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Abstract: The sand cat *Felis margarita* is one of the least-well known of all cat species. It has a wide but patchy distribution in North Africa, the Arabian Peninsula, Iran, Central Asia and Pakistan. Presence has been confirmed from only a few locations and no reliable estimates of population size or trend are available. Many aspects of their basic biology and ecology are also poorly known. The sand cat is currently classified as Near Threatened on the IUCN Red List. Four subspecies have been described but the validity of these forms has not been confirmed genetically. Sand cats in Arabia are usually assigned to *F.m. harrisoni*. Regional red listing classified the Arabian sand cat as Near Threatened but it is listed as Endangered in the United Arab Emirates and Abu Dhabi red lists. Sand cats are kept in many zoos and collections mainly in the USA, Europe and the Middle East. The largest captive group is held at Al Ain Zoo, Abu Dhabi, United Arab Emirates.



الحماية والأبحاث
CONSERVATION & RESEARCH

Arabian Sand Cat

Felis margarita harrisoni

Status Review & Conservation Strategy



Arabian Sand Cat *Felis margarita harrisoni* Status Review and Conservation Strategy

Compiled following the Arabian Sand Cat *One Plan* Conservation Workshop hosted by Al Ain Zoo, Al Ain, 13-14 November 2013.

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Foreword

As part of its commitment to the conservation of arid land biodiversity Al Ain Zoo is proud to present this Arabian Sand Cat *Felis margarita harrisoni* Status Review and Conservation Strategy.

The sand cat is listed as Near Threatened in Arabia and Endangered in the UAE and Abu Dhabi. However these assessments are based on scarce scientific evidence and we have little information about the Arabian sand cat in the wild. We lack basic understanding of many if not all aspects of biology, ecology, conservation status and threats. Equally, there is a lack of collaborative breeding and sharing of information on husbandry, health and welfare among *ex situ* collections in the region.

Al Ain Zoo has the largest sand cat population of any zoo in the world and we view this as a great responsibility. We have therefore committed to a long-term *One Plan* programme which will link both the *in situ* and *ex situ* research and conservation needed for effective and efficient species conservation.

In order to achieve our goals we will rely on the collaboration of our valued regional and international partners. In November 2013 we brought together an initial group of partners from the UAE, Saudi Arabia, Qatar, Oman, Jordan, Europe and the US and from both the *in situ* and *ex situ* communities to share knowledge, experience, problems and ideas. This document contains the information shared and actions agreed during the workshop as well as a comprehensive review of all available information on the Arabian sand cat.

We thank all the workshop delegates and look forward to working with you and others to meet our vision of a thriving sand cat population living in the wild across the Arabian region.

Thank you

H.E. Ghanim Mubarak Al Hajeri, Director General of Al Ain Zoo

Acknowledgements

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Finally we thank all the workshop participants and their host organizations for committing the time to attend the workshop, for sharing information and knowledge and for their active contributions to the workshop process and outputs.

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1. Introduction

The sand cat *Felis margarita* is one of the least-well known of all cat species. It has a wide but patchy distribution in North Africa, the Arabian Peninsula, Iran, Central Asia and Pakistan. Presence has been confirmed from only a few locations and no reliable estimates of population size or trend are available. Many aspects of their basic biology and ecology are also poorly known. The sand cat is currently classified as Near Threatened on the IUCN Red List. Four subspecies have been described but the validity of these forms has not been confirmed genetically. Sand cats in Arabia are usually assigned to *F.m. harrisoni*. Regional red listing classified the Arabian sand cat as Near Threatened but it is listed as Endangered in the United Arab Emirates and Abu Dhabi red lists. Sand cats are kept in many zoos and collections mainly in the USA, Europe and the Middle East. The largest captive group is held at Al Ain Zoo, Abu Dhabi, United Arab Emirates.

An Arabian Sand Cat *One Plan* Conservation Workshop was organised by Al Ain Zoo on 13-14th November 2013. The aims of the workshop were to develop a conservation strategy for the Arabian Sand Cat, increase collaboration and integrate *ex situ* and *in situ* conservation efforts.

The workshop was held in the Danat Hotel, Al Ain. It was attended by 30 participants representing 17 institutions and organizations. The workshop was formally opened by H.E. Mr Ghanim Mubarak al Hajeri, Director General of Al Ain Zoo and was moderated by Dr David Mallon, Co-Chair of the IUCN/SSC Antelope Specialist Group and member of the IUCN Species Conservation Planning Subcommittee. The format broadly followed the IUCN Species Conservation Strategy (SCS) process.

In the preparatory phase, a review of the current status of wild and captive populations of Arabian sand cat was compiled from all available published sources by Al Ain Zoo. The first part of the workshop consisted of a series of presentations on current conservation efforts, both *in-* and *ex situ*. The second part involved development of the conservation strategy: analysing the main threats and problems facing the sand cat; formulating a Vision and Goal for sand cat conservation, and the Objectives and Actions needed to achieve them. Appendix 6.3 contains the full workshop agenda.

The presentations were followed by an extended discussion on the main points raised. Information from the presentations was incorporated into the draft status review and the revised and updated version is presented here.

The *One Plan* Conservation Approach

The *in situ* (in the wild) and *ex situ* (in captivity) strands of conservation have traditionally been practiced separately. Field biologists and others worked to protect species and habitats in the wild whilst zoos, aquaria and botanic gardens focussed on maintaining sustainable captive populations. However it is becoming more important than ever for the *in situ* and *ex situ* communities to work together, along with other stakeholders, to combine their unique knowledge, experience and expertise because:

- In the face of dwindling populations every individual of a species, whether in the wild or captivity, has increasing conservation value.
- Many zoo and wild populations may not be demographically or genetically sustainable in the long-term.
- Active management such as supplementary feeding, water provision and the creation of artificial nesting sites to support wild or semi-wild populations will become increasingly necessary, requiring a mix of both *in situ* and *ex situ* expertise.
- Other increasingly important conservation tools such as reintroduction, reinforcement, assisted reproduction and cryopreservation require a diverse range of skills from animal capture and handling to field biology techniques and ecological knowledge.

To encourage a more integrated, efficient and effective conservation effort in the future the *One Plan* conservation approach has been increasingly promoted by the IUCN Conservation Breeding Specialist Group in recent years. The approach advocates that there should be only one comprehensive conservation strategy for a species which integrates all populations and individuals whether *in situ*, *ex situ* or *in between*, providing the best chance of securing a sustainable population and a therefore future for endangered species.

This document represents the first workshop held in the Arabian region under the guidelines of the IUCN Conservation Breeding Specialist Group *One Plan* approach and the IUCN Species Conservation Strategy process.

