclay, D. & Moqanaki, E.



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Citation: Ross, S., Barashkova, A., Dhendup, T., Munkhtsog, B., Smelansky, I., Barclay, D. & Moqanaki, E. 2020. *Otocolobus manul* (errata version published in 2020). *The IUCN Red List of Threatened Species* 2020: e.T15640A180145377. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T15640A180145377.en

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Felidae

Scientific Name: *Otocolobus manul* (Pallas, 1776)

Synonym(s):

- *Felis manul* Pallas, 1776

Common Name(s):

- English: Pallas's Cat, Manul
- French: Chat manul
- Spanish; Castilian: Gato de Pallas, Gato manul
- Kazakh: Sabanshy
- Mongolian: Manul
- Persian: Gorbe-ye-Palas
- Russian: Манул [manul]
- Tibetan: Dromba

Taxonomic Notes:

The Pallas's Cat has retained the monotypic genus *Otocolobus* and has been placed within the Leopard Cat lineage (Johnson *et al.* 2006). O'Brien and Johnson (2007) estimated that *Otocolobus manul* diverged from a Leopard Cat ancestor approximately 5.9 million years ago. There have been no recent molecular or morphological studies on the species, and two subspecies (*O. m. manul* [Pallas, 1776] in the Southwest and Central Asia and *O. m. nigripectus* [Hodgson, 1842] in the Himalayas) have been tentatively suggested, largely based on variation in pelage colouration (Kitchener *et al.* 2017).

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: November 6, 2019

Justification:

Pallas's Cat has a wide but fragmented distribution across the grasslands and montane steppes of Central Asia. Pallas's Cats are generally found at low densities, though in small rich patches in Russia they have been found at much higher density (Kirilyuk and Barashkova 2011). Their low density is believed to be a result of interspecific predation and the resulting habitat specialisation leading to a

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small percentage of the landscape being suitable for their needs. Due to their general low density and patchy distribution, relatively large areas are required to conserve viable populations (Ross et al. 2019a). Pallas's Cats are also highly dependent on cavities to provide dens for daily use and rearing young, which further restricts habitat availability (Ross *et al.* 2010a).

Predation by sympatric carnivores, herding dogs, and human offtake are the main known causes of mortality, but habitat disturbance and fragmentation is believed to be their main threat (Ross *et al.* 2019b). Mineral exploitation and infrastructure developments have increased throughout the species range. Pallas's Cat also continues to be at risk from a declining prey base due to pika (*Ochotona* spp.) and rodent control programmes leading to prey depletion and secondary poisoning (Ross *et al.* 2019b).

Due to the difficulty of observing the species, data generally consist of individual records, and there are no current monitoring programmes that would allow empirical estimates of population size or population trend. However, recent reviews have highlighted that the global population size is unlikely to be low enough to qualify as Near Threatened (Barashkova *et al.* 2019). In addition, we used the methods of Santini *et al.* (2019) to quantify habitat loss and disturbance across Pallas's Cats range between 1994 and 2015 (or three generations). The analyses indicated that between these years the change in suitable habitat and level of habitat fragmentation was low, suggesting suitable habitat is likely to be disappearing at a lower rate than previously assumed, and indicating the population may be more stable than thought. Though caution is needed as information on the Pallas's Cat is incomplete, and threats may be acting at a different scale than our analyses. We also have no information describing the species population dynamics and how the population may track prey availability. Nevertheless, based on distributional data, the Pallas's Cat population as a whole appears more stable than previously thought leading to its inclusion in the Least Concern category.

Previously Published Red List Assessments

2016 – Near Threatened (NT)
https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T15640A87840229.en

2015 – Near Threatened (NT)
https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T15640A50657610.en

2008 – Near Threatened (NT)

2002 – Near Threatened (NT)

1996 – Lower Risk/least concern (LR/LC)

1994 – Insufficiently Known (K)

Geographic Range

Range Description:

The Pallas's Cat primarily occurs within regions of montane grassland and shrubland steppe of Central Asia, but is found as far west as Western Iran and previously extended into Armenia and Azerbaijan (Ross *et al.* 2016). The core populations of Pallas's Cat are believed to occur in Mongolia and China (Smith *et al.* 2008, Jutzeler et al. 2010). In Russia, the Pallas's Cat occurs along the border with Mongolia and China mainly in the Altai, Tyva, and Buryatia Republics (Altai and Sayan Mountains), and Trans-Baikal Territory (Koshkarev 1998, Barashkova *et al.* 2007). They are found in mountain steppe and semi desert foothills in Central and eastern Kazakhstan (Barashkova *et al.* 2019), and some areas of Kyrgyzstan (Snow Leopard Trust 2014, Barashkova *et al.* 2019). In Uzbekistan and Tajikistan the species was recorded before the 1960s but not more recently (Barashkova *et al.* 2019).