2. Arabian Sand Cat Status Review

2.1. Introduction

The sand cat is one of the least known species of wild cat (Nowell and Jackson, 1996). There are relatively few specimens or confirmed records, detailed field studies are lacking and information from the wild is fragmentary. Summaries are provided by Harrison and Bates (1991), Sunquist and Sunquist (2002) and Sliwa (2013).

2.2. Taxonomy

Felis margarita Loche, 1858

Common names

English: Sand cat

French: Chat des sables, chat du desert, chat de Marguerite

German: Sandkatze

Arabic: Al qitarriml, Al Tiffa

Several subspecies have been proposed but only four are widely recognized: *F.m. margarita* in North Africa and Sahara, *F.m. harrisoni* in Arabia, *F.m. scheffeli* in Pakistan and *F.m. thinobia* in Central Asia (Hemmer et al., 1976). These forms have been described based on morphological differences, mainly pelage and skull characteristics. Sample sizes are small and the proposed subspecies have not yet been investigated by genetic analysis so their validity is currently unclear. Karyotyping of a single specimen of each subspecies yielded preliminary genetic evidence in support of the divisions above based on C-banding, however, they were indistinguishable by R-banding and G-banding (Nowell and Jackson, 1996).

Sand cats in Arabia are considered intermediate between the Saharan and Central Asian/Pakistan in appearance, the western subspecies being brighter in colour and better marked with the eastern subspecies being paler and less marked (Akers, 2001).

Recent genetic analysis of sand cats in Al Ain Zoo found that an individual from Syria was genetically very close to those in Al Ain Zoo's collection (Al Ain Zoo, unpublished data).

2.3. Description

The sand cat is small and stocky with a head-body length 40-57 cm with short legs and a tail length of 23-31 cm (Sunquist and Sunquist, 2002). Weights of wild-caught adults from Turkmenistan range from 2.1-3.4 kg for males ($n=12$) and 1.4-3.1 kg for females ($n=5$) (Heptner and Sludskii, 1972). The coat is pale yellow or sandy, the tail has two or three rings and a black tip and there are dark horizontal bars on the legs. A reddish streak runs from the corner of the eye across each cheek. Soles of the feet are covered with a thick layer of dark wiry hair that conceals the pads. The ears are large and set widely apart and low on the sides of the head. Some ear structures are greatly enlarged relative to other small felids. For detailed descriptions see Harrison and Bates (1991), Sunquist and Sunquist (2002) and Sliwa (2013).

2.4. Biology and Ecology

2.4.1. Adaptations to an Arid Environment

Sand cats are well adapted to a desert environment and a psammophilic, or sand-dwelling, lifestyle (Nowell and Jackson, 1996). They can apparently exist without drinking, obtaining sufficient water from their prey, which allows them to live far from water sources (Nowell and Jackson, 1996). They have thick, dark wiry hair on the soles of their feet (see Figure 1), insulating the foot pads against extremes of heat and cold and allowing easier movement through sand (Nowell and Jackson, 1996).

The ears are large and set widely apart and low on the sides of the heads. This enables the sand cat to flatten their profile while hunting and may aid detection of movements of subterranean prey (Kingdon, 1991) as well as protect the inner ears from wind-blown sand (Nowell and Jackson, 1996).

Sand cats have been seen above ground in daylight near their burrows lying on their backs in a posture which may help to shed internal heat (Nowell and Jackson, 1996). This behaviour is seen regularly in captivity at temperatures above 30°C (Nowell and Jackson, 1996).



Figure 1: The thick wiry hair covering the foot pads of the sand cat (L. Banfield, AAZ).

2.4.2. Habitat

Sand cats have been recorded in a variety of sandy habitats as well as more atypical habitats (see Figure 2).

In Algeria sand cats have been reported from areas bordering great dune expanses, large sandy wadis and in areas with alternating rocky and wide sandy valleys (Belbachir, 2009). In Morocco sand cats were recorded in sandy areas with the perennial grass *Panicum turgidum*, low bushes and *Acacia tortillis* ssp. *raddiana* trees (Sliwa et al., 2013).

In Turkmenistan sand cats are reported to be most abundant in extensive sand massifs where compacted soils are generally absent but also areas with heavier clay soils (Heptner and Sludskii, 1972). In Pakistan the only area sand cats are found is one of high rolling sand dunes interspersed by flat stony plains at about 900m altitude in an area of extreme aridity (Roberts, 1997).

In the Arabian Peninsula sand cats are recorded from a wide area of mainly sandy habitats, however, they have also been recorded from areas of hard, rocky substrate, including gravel plains and the volcanic lava fields of the Harrat (for example Abbadi, 1992; Bunaian et al, 2001; Cunningham, 2002; Strauss et al., 2007). The Harrat is a large area of alkaline volcanic rock spreading 40,000 km² across north eastern Jordan, southern Syria and into northwest Saudi Arabia. Sand cats have been recorded from the Harrat of Jordan (Bunaian et al., 1998) and Saudi Arabia (Seddon et al., 1997).

In the UAE sand cats have been recorded from inter-dune gravel flats with scattered calcrete hills bordered by sparsely vegetated sand dunes. *Haloxylon salicornicum* shrubs and *Pennisetum divisum* dominated the gravel flats (Cunningham, 2002). There

are also several records from sand dunes areas (for example Cunningham, 2002; Drew and Tourenq, 2005).

In Oman a sand cat was recorded on the northern edge of the Umm as Samim, a low-lying quicksand and saltmarsh area bordering the Empty Quarter (Harrison, 1968).

In Syria sightings are mainly from sandy habitats dominated by dwarf perennial shrubs *Calligonum comosum* and *Stipagrostis plumosa* (Serra et al., 2007). In north-east Jordan they were reported to prefer sandy desert and depressions without *Acacia* (Bunaian et al., 1998).

Daytime sand surface temperatures in the Sahara during the summer can reach 52°C (Nowell and Jackson, 1996). Daytime air temperatures range up to 58°C in the shade but night temperatures are much lower reaching to -0.5°C; in the Central Asian part of the range it snows in winter and temperatures can drop as low as -25°C (Nowell and Jackson, 1996).

At a known site in Saudi Arabia the climate is arid with scant erratic rainfall 50-100mm/year and mean daily temperatures of 21.1 ± 6.45°C during the cool season (Nov-April) and 27.83 ± 8.45°C during the hot (May-October) seasons (Sher Shah and Cunningham 2008). Maximum and minimum temperatures have been reported as 38.7-40.7°C and 10.7-11.7°C respectively (Henry and Dubost, 2012).

It is possible that sand cats thrive in very arid areas which lacking competition with other species such as Gordon's wildcat, feral cats and foxes (EPAA, 2004), however, sand cats have also been found in areas where there are other carnivores including fennec fox *Vulpes zerda*, Rüppell's fox *Vulpes rueppellii*, golden jackal *Canis aureus* and African wild cat *Felis silvestris lybica* (for example Abbadi, 1992; Belbachir, 2009; Sliwa, 2013). Sand cats have also been recorded in areas with feral camels (Belbachir, 2009) and an area where the vegetation is reportedly degraded (Strauss et al., 2007).

The micro-distribution of the small mammals which form part of the sand cat's prey is often clumped around vegetation and does not extend into bare sand ranges (Happold, 1984). This has the potential to limit the distribution and density of sand cats in areas devoid of vegetation or during drought years where vegetation dies back. Sand cat populations may therefore fluctuate, decreasing and increasing in response to environmental changes that affect prey availability (Sunquist and Sunquist, 2002).

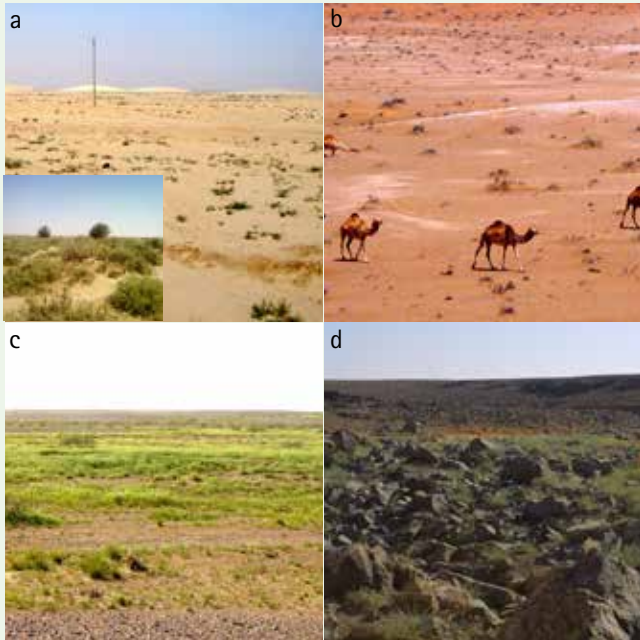


Figure 2: Variation in habitat types at known locations of Arabian sand cat.

(a) Iraq, West An-Najaf Desert (M. Mohammad) – sandy soils and dunes with some compact inter-dune soil and scattered shrubs of *Capparis spinosa*, *Citrullus colocynthis*, *Tamarix* sp and *Lycium shawii* at various densities (Mohammad et al 2013).

(b) UAE, near Sweihan (P. Cunningham) – inter-dune gravel flats with scattered calcrete hills bordered by sparsely vegetated sand dunes (Cunningham 2002).

(c) Saudi Arabia, Saja/Umm Ar-Rimth Protected Area (D. Kifle) – gravel plain with vegetation consisting of associations of *Acacia tortillis* and *Panicum turgidum*, dominated by *Haloxylon salicornicum*, *Fagonia indica* in addition to some grasses such as *Centropodia forsskali* and *Stipagrostis hirtugluma* (Strauss et al 2007).

(d) Jordan, Eastern Desert/Harrah (M. al Qarqaz) – basalt steppe desert interspersed with siltflats and many shallow wadis. Devoid of trees and dominated by woody perennial herbs.

2.4.3. Range Size and Density

There is a limited amount of information on the range size and density of sand cats. The most detailed project so far is a long-term trapping study of small carnivores undertaken by Moayyad Sher Shah, Dr. Mohammed Shobrak and colleagues in

Saja/Umm Ar-Rimth reserve in Saudi Arabia. The habitat of 95% of the reserve is sand and fine gravel with vegetation dominated by *Acacia tortillis* (Strauss et al., 2007). Preliminary results were reported in Strauss et al. (2007) and an update was provided during the Arabian Sand Cat One Plan Conservation Workshop in 2013.

In 4509 trap-nights, 64 (31.33) sand cats were captured compared with ten times the number of Rüppell's fox *Vulpes rueppelli* which shares a similar preference for sandy habitats.

On one occasion a young male kitten and a young female kitten were caught in the same trap. Between February 2004 and July 2006 12 (5.7) were fitted with radio collars (see Figure 3) and 600 locations subsequently obtained. Annual home range sizes of 7 (3:4) cats were estimated at 19.6–50.7 km² (M. Sher Shah and M. Shobrak, pers. comm.).

During a trapping survey in the Arava Valley four cats were radio collared and tracked over a 9 month period. The habitat was open areas and wadi beds with a firm sand, pebble or stone ground. One of the collared cats was found to travel an average of 5.4km at night. The home range of one adult male was estimated at 16km². Twenty two individuals were found within the 100km² study area (Abbadi, 1992).

A spotlight study in Morocco over 9 nights and 991km detected 3 sand cats (Sliwa et al., 2013).

Neighbouring males may have overlapping ranges (Abbadi, 1992) and considerable overlap has been found between male and female seasonal ranges (Strauss et al., 2007).

Male was estimated at 16km and they may overlap with those of neighbouring males (Abbadi 1992). In Saudi Arabia annual ranges are larger, up to 40km² (Mallon et al. 2011).



Figure 3: A sand cat radio-collared as part of the long-term study in Saja/Umm Ar-Rimth reserve, Saudi Arabia (M. Sher Shah, NWRC).

2.4.4. Diet

The diet of the sand cat includes various small mammals, birds, reptiles and insects. In Central Asia major prey items were found to be gerbils *Gerbillis* spp., jerboas *Jaculus* spp. and hamsters *Mesocricetus* spp. and various reptiles and arthropods (Heptner and Sludskii, 1972). Sand cats will also attempt to catch birds and have been observed catching a desert lark *Ammomanes deserti* (Abbadi 1992). In the Sahara sand cats have a reputation of being snake hunters, particularly of horned and sand vipers and they may cover large kills with sand and return to continue eating later (Dragesco-Joffe, 1993).

In Arabia sand cats they have been recorded preying on spiny-tailed lizard *Uromastyx aegyptia* (Mendelssohn, 1989) and jird *Meriones arimalius* (J. Judas, pers. comm.). They may feed on locusts when they swarm (Cunningham, 2002) and are capable of rapid digging to catch prey (Mallon et al., 2011). In Arabia the sand cat's distribution may coincide with that of sand skinks *Scincus mitranus* and Arabian toad-head lizards *Phrynocephalus arabicus*, both thought to be an important food source (Sunquist and Sunquist, 2002).

2.4.5. Predation

The main suspected predators include large birds of prey, venomous snakes and large carnivores (Akers, 2011) although no confirmed instances of predation on sand cats have been reported.