Outside Iran, records of Pallas's Cat in the southwest of its range (also vaguely known as the Caspian Sea range; Southern Caucuses, Turkmenistan, Afghanistan, and Pakistan) are rare and thus the conservation status of the species there is unknown (Habibi 2004, Hameed *et al.* 2014, Farhadinia *et al.* 2016, Moqanaki *et al.* 2019). Iran appears to have the widest geographic distribution of the Pallas's Cat in this region, where most of the recent occurrence records are associated with the two main mountain chains of Alborz and Zagros in the north and west, respectively (Karami *et al.* 2016, Moqanaki *et al.* 2019, Yusefi *et al.* 2019). In Afghanistan, multiple occurrences have been recently collected from Bamyan Province during camera trap surveys for the Persian leopard (*Panthera pardus*; WCS 2017). Recent occurrence records from Pakistan are restricted to Gilgit-Baltistan, and there is evidence they inhabit the border area with Afghanistan (Hameed *et al.* 2014, Hussain 2018). The latest Pallas's Cat records from Turkmenistan are from Dushak Erekdag in the Kopet Dag, the Turkmen-Khorasan Mountain Range in the borderland with north-eastern Iran (A. Potaeva and T. Rosen, pers. comm. 2019). The species presence in Pakistan's Baluchistan Province, as well as Armenia and Azerbaijan in the Caucasus, is uncertain (Moqanaki *et al*. 2019).

Recent records from Bhutan, Nepal, and India also suggest Pallas's Cat presence in the Eastern Himalayan region but at a low density (WWF 2012, Thinley 2013, Shrestha *et al.* 2014, Mahar *et al*. 2017, Dhendup *et al*. 2019, Pal *et al*. 2019). The highest elevation record for Pallas's Cat, of 5,593 m, was found in the Himalayan region in Nepal (Werhahn *et al*. 2018).

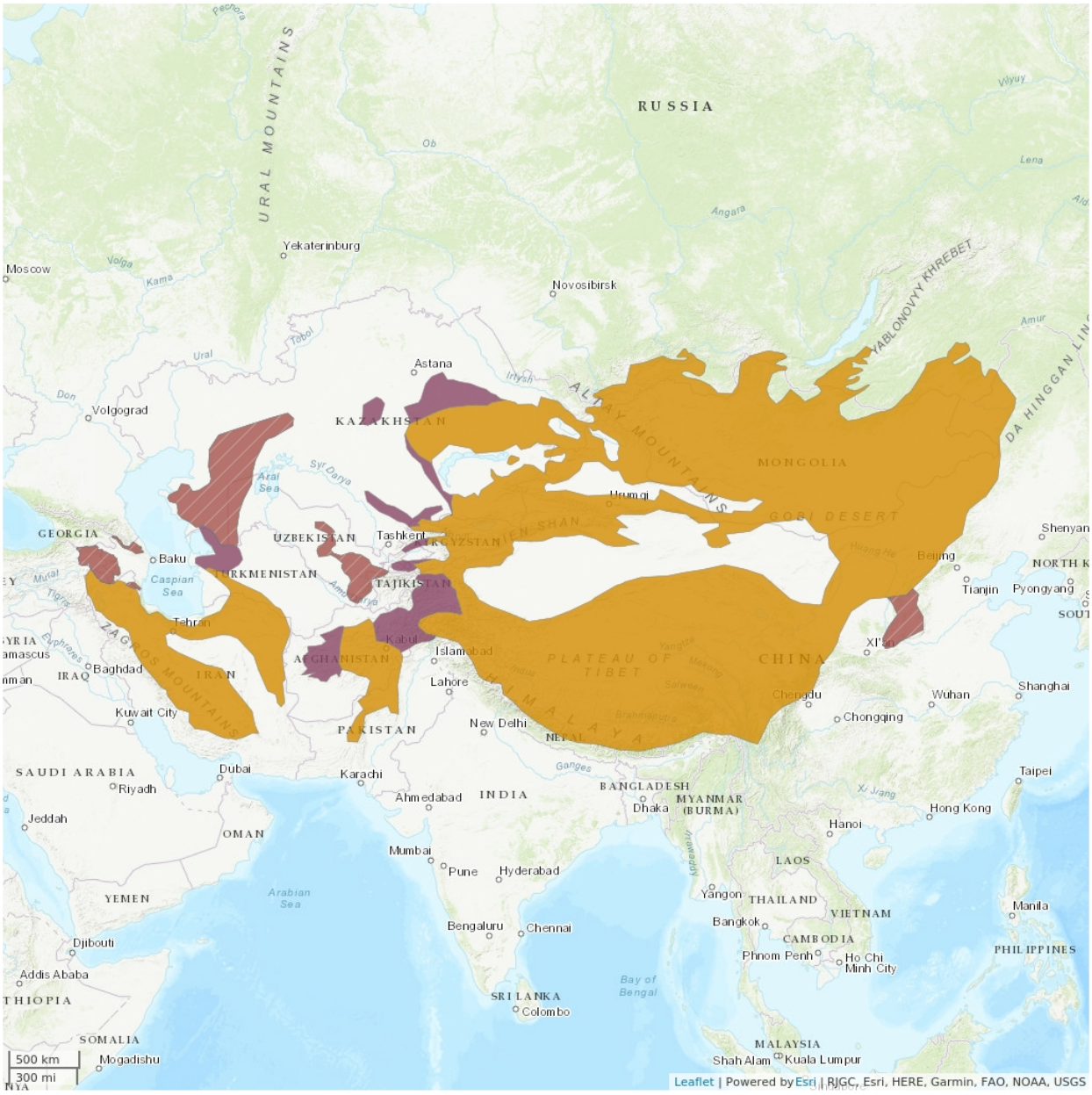
Country Occurrence:

Native, Extant (resident): Afghanistan; Bhutan; China; India; Iran, Islamic Republic of; Kazakhstan; Kyrgyzstan; Mongolia; Nepal; Pakistan; Russian Federation; Turkmenistan

Native, Possibly Extant (resident): Tajikistan; Uzbekistan

Native, Possibly Extinct: Armenia; Azerbaijan

Distribution Map



Legend

- EXTANT (RESIDENT)
- POSSIBLY EXTANT (RESIDENT)
- POSSIBLY EXTINCT

Compiled by:

IUCN (International Union for Conservation of Nature) 2020

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T15640A180145377.en

Population

As Pallas's Cat has a wide yet fragmented distribution across the grasslands and montane steppes of Central and Western Asia, we assume the global population is fragmented into many sub-populations. Due to the difficulty of reliably and repeatedly detecting Pallas's Cat by any survey protocol, the differentiation of sub-populations and the estimate of population size remains extremely difficult. Nevertheless, several estimates of population density have been made, using several methods. In central Mongolia, an estimate of 4–8 cats/100 km² was made based upon radio telemetry of 28 cats, weekly spotlight surveys, and observations while radiotracking over a period of 2 years, giving confidence that most individuals were observed (Ross 2009). Several population estimates have been made in Russia, based on snow tracking and correction formulas. Snow tracking studies in Russia have suggested that the Pallas's Cat can periodically occur at very high densities up to 100 cats/100 km² in areas of Dauria (Kirilyuk and Barashkova 2011, Barashkova *et al.* 2017). Confirming the high densities, Naidenko *et al.* (2014) captured a total of 16 Pallas's Cats in an area of 16 km², equating to an apparent density of 100 cats/100 km² in Dauria. Though the high density is very likely to be a localised phenomenon, possibly related to prey eruptions. However, given the lack of repeated occurrences of the Pallas's Cat in many areas across its range, it seems low density (4 cats/100 km²) is a more applicable average density for the species. In a recent review of Pallas's Cat in Russia and Central Asia, Barashkova *et al.* (2019) estimated the potential population size in this region as approximately 49,000–98,000. Though they added the estimate is highly speculative. The estimate also assumed the entire predicted suitable habitat is currently occupied. Based on our understanding of the AOO (based on predictive models of Pallas's Cat occupancy), we estimate the global population of mature Pallas's Cats at approximately 58,000. This is based on the assumption that within the AOO Pallas's Cat has an average density of 4 cats/100 km², and that 20% of the population are immature non-breeders. Despite the speculative nature of these estimates, they indicate that the population size of Pallas's Cat almost certainly exceeds the limits specified under the Near Threatened classification.

Current Population Trend: Decreasing

Habitat and Ecology **(see Appendix for additional information)**

Pallas's Cat is distributed in landscapes with extreme continental climates - little rainfall, low humidity, and a wide range of temperatures. They are rarely found in areas where there is persistent snow cover of depths over 10 cm, and a continuous snow cover of 15–20 cm is thought to mark the ecological limit for this species (Heptner and Sludskii 1972, Kirilyuk and Puzanski 2000, Sunquist and Sunquist 2002). They are generally associated with montane grassland steppe and shrub steppe, but are habitat specialists, selecting habitats providing hiding cover such as ravines, rocky areas, and disruptive vegetation cover that allow them to move through the landscape without being detected by predators (Ross 2009, Ross *et al.* 2012). Their optimal habitat consists of a mix of grassland and shrub steppe with rocky cover, ravines, and hill-slopes. They are rarely found in lowland basins or flat featureless plains, although may access these areas through ravines or other disruptive cover, to access prey or in transit to better habitat (Ross 2009, Barashkova *et al.* 2019, Ross *et al.* 2019b).