2.4.6. Behaviour

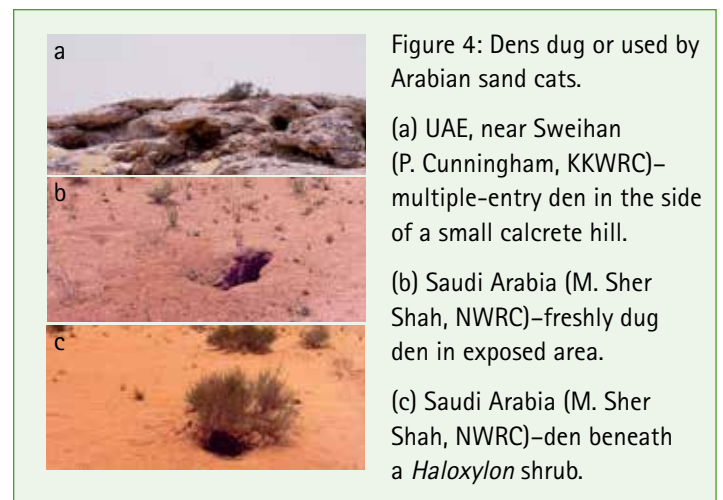
Sand cats are solitary with male and female generally only coming together for mating. Despite reports of overlapping territories (see above) in recorded encounters between radio collared sand cats one fled quickly covering large distances up to half its entire nocturnal route (Abbadi 1992).

Dens are used where sand cats escape from the sun during the day. Dens can be found in open areas or beneath rocks or vegetation, may have multiple entrances (see Figure 4) and may be used interchangeably by different cats at different times (Abbadi, 1992). Although sand cats are good diggers and can construct their own dens they may also adopt and improve existing dens that may have been constructed by other species (Nowell and Jackson, 1996).

Although generally reported as nocturnal there are several records of diurnal activity of sand cats in Arabia, especially in winter when conditions are cooler (M. Sher Shah, pers. comm; Dragesco-Joffé, 1993). Individuals that were active in the early morning have been

observed in Saudi Arabia (T. Wachter, pers. comm; J. Judas, pers. comm.) and in the afternoon in the Arava Valley (Abbadi, 1992).

One study found that sand cats have regular behaviour although they were not found to travel regular paths (Abbadi, 1992). At nightfall they were found to take up a lookout position at their den opening and survey the surrounding area for about 15 minutes before leaving. They were active generally throughout the night, hunting and travelling an average of 5.4 km (Abbadi, 1992).



Freezing behaviour when disturbed by people has been noted several times (Abbadi, 1992; Sliwa et al., 2013). They crouch low to the ground and hide in depressions or below vegetation (see Figure 5). There are reports of docile behaviour, for example "completely non-aggressive to the extent that one can reach down its den and lift it out by hand without it defending itself or attacking" (Akers, 2011), however, this contradicts other reports of captured sand cats being "fierce, flattening the ears and spitting loudly" (Harrison and Bates, 1991).

Information on breeding behaviour in the wild is very limited but it is reported that sand cats emit a mating call which resembles the barking of a small dog purr (Anon, 2008).





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Few details about the life cycle of the sand cat in the wild are available. Births have been reported from January to April in the Sahara, April in Turkmenistan and September-October in Pakistan (Nowell and Jackson, 1996; Sliwa, 2013). In captivity gestation is 59-67 days, litter size is 1-5 (average 2.7) and young are born all year round with a peak in March-April (15%) and fewest (6%) in November-December (Breton, 2013). Kittens' eyes open by the 14th day, they begin to walk by the 21st day and by 5 weeks they emerge from the burrow and begin to dig for food (Anon, 2008). Males and females become sexually mature at 10-12 months (Anon, 2008). Life span is reported to be up to 13 years in the wild and up to 17 years in captivity (Anon, 2008; Breton, 2013).

2.5. Field Signs and Studies

Sand cats are difficult to study in the wild because of their patchy distribution, low density, cryptic habits and lack of obvious field signs.

Although previous reports state that the thick hairs on the foot pads of sand cats prevent them from leaving defined footprints (Ognev, 1935) this is more related to the substrate. Clear footprints including claws are possible (see Figure 6). The usefulness of this in the field is obviously limited by the arid nature of sand cat habitats although claw impressions in footprints have been reported (Dragesco-Joffé, 1993). Droppings are generally covered with sand although they are occasionally left uncovered in captivity.

Dens have been found in open sand, beneath vegetation or on hillocks and can have single or multiple entrances (Cunningham, 2002; Sliwa et al., 2013; Sher Shah and Shobrak, pers. comm.). One den measured was 41cm long and 14cm wide at its mouth (Roberts, 1997).

Sand cats may be difficult to detect using night spotlight surveys due to their reported habit of closing their eyes against the light and therefore avoiding eye shine (Abbadi, 1992), however, this method has been used to successfully locate sand cats (Sliwa et al., 2013).

One trapping study found that trapped sand cats did not re-enter baited traps despite passing close by them (Abbadi, 1992) whilst other studies have found that recapture is possible (M. Sher Shah and M. Shobrak, pers. comm.).

Several trapping projects have been successful using chicken as bait (Abbadi, 1992; Ostrowski et al., 2003; Strauss et al., 2007) but in another success came only after changing the bait from chicken to tinned fish (P. Seddon, pers. comm.). Tinned fish has also been successful elsewhere (T. Wachter, pers. comm.).

In Jordan, RSCN is conducting surveys of small and medium carnivores using five methods (sign surveys, interviews, live trapping, camera trapping, and spotlighting) although sand cats have not been detected to date (O. A'abed, pers. comm.).

A spotlighting survey carried out in the Moroccan Sahara resulted in sightings of 11 sand cats. An in-depth ecological study is proposed (Sliwa et al., 2013).



Figure 6: Variation in Arabian sand cat footprints according to substrate with drier substrate to the left and wetter to the right. In the wettest substrate claws are also visible. Front paws, taken at Al Ain Zoo (L. Banfield, AAZ).

2.6. Distribution

2.6.1. Global

Sand cats have a wide but disjunct distribution across North Africa to Arabia, Iran, Pakistan and the southern part of Central Asia. There are large gaps between known areas of distribution and it is unclear if these reflect a lack of surveys or whether sand cats are absent from these areas (Mallon et al. 2011).

In North Africa, sand cats have been recorded in Morocco–Western Sahara, Algeria, Mauritania, Niger, the Eastern Desert of Egypt and Sinai, but there are no records to date from Tunisia, Libya or Western Egypt (Sunquist and Sunquist 2002, Sliwa 2013). The first specimen was obtained in Algeria close to the Libyan border and it may occur in that country too (Hufnagl 1972).

In Central Asia sand cats have been recorded in Kazakhstan, Turkmenistan, and Uzbekistan, in the Kara Kum desert and Ustyurt Plateau, extending north to 46–47°N (Heptner and Sludskiy 1972, Bekenov 2008). Distribution in Uzbekistan and some recent records from the Kyzyl Kum desert and near Bukhara were reported by Gritsina 2014.

In Pakistan it is known only in the Chagai Desert plateau of Balochistan province (Roberts 1997) close to the border with Afghanistan. Several sand cats from this locality were captured for the zoo trade soon after the species was discovered there

in 1966 but, due to overexploitation by collections, by 1973 they reportedly very hard to find (Sunquist and Sunquist 2002). In Iran it is known from Khorassan province in the north-east, Kavir National Park in the north-centre and Fars Province in the south-west (Firouz 2005). It was camera trapped recently in Abbotabad Protected Area near Na'en, east of Isfahan, during a project operated by the Iranian Cheetah Society. There are further recent records from the south-east and east, near the borders with Pakistan and Afghanistan. Although the species has not yet been recorded in Afghanistan, it may well occur there, for example in the Registan Desert and Seistan basin, given its presence close by on the borders.

2.6.2. The Arabian Peninsula

The sand cat was first recorded in the Arabian Peninsula in 1950. It has been recorded widely but sparsely from Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, the UAE and Yemen, as well as the Sinai Peninsula of Egypt (Gasperetti et al., 1985; Goodman and Helmy, 1986; Harrison and Bates, 1991; Serra et al., 2007; Mohammad et al., 2013). These reports consist of specimens, confirmed records, live-caught and camera-trapped animals, skulls, skins and local reports. See Table 1 for a summary of all records found and Figure 7 for distribution map.

Egypt (Sinai): There are three specimens from the Eastern Desert including one from near the Red Sea coast and four from Sinai (Goodman and Helmy, 1990).

Iraq: First recorded in 2012 when three specimens were obtained from the desert near An Najaf, south of Baghdad (Mohammad et al., 2013).

Jordan: Specimens have been collected from Wadi Rum (Amr et al., 1987, Qumsiyeh et al., 1993). An individual was spotlighted, caught, examined and released near Qasr Burqu' in the Badia region of north-east Jordan, 5 km NW of Mansheyat Al-Ghiath (Bunaian et al., 1998, 2001). Despite intensive trapping and spotlighting, no sand cats were recorded on the Jordanian side of Wadi Araba (Bunaian et al., 2001).

Kuwait: One specimen was obtained from Wafra in Saudi Arabia on the border with Kuwait (Harrison and Bates, 1991). Eight wild caught animals were presented to the Kuwait Scientific Centre 2002–2008. Some of the sand cats were caught from Al-Rejje, south of Kuwait near the Saudi border while others were caught in the northern part of Kuwait; Ali-Alsalem Air base, Al-Abdali and Al-Beeth near the border of Iraq. (S. Behbehani, pers. comm.).

Oman: There are records from Ramlat al Ghafa (Hayman and Harrison, 1950), Umm as Samim and south-west of Ibri (Harrison and Bates, 1991). There are also records from the Arabian Oryx Sanctuary in the central region and As Saleel Nature Reserve (Mallon and Budd, 2011). Wild caught animals from Mughshin (Maghshan) (in the south-west) and Wahiba Sands (south-east) have been acquired by the Oman Wild Animal Breeding Centre (Khaled al Rasbi, pers. comm.).

Palestine: A radio-collaring study has been conducted in Wadi Arava (Abbadi, 1992) but the population was reported to be declining with the expansion of cultivation (Harrison and Bates, 1991). Sand cats are now reportedly extinct there and an attempted reintroduction has failed (www.Jerusalemzoo.org.il). A sight record from Gaza was reported by von Jaffa (2007).

Qatar: Two records were reported in Harrison and Bates (1991) including one specimen coming from the UAE border which is now in the Harrison Zoological Museum. Wild caught individuals have been acquired by Al Wabra Wildlife Preservation which are assumed to have been caught locally within Qatar although this cannot be confirmed (H. Matthews, pers. comm.).

Saudi Arabia: A few records from the east, one from Ashayrah in the west and one from Wafra on the Kuwait border were reported in Harrison and Bates (1991). Several animals have been live-trapped during a long-term study at Saja/Umm Ar-Rimth Protected Area in central Saudi Arabia (Strauss et al., 2007; M. Sher Shah and M. Shobrak, pers. comm.). One sand cat was seen in the early morning in Uruq Bani Ma'arid reserve in 1996 not far from the main ranger camp (T. Wacher, pers. comm.) and there are records of ranger sightings (Sher Shah, pers. comm.). Several sand cats were caught in traps during meso-carnivore studies in the same reserve (Sher Shah, pers. comm.). There are records of rare sightings and a partially mummified sand cat from the northern Liss sector of the Harrat al-Harrah Protected Area in the North of the country (Seddon et al., 1997) and in November 1997 an individual was trapped in the south-central part of the reserve (P. Seddon, pers. comm.). Sand cats were regularly caught but in small numbers in fox traps in Mahazat as Sayd reserve between 1998 and 2003 (J. Judas, pers. comm.) and there are additional records from there. Ten sand cats were trapped near Riyadh for health studies (Morsy et al., 1999). Extensive trapping has been carried out through At Taysiyah/Al Jandiliyah within the Ad Dahna dune belt without success (P. Seddon, pers. comm.).

Syria: The first record in Syria was obtained during a camera-trap study in the Tadmor area in 2005 (Serra, 2007).

UAE: There are a few confirmed records plus some anecdotal evidence. Distribution was summarised by Cunningham (2002) and further records were added by Drew and Tourenq (2005). The first live sighting occurred in 2001 around 35 km northwest of Al Ain at 235m altitude; the animal was found at 10:00 am on the western side of a small calcrete hill near a den along with numerous tracks, scats and prey remains (Cunningham, 2002). Between 1995 and 2005 there were only 4 authenticated records despite intensive surveys and trapping in favourable habitats between 2002 and 2005 (Drew and Tourenq, 2005). There are however several records of skulls, carcasses and other unconfirmed reports.

Yemen: One sand cat was caught near Beihan in 1952 and sent to London Zoo (Harrison and Bates, 1991). There have been no other reports of the species since then (Al-Jumaily 1998; Mallon and Budd, 2011). Extensive areas of sandy habitat exist, for example, along the southern fringe of the Rub al Khali and in the Ramlat as Sabatayn.