A recent review discussed the general habitat features of Pallas's Cats' in Central Asia (Barashkova *et al.* 2019), Western Asia (Moqanaki *et al.* 2019), and the Himalaya and China (Dhendup *et al.* 2019). Central Asian habitats were characterised by hills, rocky outcrops, scree slopes, ravines, and rock cover, with petrophytic dry steppe or semi-desert vegetation (Heptner and Sludskii 1972; Sludskii 1982; Kirilyuk and

Puzansky 2000; Ross *et al.* 2010a, b, 2012; Istomov *et al.* 2016; Barashkova *et al.* 2019).

In Western Asia, a single record in the Iranian Caucasus suggests Pallas's Cat uses open, hilly steppes and shrubland, with rocky outcrops and scattered trees (Aghili *et al.* 2008). In Iran, the Pallas's Cat occurs across a wide continuum of habitats, from arid grassland steppes and dry mountains to temperate open shrublands. In Afghanistan, habitat consists of arid plateaus with flat and rolling mountains interspersed by rocky and deep valleys. In Pakistan, the species prefers alpine and subalpine scrub, dominated by rugged and broken terrain with high cliffs, ridges and ravines. In Turkmenistan, the species is predominantly associated with mountains and foothills (Heptner and Sludskii 1972, Rustamov and Hojamyradov 1994, Chalani *et al.* 2008, Joolaee *et al.* 2014, Farhadinia et al. 2016, Talebi Otaghvar *et al.* 2017, Adibi *et al.* 2018, Moqanaki *et al.* 2019). In Turkmenistan, the species is historically considered rare (Shukurov 1962) and predominantly associated with mountains and foothills of the Kopet Dag and the Big Balkan range (A. Potaeva and T. Rosen, pers. comm. 2019, Shukurov 1962). Pallas's Cat has also been found in juniper woodland (*Juniperus* spp.) in Pakistan and Iran (Hameed *et al.* 2014, Dibadj *et al.* 2018). In Western Asia, the median elevation of Pallas's Cat records is 2,372 m (range: 894–3,665 m), which corresponds to a mid-mountain elevation (Moqanaki *et al.* 2019).

There are fewer records or accounts of Pallas's Cat habitat in the Himalaya and China region, meaning we are unable to assess the importance of different habitat types. However, habitats of the region are generally of higher elevation with some of the highest elevation records found for the species (Fox and Dorji 2007, Chanchani 2008, Werhahn *et al.* 2018, Dhendup *et al.* 2019, Pal *et al.* 2019). In Bhutan, with its warmer south-facing Himalayan slopes, Pallas's Cat is found in rolling hills dominated by glacial out-wash and alpine steppe vegetation (WWF 2012, Thinley 2013). Pallas's Cat occurs in Nepal in upper Manang valley within broken and rocky habitats, rolling hill slopes with few cliffs, and in Dolpo in rocky hill slopes within montane grassland steppe (Shrestha *et al.* 2014, Lama *et al.* 2016, Regmi *et al.* 2016). In India, the majority of records are from the Trans-Himalayan landscapes of Ladakh and Sikkim (Prater and Barruel 1971, Mallon 1991, Mahar *et al.* 2017, Pal *et al.* 2019). In the Tibetan region Pallas's Cat has been reported in desert steppe habitat at 5,050 m dominated by *Stipa* spp. (Fox and Dorji 2007) and in mountainous alpine meadows in Qinghai (Li *et al.* 2013) and Mountain steppe in Sichuan (Webb *et al.* 2014, 2016).

The observed large-scale habitat associations of Pallas's Cat, which all contain some form of disruptive or hiding cover, can be explained by Pallas's Cat being under constant risk of predation by sympatric aerial and terrestrial carnivores (Ross 2009). We have evidence of predation by numerous large raptors, and carnivores such as the grey wolf (*Canis lupus*), herding dogs, and red foxes (Vulpes vulpes), they are also hunted by humans (Ross 2009, Barashkova and Smelansky 2011; Ross *et al.* 2012, 2019b), other large carnivores, such as snow leopard, may also opportunistically predate Pallas's Cat where they co-exist. The Pallas's Cat is not a fast runner and when threatened by other predators its best line of defence is hiding out of sight, relying on their excellent camouflage and taking cover in burrows (of marmots or sympatric carnivores) or in rock crevices. In general, open areas without suitable cover are avoided and habitats with disruptive cover such as ravines, rocky areas, shrub-steppe, and hill-slopes are highly selected (Ross 2009, Ross *et al.* 2010a). As a result, Pallas's Cat uses only a small fraction of habitats available within the steppe ecosystem. Their habitat selection and specialisation is the most likely explanation for their low densities (Ross *et al.* 2016, 2019a), and should be accounted for in expert knowledge-based estimates of their potential population size.