Table 1: Records of the Arabian Sand Cat in the Arabian Peninsula

Country	Date	Locality	Type	Source
Egypt (Sinai)	1978	Wadi Umm Hashiba	2 males collected	Goodman and Helmy, 1986
	1975	Sinai, along Mitla Road	Live caught, died 1983	Goodman and Helmy, 1986
	?	Sinai	Sighting	Hemmer, 1976 (cited in Harrison and Bates, 1991)
	?	Sinai	Live caught	Goodman and Helmy, 1986
Iraq	2012	West An-Najaf desert	Two captive animals examined in Baghdad; specimens now in Iraq Natural History Museum	Mohammad et al., 2013
	2012	Al Jufaira oasis (An Najaf Desert)	One stuffed animal seen, reportedly from this location	Mohammad et al., 2013
Jordan	1997	Burqu'a (Eastern desert) 5 km NW of Mansheyat Al-Ghaith	Live-trapped	Bunaian et al., 1998
	1997	Erwished (Eastern desert)	Spotlighted	Bunaian et al., 1998
	1977	Wadi Rum	Skull	Hemmer, 1978
	1965	Wadi Rum	Sighting	Mountfort, 1965
Kuwait	2002-2008	Southern Kuwait: Al-Reqie, near Saudi border Northern Kuwait: Ali-Alsalem Air base, Al-Abdali and Al-Beeth border of Iraq	A total of 8 animals caught and presented to TSCK	s. Behbehani, pers. comm.
	1953	Wafra (on Saudi Arabia border)	Kitten photographed	Harrison and Bates, 1991
Palestine	1988	Arava	Four animals radio-collared	Abbadi, 1992
	?	Gaza, near Rafah	Individual photographed	von Jaffa, 2007
Oman	2008	Mughshin (Maghshan)	3 caught and taken to Omani Wild Animals Breeding Centre	K. al Rasbi, pers. comm.
	2007	Mughshin (Maghshan)	1 caught and taken to Omani Wild Animals Breeding Centre	K. al Rasbi, pers. comm.
	1967	20 km southwest of Ibri	Specimen	Harrison, 1968
	1967?	Northern edge of Umm as Samim	Specimen (now in HZM)	Harrison, 1968
	?	Ramlat al Ghafa	Skin	Hayman and Harrison, 1950
	?	Wahiba Sands	One caught and taken to Omani Wild Animals Breeding Centre	K. al Rasbi, pers. comm.
	?	As Saleel	?	Mallon and Budd, 2011
Qatar	1974	"From the desert"	?	Schauenberg, 1974 (cited in Harrison and Bates 1991)
	1970?	Near UAE border	Live caught and kept in captivity, died in 1970. Specimen in the Harrison Zoological Museum	Harrison, 1972
	?	?	Animals presented to Al Wabra Wildlife Preservation which may have come from Qatar.	H. Matthews, pers. comm.

Table 1: Records of the Arabian Sand Cat in the Arabian Peninsula

Country	Date	Locality	Type	Source
Saudi Arabia	2001-2009	Saja/Umm Ar-Rimth	Total of 64 individuals trapped	M. Sher Shah & M. Shobrak, pers. comm
	2003-2007	Saja/Umm Ar-Rimth	4 trapped in reserve fence	Sher Shah and Cunningham, 2008
	2006	Saja/Umm Ar-Rimth and Mahazat as Sayd reserves	6 live caught	Strauss et al., 2007
	1998-2000	Mahazat as Sayd reserve	17 trapped and tested for FIV, FeLV and CDV	Ostrowski et al., 2003
	1999	Near Riyadh	10 trapped for health studies	
	1997	Mahazat as Sayd Houbara Reintroduction Site	3 individuals captured and translocated	Lenain and Warrington, 2001
	1997	Harrat al-Harrah Protected Area,	Individual trapped	P. Seddon, pers. comm.
	1996	Uruq Bani Ma'arid Protected Area	Individual sighted in early morning	T. Wachter, pers. comm.
	1996	Harrat al-Harrah Protected Area	Partially mummified specimen collected at Jibal Zallaqah	Seddon et al., 1997
	1992	Harrat al-Harrah Protected Area	Individual sighted in Liss Sector	Seddon et al., 1997
	1989	Harrat al-Harrah Protected Area	Individual caught and released by rangers Dead individual captured	Goriup et al., 1989 M. Sher Shah, pers.comm.
	1982	Rumah	Individual photographed by Vincett	Harrison and Bates, 1991
	1980	Ashayrah	One sighting	Gasperetti et al., 1985
	1967	Between As Sarrar and Al 'Uwaynah	One live-caught and photographed	Harrison, 1968
	1953	Wafra (on Kuwait border)	Kitten photographed	Harrison and Bates, 1991
Syria	2005	Al Talila (near Tadmor)	Camera trapped	Serra et al., 2007
United Arab Emirates	2012	Sweihan	Individual caught and presented to Al Ain Zoo	Lisa Banfield, pers. comm.
	2005	Baynunah	Photographed	Drew and Tourenq, 2005
	2004	Sweihan	Caught and presented to Al Ain Zoo	Drew and Tourenq, 2005
	2002	South of Al Ain	Caught and found for sale in pet shop	Drew and Tourenq, 2005
	2002	Sweihan	?	Drew and Tourenq, 2005
	2001	35 km northwest of Al Ain	Seen at den	Cunningham, 2002
	1999	Near Margham	Unconfirmed sighting	Cunningham, 2002
	1995/96	Sulayf/Wutayd northwest of Liwa	Tracks	Cunningham, 2002
	1992	Ghayathi (western Abu Dhabi)	Carcasses	Osborne, 1992 (Cited in Cunningham, 2002)
	1988/89	Near Liwa oasis	Animals donated to Al Ain Zoo reportedly came from here	Cunningham, 2002
	1987	Southwest of Wutayd	Carcasses	Cunningham, 2002
	?	Near Jebel Ali	Skulls	Cunningham, 2002
	?	Ras al Khaimah	Skulls	Cunningham, 2002
?	Jebel Ali	Bedouin reports	Gross, 1987	
?	Falaj al Mualla	Bedouin reports	Gross, 1987	
Yemen	1952	Beihan	Individual taken to London Zoo	Harrison and Bates, 1991

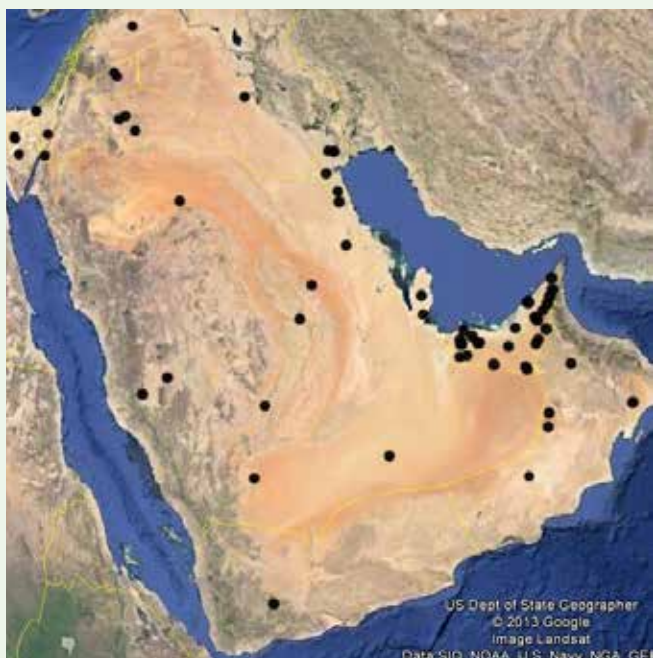


Figure 7: Distribution of the Arabian sand cat based on published and unpublished, confirmed and unconfirmed reports. Details are shown in Table 1.

2.7. Conservation Status

There are no reliable estimates of population size or trend. It is generally regarded as rare and sparsely distributed, except in Central Asia. Heptner and Sludskiy (1972) described it as common and reported that in the 1960s up to 1000 skins a year were processed in Uzbekistan, 500–2000 in Turkmenistan and 100 in Kazakhstan.

The Sand cat is listed on the IUCN Red List as Near Threatened as a precautionary measure due to its patchy distribution and low number of confirmed records, the degradation of desert ecosystems and a potential decline in small mammal prey, but research may find it to be either Vulnerable OR Least Concern (Mallon et al. 2008). During the production of this publication the IUCN listing for the sand cat was being reassessed and was due for announcement by June 2014. It is included in CITES Appendix II.

Regional red list status was assessed informally during the annual Sharjah workshops as Lower risk/least concern in 2000 with “no evidence to support any rate of decline” except in Oman where there had been no recent sightings in prime habitat. In 2004 it was listed as Near Threatened (EPAA 2004). A formal Red List workshop in 2011 also assessed its regional status as Near Threatened (Mallon and Budd 2011).

Table 2: Occurrence of Arabian Sand Cats in Protected Areas

Country	Site
Saudi Arabia:	Mahazat as Sayd (2244 km ²); Saja/Umm Ar-Rimth (6000 km ²); Uruq Bani Ma'arid (12,787 km ²); Harrat al Harrah (13,775 km ²)
Oman:	As Saleel
Jordan:	Wadi Rum; proposed Burqu' protected area
Syria:	Al-Talila
UAE:	Baynunah

In 1996 the sand cat was assessed as Endangered in the UAE based on opinion of the UAE Biodiversity Conservation Committee (Hornby 1996). Based on the scarcity of records, Drew and Tourenq (2005) estimated that there were <250 mature individuals in the Emirate of Abu Dhabi and also assessed it as Endangered.

2.8. Threats

There is little firm evidence of threats to the sand cat. Possible threats include habitat degradation, especially due to overgrazing by camels and goats, expansion of human settlements, persecution of carnivores, climate change and disturbance, to which they seem extremely sensitive (Harrison and Bates, 1991; CBSG, 2000; EPAA, 2004; Drew and Tourenq, 2005; Mallon et al., 2011). They may be threatened locally by the pet trade (Roberts, 1977), although there are few recent reports, and they can get stuck in fences and die if not released (Sher Shah and Cunningham, 2008) (see Figure 8). They are not usually persecuted due to religious respect for small cats because of their association with the Prophet Mohammed, according to Dragesco-Joffé (1993). In the Moroccan Sahara two sand cats were reportedly killed by the dog of a shepherd (Sliwa et al., 2013). There may be a risk of disease transfer from domestic and feral cats; one study in Saudi Arabia found an 8% prevalence of feline leukaemia virus (FeLV) in 17 sand cats although no instances were found of other viruses (Ostrowski et al., 2003).



Figure 8: A sand cat stuck in a fence within the Saja/Umm Ar-Rimth Protected Area in Saudi Arabia (M. Sher Shah, NWRC). While this and another cat survived two were not found in time and died (Sher Shah and Cunningham, 2008).

3. Arabian Sand Cat *One Plan* Conservation Workshop Report

The information below is gathered from presentations of the workshop delegates (see Appendix 6.3 for agenda) and from the discussions that followed.

3.1. *Ex situ* Conservation

3.1.1. Global Captive Population

According to the latest edition of the International Studbook (2013), in 2012 there were 94 sand cats (44.50) in 23 EAZA institutions and 2 associated institutions and 24 (11.13) plus 3 neutered in 13 collections in the USA and Canada (Breton, 2013). A few more animals are held in non-registered institutions in Europe, Russia and the Middle East. Coordinated regional breeding programmes are in place in Europe and the Middle East by EAZA and EEP and AZA in North America SSP. The International Studbook is maintained by Grégory Breton of Parc des Félines, France.

All sand cats in captivity originate from Pakistan or Arabia so are nominally either *scheffeli* or *harrisoni*. The European population consists of only *harrisoni* and the North American population consists of *harrisoni* and *harrisoni* x *scheffeli* (Breton, 2013).

3.1.2. Arabian Population

In the Arabian Peninsula as of December 2013 there were 59 animals in 6 collections (see Table 3). The largest numbers are held at Al Ain Zoo (32; 17.15) and Al Wabra Wildlife Preservation (19; 9.10). At least two institutions, Riyadh Zoo and Al Bustan Zoological Centre in Sharjah, are planning to keep sand cats.

In Abu Dhabi and UAE in general, joint breeding efforts, information exchange and better record keeping are desirable.

Al Ain Zoo, UAE

The collection currently possesses the largest single collection of sand cats (32; 17.15) anywhere in the world. The founders include three wild-caught animals, two sourced locally, including one caught in 2012 near Sweihan and one from Tadmor, Syria. Most of the sand cats are closely related and genetic diversity is low. Although breeding has been successful, the breeding programme has been temporarily halted while clear objectives are identified

and a regional population management plan is produced.

Mortality of new born young due to multiple factors has been an issue in the past. In cooperation with Cincinnati Zoo, 2 kittens were born through *in vitro* fertilization. Males live on average 7.5 years (maximum 15) and females average 6.9 years (maximum 13).

A Sand Cat Conservation and Research Project has recently been launched by Al Ain Zoo. Part of this involves collaboration with the Wild Genes laboratory at the Royal Zoological Society of Scotland to identify genetic markers and assess the relatedness of animals in the collection. Results so far show that four haplotypes have been identified among the captive population at Al Ain, with one of them dominating.



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Al Wabra Wildlife Preservation, Qatar

In November 2013 there were 19 (9.10) animals including proven breeders. Currently 6 pairs have been put together for breeding although not all have bred to date. The captive population originates from a mix of wild-caught founders and captive-bred animals from Twycross Zoo, UK. In the current population the ages of males range from 3-13 years and females 5-13 years. Automatic video and still cameras are being used to monitor the animals and these have revealed some useful information on behaviour and aided management.