Pallas's Cat also has a dependency on refuges or dens. Dens are used on a daily basis to provide important cover from predators, for feeding, mating, giving birth, raising young, and for thermoregulation during the extremely cold winters (Ross *et al*. 2010a). Den availability is thought to be critical for survival, and a critical habitat requirement for their conservation (Ross 2009, Ross *et al.* 2010a). Dens mostly consist of marmot burrows and rock crevices (Ross *et al.* 2010a), in Southern Siberia and Kazakhstan the den sites of sympatric carnivores are more commonly used (Ross *et al*. 2019b), and in Iran Pallas's Cat has been observed using aged Juniperus excelsa tree cavities as breeding dens (Dibadj *et al.* 2018). Despite the range of habitats used by the species, the presence of suitable cavities appears to be a standard niche requirement (Ross *et al.* 2019a).

The annual home ranges of Pallas's Cat are unusually large for a small felid. Researchers in Mongolia

have measured mean annual home ranges as follows (Ross *et al.* 2012):

Female = 95% kernels 23.1 +/- 8.9 km²; 100% MCP = 64.1+/-18.6 km²; n = 13

Male = 95% kernels 98.8 +/- 17.2 km², 100% MCP = 159.0 +/- 59.3 km²; n = 9

Radio-tracking studies of Pallas's Cat in the Daursky State Nature Reserve (Zabaikalsky Krai, Russia)

calculated the following ranges (Barashkova and Kirilyuk 2011):

Female = 95% kernels 6.0 +/- 3.4 km²; 100% MCP = 10.0 +/- 6.5 km²; n = 4

Male = 95% kernels 22.9 +/- 12.9 km²; 100% MCPs = 16.5 +/- 9.4 km²; n = 3

Pallas's Cat diet is mainly composed of small lagomorphs and rodents, it is known to be a pika (Ochotona spp.) specialist (Ross et al. 2010b). Pikas are the most important prey across its range, typically comprising over 50% of the diet and highly selected over other prey species (Heptner and Sludskii 1972, Ross et al. 2010b). As pikas are 2–4 times larger than other common small mammal prey, Pallas's Cat preference for them optimises hunting efficiency and energy intake. They also consume gerbils, jirds, voles, hamsters and ground squirrels; less frequently consumed prey includes small birds, young marmots, hares, hedgehogs, reptiles, and invertebrates (Kirilyuk 1999, Ross *et al.* 2010b, Adibi *et al.* 2018, Werhahn *et al.* 2018, Barashkova *et al.* 2019, Moqanaki *et al.* 2019). Pallas's Cats has also been recorded eating berries (Kirilyuk 1999) and scavenging from carcasses (Ross *et al.* 2010b, 2019b).

In an assessment of Pallas's Cat habitat loss and fragmentation at a global scale, E.M. Moqanaki, (unpublished analyses) used the methods of Santini *et al.* (2019) to quantify habitat loss and disturbance across Pallas's Cats range (AOO) between 1994 and 2015 (or three generations). The analyses indicated that between these years the change in extent of suitable habitat within EOO (represented by ESA (2015)'s CCI land cover categories 120, 121, 122, 130, 140, 150, 200, 201, 202) and level of habitat fragmentation was very low (below 5%). As previous assessments have used estimates of habitat loss as justification to infer a declining Pallas's Cat population, the analyses suggests the population is likely to be more stable than previously thought. A more detailed analyses, of habitat loss

across the species range, that includes more variables and simulation, is recommended to provide a better indicator of Pallas's Cat and other steppe species likely status.

Systems: Terrestrial

Use and Trade

The extent of illegal hunting and illegal trade of Pallas's Cats or their body parts is unknown (Barclay *et al.* 2019, Ross *et al.* 2019a). It has been reported that international trade in Pallas's Cat pelts ceased since the late 1980s, and Mongolia is the only range country where hunting of Pallas's Cat is permitted today, although they can be hunted in China if a special license is obtained (Lu *et al.* 2010, Ross *et al.* 2016, Barclay *et al.* 2019). The permitting system in Mongolia is said to be ineffective and Pallas's Cat furs were exported illegally to China (Murdoch *et al.* 2006). It has been estimated that there were about 1,000 legal Pallas's Cat hunters in Mongolia with a mean harvest rate of 2 Pallas's Cats per hunter per year (Wingard and Zahler 2006). It is difficult to estimate levels of illegal hunting, though it is likely much higher than the legal level of hunting and is known to happen across all range countries. Evidence of illegal trade in Pallas's Cat is reported from Afghanistan and Pakistan (e.g. Kretser *et al.* 2012), but it seems to be only occasional and opportunistic, though this may reflect the rarity of Pallas's Cat. Marmots are commonly hunted in most of the Pallas's Cats range and Pallas's Cats are often mistaken for marmots and shot (Ross *et al.* 2019b). They are also trapped incidentally in leg-hold traps and snares set for other animals (Ross 2009). The fat and organs of Pallas's Cats are used as medicine in Mongolia and Russia (Ross *et al.* 2016, Barashkova *et al.* 2019). A report from Kyrgyzstan suggests that Pallas's Cat is often harvested in winter by tracking them back to their den and capturing them using snares (T. Rosen pers. comm. 2020). Undoubtably more information on illegal offtake of Pallas's Cat is needed, as hunting could be a more significant threat than we currently assume, certainly at a local level but possibly also range wide.

Threats (see Appendix for additional information)

Pallas's Cat has several known and tested biological causes of vulnerability, including feeding and habitat specialisation, large home range sizes, making them difficult to protect within reserves, and a dependency on shelters made by other threatened species, such as Siberian marmots Marmota sibirica (Ross 2009, 2010 a,b, 2012). In most regions, the specialist requirements of the Pallas's Cat result in its distribution being naturally fragmented, due to resources and habitat patches being separated by large areas of poor habitat with insufficient prey or cover from predation (Ross *et al.* 2016, 2019b). As Pallas's Cat is predated by sympatric carnivores it has a need for safe refuges, and so has a dependency on marmot burrows and rock cavities, particularly for raising young (Ross *et al.* 2010a). Most marmot species remain non-threatened but the Siberian Marmot, which overlaps Pallas's Cat's range in Russia and Mongolia, has declined due to overharvesting and is now classified as Endangered (Clayton 2016). The decline in marmots may result in the loss burrow habitat which is regarded as a keystone resource for Pallas's Cat in many regions of grassland steppe across its range (Ross *et al.* 2010a). The most serious threat to Pallas's Cat across its range is habitat degradation and fragmentation that are largely consequences of increasing livestock numbers, conversion of steppe grasslands into arable land, infrastructure development and resource extraction. Mineral exploitation and infrastructural developments have also increased substantially across the range with increased fragmentation as a result (Awehali 2011, Paltsyn *et al.* 2012, Selles 2013; Ross *et al.* 2016, 2019a). Due to degradation and loss of habitat, Pallas's Cat populations are becoming increasingly fragmented, and isolated

subpopulations are very likely disappearing without our knowledge (Ross *et al.* 2019a). In Mongolia, for example, livestock numbers have increased from 26 million in 1991 to 66 million in 2018 (FAO 1998, National Statistical Office of Mongolia 2018). Increasing livestock numbers result in heavy grazing and habitat degradation, but also in displacement of Pallas's Cats and increasing number of herding dogs which are known to kill the species (Ross 2009, Barashkova and Smelansky 2011, Ross *et al.* 2012, Joolaee *et al.* 2014, Farhadinia *et al.* 2016, Ruta 2018). In Kazakhstan there is also a threat from farming, as large areas of secondary steppe grassland are being converted into arable pastures endangering local Pallas's Cat subpopulations by increasing isolation and fragmentation of habitat (A. Barashkova pers. comm. 2019). Predation by herding dogs, feral dogs, accidental capture when trapping or snaring other animals, and illegal and legal hunting are the main recorded causes of direct anthropogenic mortality of Pallas's Cats (Ross 2009, Barashkova and Smelansky 2011, Farhadinia *et al.* 2016, Ross *et al.* 2016, Ruta 2018, Barashkova *et al.* 2019, Ross *et al.* 2019). New emerging threats are also of concern. Climate change for example is predicted to have large impacts on the grasslands and mountain ecosystems of Central Asia and the Himalayas (Angerer *et al.* 2008, Xu *et al.* 2009). The potential impacts of climate change on Pallas's Cats are unknown, but evidence suggests recent changes of the grassland and mountain ecosystems of Central Asia and Himalayas are at least in part related to climate change (Angerer *et al.* 2008, Xu *et al.* 2009). Climate change is also predicted to have large impacts on steppe and mountain ecosystems in the future with a cascade of changes to the ecosystem likely to follow (IPCC 2014). As Pallas's Cat is a strict seasonal breeder, female ovulation and male sperm production are both regulated by day length and peak during the late winter breeding season (Brown *et al.* 2002). Considering that the breeding season is dictated by day length, as opposed to climate, Pallas's Cats may be unable to respond to seasonal changes in ecological parameters that result from climate change. As indicated by large gains in body mass, Pallas's Cats build-up energy reserves during the summer when prey is abundant (Ross 2009, Naidenko *et al.* 2014), and invest these reserves in reproduction during the late winter when prey availability is low (Ross *et al.* 2010a). As climate change alters seasonal patterns, and with it prey availability, this is likely to affect Pallas's Cats' ability to balance energy reserves (Ross *et al.* 2019a). The poisoning of small mammals, such as pikas and Brandt's vole Lasiopodomys brandtii, is still occurring in the steppe ecosystem, with an aim of reducing disease transmission from small mammals to humans and livestock and improving rangeland quality for livestock (Smith *et al.* 2008). Although information is scarce, poisoning continues in China where pika populations can be reduced by 95% (Lai and Smith 2003, Badingqiuying *et al.* 2016). In the Qinghai-Tibetan Plateau, for example, between 2006 and 2013 approximately $25.5 million was spent to eradicate the plateau pika (*O. curzoniae*) from over 78,500 km2 in Sanjiangyuan National Nature Reserve alone (Wilson and Smith 2015). Research has also shown carnivore populations may suffer declines as a consequence of poisoning campaigns (Badingqiuying *et al.* 2016). In Mongolia, campaigns to control small mammal numbers have occurred in all provinces (Clark *et al.* 2006, Winters 2006, Ross *et al.* 2016) but there is no information on its current prevalence. In Russia and Kazakhstan poisoning occurs at a local scale to control local disease outbreaks (Barashkova et al. 2019). Although the occurrence of poisoning has very likely decreased over the last decade, where the practice continues there is little doubt that aerial and terrestrial carnivores will suffer multiple consequences, such as secondary poisoning and prey depletion (Ross *et al.* 2019a).

Conservation Actions **(see Appendix for additional information)**

In 2019 a conservation action plan was written to move towards promoting the survival of Pallas's Cat across its historic range. The action plan has a number of conservation actions including increasing conservation research, education and awareness, decreasing human caused mortality and coordinating

conservation efforts. These actions will be implemented over the next 10 years (Pallas's Cat Global Action Planning Group 2019), and consequently, conservation action is expected to increase in the near future. In situ conservation of the species occurs mainly through prohibition or regulation of hunting and trade, and habitat conservation within protected areas (Barashkova et al. 2019; Pallas's Cat is listed under CITES Appendix II as *Felis manul*). Hunting of this species is prohibited in most current range countries except Mongolia (Nowell and Jackson 1996), which restricts hunting and regulates trade through a permitting system. Trophy hunters can purchase limited hunting licenses in Mongolia and export trophies (Clark *et al.* 2006). Using predictive modelling across Central Asia, Barashkova *et al.* (2019) estimated that suitable Pallas's Cat habitats cover 170 protected areas of Russia, Mongolia, Kazakhstan, and Kyrgyzstan; although confirmation of the species has only been documented in 36 of the protected areas. In Russia, the Tyvan and Daurian State Nature Reserves remain the most important protected areas for Pallas's Cat conservation, the recently created federal refuge in Dzeren's Valley (subordinated to Daursky reserve) is also occupied by Pallas's Cat's (Barashkova *et al.* 2019). Although research is ongoing in Western Asia and the Himalaya, conservation actions are currently limited (Moqanaki *et al.* 2019, Dhendup *et al*. 2019). A preliminary assessment of the potential distribution of the Pallas's Cat in Western Asia predicted vast climatic suitability across mid-elevation areas in this region, yet dispersal barriers and biotic interactions (e.g. predator-prey relationships) may have restricted the currently occupied habitat (Moqanaki *et al.* 2019). The same is true of China, but Pallas's Cat has been reported in several protected areas including: Xuelingyunshan, Tuomuerfeng, Luoshan, Baijitan, Qinghaihuniaodao, Wanglang, Wolong, Zhumulangmafeng, Kalamailishan, Qitaihuangmobanhuangmo, Aerjinshan, Ganjiahu (Xinjiang), Luobupoyeluotuo (CSIS 2008). It is reportedly present in at least 29 Chinese Nature Reserves (Mallon 2002, Smith *et al.* 2008, Jutzeler *et al.* 2010, Dhendup *et al.* 2019). Required Conservation Actions

• Implimentation of conservation action plan (Pallas's Cat Global Action Planning Group 2019).

• Confirm occupancy in protected areas within the species EOO, and extend to confirm occupancy in suitable habitats predicted using distribution models.

• Establish a suitable and quantifiable monitoring method for the species.

• Identify and implement population monitoring in key areas that have potential to indicate the species status at a wider scale.

• Identify regions where human caused threats endanger Pallas's Cat and implement mitigation measures.

• Recommend new protected areas in Pallas's Cat hotspots not currently protected.

• Increase collaboration between Pallas's Cat researchers to validate and refine population distribution and habitat distribution models.

• Understand the species population dynamics in relation to potential prey population cycles in areas where we know large population fluctuations occur (such as the Daurian steppe). Establish whether other areas are similarly subject to large changes in Pallas's Cat population size.

Credits

Assessor(s): Ross, S., Barashkova, A., Dhendup, T., Munkhtsog, B., Smelansky, I., Barclay, D. & Moqanaki, E.

Reviewer(s): Breitenmoser, U. & Rosen, T.

Contributor(s): Jahed, N., Farhadinia, M., Kabir, M., Adibi, M., Din, J., Raeesi Chahartaghi, N., Ostrowski, S., Kiriliuk, V., Spitsyn, S., Naidenko, S., Zhumabai uulu, K., Koshkin, M., Augugliaro, C., Nasanbat, B., Baatargal, O., Gritsina, M., Grachev, A., Monti, I., Shrestha, B., Mahar, N., Kolipaka, S., Ram Regmi, G. & Jackson, R.

Authority/Authorities: IUCN SSC Cat Specialist Group (wild cats)

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https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T15640A180145377.en

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Citation

Ross, S., Barashkova, A., Dhendup, T., Munkhtsog, B., Smelansky, I., Barclay, D. & Moqanaki, E. 2020. *Otocolobus manul* (errata version published in 2020). *The IUCN Red List of Threatened Species* 2020: e.T15640A180145377. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T15640A180145377.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the

Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
3. Shrubland -> 3.4. Shrubland - Temperate	Resident	Suitable	Yes
4. Grassland -> 4.4. Grassland - Temperate	Resident	Suitable	Yes
8. Desert -> 8.2. Desert - Temperate	Resident	Suitable	No

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Fibre	No	No	No
Medicine - human & veterinary	Yes	Yes	Yes
Fuels	No	No	No
Pets/display animals, horticulture	No	Yes	No
Other chemicals	No	No	No
Manufacturing chemicals	No	No	No
Poisons	No	No	No
Food - animal	No	No	No
Sport hunting/specimen collecting	Yes	Yes	Yes
Establishing ex-situ production *	No	No	No
Construction or structural materials	No	No	No
Research	No	No	No
Wearing apparel, accessories	Yes	Yes	Yes
Other household goods	No	No	No
Food - human	No	No	No
Handicrafts, jewellery, etc.	No	No	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score

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1. Residential & commercial development -> 1.1. Housing & urban areas	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Future	Minority (50%)	Causing/could cause fluctuations	Low impact: 3
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.1. Nomadic grazing	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance		
3. Energy production & mining -> 3.1. Oil & gas drilling	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
3. Energy production & mining -> 3.2. Mining & quarrying	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	Minority (50%)	Negligible declines	Low impact: 4
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.2. Unintentional effects (species is not the target)	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.3. Persecution/control	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects		

5. Biological resource use -> 5.2. Gathering terrestrial plants -> 5.2.2. Unintentional effects (species is not the target)	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.3. Indirect species effects		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.3. Indirect species effects		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion		
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Ongoing	Whole (>90%)	Causing/could cause fluctuations	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.2. Droughts	Ongoing	Whole (>90%)	Causing/could cause fluctuations	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.3. Temperature extremes	Ongoing	Whole (>90%)	Causing/could cause fluctuations	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Yes
Systematic monitoring scheme: No
In-place land/water protection
Conservation sites identified: Yes, over part of range

Conservation Action in Place
Percentage of population protected by PAs: 1-10
Area based regional management plan: No
Occurs in at least one protected area: Yes
Invasive species control or prevention: No
In-place species management
Harvest management plan: No
Successfully reintroduced or introduced benignly: No
Subject to ex-situ conservation: Yes
In-place education
Subject to recent education and awareness programmes: Yes
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
2. Land/water management -> 2.1. Site/area management
2. Land/water management -> 2.2. Invasive/problematic species control
2. Land/water management -> 2.3. Habitat & natural process restoration
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery
3. Species management -> 3.4. Ex-situ conservation -> 3.4.1. Captive breeding/artificial propagation
4. Education & awareness -> 4.1. Formal education
4. Education & awareness -> 4.2. Training
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level

Conservation Action Needed
5. Law & policy -> 5.2. Policies and regulations
5. Law & policy -> 5.3. Private sector standards & codes
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.1. International level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.4. Harvest, use & livelihoods
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
2. Conservation Planning -> 2.2. Area-based Management Plan
2. Conservation Planning -> 2.3. Harvest & Trade Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 1619265
Continuing decline in area of occupancy (AOO): Yes
Extreme fluctuations in area of occupancy (AOO): Unknown
Estimated extent of occurrence (EOO) (km^2): 12801561
Continuing decline in extent of occurrence (EOO): Yes
Extreme fluctuations in extent of occurrence (EOO): Unknown

Distribution
Lower elevation limit (m): 440
Upper elevation limit (m): 5,593
Population
Number of mature individuals: 58,000
Continuing decline of mature individuals: Yes
Extreme fluctuations: Unknown
Population severely fragmented: Yes
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 3.61

Errata

Errata reason: This erratum version of the assessment was created to attach the updated distribution map. The previous version of this assessment accidentally included an older version of the map.

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.