Breeding Centre for Endangered Arabian Wildlife (BCEAW), Sharjah, UAE

Currently only two females are held. There have been around 20 sand cats kept at the centre in the last 15 years. No new acquisitions will be made until survivability can be ensured. The main health problem is toxoplasmosis, a protozoan infection that is fatal in felids. The disease can be passed on by oocysts in faeces and in meat through vertical transmission from females to young *in utero*. Cats are the only definitive host, but other vertebrates are intermediate hosts so it is important to prevent access to enclosures by rodents. Sand cats are given a meat-based diet including chicken, lizards, mice and other rodents. Locusts are given for enrichment and supplementation.

Oman Wild Animal Breeding Centre, Oman

The first sand cat was wild-caught and obtained in 2007 from Magshan, followed by three more from the same area in 2008 and later another from the Wahiba Sands. In total, 21 sand cats have been received or born at the Centre, but only 3 (1.2) are now left. Females have given birth to 5 young on more than one occasion but these did not survive beyond 6 months. Health problems encountered include panleucopaenia and hepatitis. Two males both lost all their teeth.

The Scientific Centre, Kuwait

Eight wild animals caught locally have been donated between 2002 and 2011. The first three were transferred to the Kuwait Institute of Scientific Research station at Sulaibya but were subsequently returned to the Centre. In 2009 there were 6 (5.1) but only 2 males remain. The last breeding occurred in 2008. TSCCK does not currently possess a full breeding facility and hopes to develop one and improve husbandry and breeding.

Table 3. Captive Sand cats in the Arabian Peninsula, November 2013

Facility	Total	Male	Female
Al Ain Zoo	17	15	32
Al Wabra Wildlife Preservation	9	10	19
Breeding Centre for Endangered Arabian Wildlife	-	2	2
Oman Wild Animal Breeding Centre	1	2	3
The Scientific Centre Kuwait	2	-	2
King Khaled Wildlife Research Centre	1	-	1
Total	30	29	59

3.1.3. Assisted Reproduction

The Cincinnati Zoo and Botanic Garden is leading a program of Progressive Application of Assisted Reproduction to Sand Cat Conservation. The aims are:

- Semen collection and banking of the most valuable sand cats in Middle Eastern zoos.
- Semen collection and banking of founder males in the wild (using a simplified protocol).
- Artificial insemination of valuable but incompatible sand cat pairs in Middle Eastern zoos.
- Freezing semen for artificial insemination to facilitate genetic exchange between Middle Eastern zoos and regional populations in the US and Europe.

3.2. *In situ* Conservation

Presentations of on-going studies in Jordan and Saudi Arabia were given at the workshop. No other research projects focussed on sand cats are known from Arabia.

In Jordan the Royal Society of Conservation of Nature is conducting surveys of small and medium carnivores using five methods (spoor surveys, interviews, live trapping, camera trapping and spotlighting (Omar A'abed, pers. comm.). To date there have been no sand cats found during this study.

The second study presented was that of the long-running project of Moayyad Sher Shah, Dr. Mohammed Shobrak and colleagues in Saja/Umm Ar-Rimth reserve in Saudi Arabia. In 4509 trap nights, 64 (31.33) sand cats were captured compared with ten times the number of Rüppell's fox *Vulpes rueppelli*. On one occasion a young male and a young female kitten were caught in the same trap. Estimated at approximately a month old they weighed 0.45kg and 0.60kg respectively. Additionally, between February 2004 and July 2006 12 (5.7) sand cats were fitted with radio collars and 600 locations were obtained. Data regarding range size and density found during this study has been included in 2.4.3 above.

3.3. Problem Analysis– Wild Populations

The main threats to wild and captive sand cats in the region, the underlying causes, constraints and gaps were identified by four working groups. These were then reviewed by all participants and grouped together as appropriate. Assessing the severity of individual threats to sand cats was problematic because so little quantified information is available.

3.3.1. Direct Persecution

Carnivores are routinely shot, trapped and poisoned in the Arabian region (Gasperetti et al., 1985; Harrison and Bates, 1991; Mallon and Budd, 2011). This indiscriminate persecution is focused primarily on larger species but smaller species are also killed, even if not deliberately targeted. Anti-predator strategies are also in operation at some Houbara bustard *Chlamydotis undulata* release sites. Some sand cats are no doubt killed but it is very difficult to estimate the number. Many people may be unaware of the conservation status of the sand cat and its special nature. The overall impact on the sand cat is likely to be low, but the situation needs to be kept under review.

3.3.2. Fences

Four cases of sand cats becoming stuck in fences were reported between 2004 and 2007 at Saja/Umm Ar-Rimth and Mahazat as Sayd reserves in Saudi Arabia (Sher Shah and Cunningham, 2008). Several nature reserves in the region are fenced. This is clearly a problem but may be localised and it not possible to assess the extent without further research.

3.3.3. Trade

There is an extensive trade in wildlife within the region for pets and private collections. Sand cats are rarely seen for sale in markets though one was reported in Iraq in 2012 (Mohammad et al., 2013). The overall impact is considered to be low however there is a cautionary example of overexploitation from Pakistan. Following the sale of 9 animals to zoos in the mid-1960s, there was a surge in trapping and collecting and by 1973 it was almost impossible to find sand cats in that area (Sunquist and Sunquist, 2002).

3.3.4. Habitat Loss and Degradation

This factor is considered to be a high threat to biodiversity across the whole region. Contributory causes include overgrazing, residential and industrial development, cutting of trees, over-extraction of ground water and poorly planned agricultural expansion. Construction of boreholes has exacerbated the problem, leading to the expansion of settlements and year-round grazing of formerly seasonal rangelands. The impact on the sand cat is hard to assess because of the lack of data. Overgrazing degrades the vegetation, reducing ground cover for small mammals, reptiles and arthropods, thus reducing prey availability for sand cats. Recreational off-road driving, particularly 'dune-bashing', damages sand dune habitats which may affect sand cat populations more than other small carnivores. There is a lack of integrated land-use planning across much of the region.

3.3.5. Disturbance

Access to areas of wilderness has greatly improved with road construction and the wide availability of 4WD vehicles. This has resulted in increased levels of disturbance and the shrinking of undisturbed 'core' areas for wildlife.

3.3.6. Drought and Climate Change

Periodic droughts affect the region but their impact on the sand cat and its prey are unknown. Collation of published information indicates that temperatures have been increasing by 0.2-0.3°C per decade across the Arab region and could increase by a further 3-4°C by the end of the century (Verner, 2012). Based on the few long-term records available the frequency of extreme events such as hot days, droughts and intense rainfall seems to be increasing although overall rainfall is expected to decrease in most of the region (Verner, 2012). The impact of these changes on the ecosystem of the sand cat is not known however droughts, higher temperatures and decreased rainfall are likely to have a negative impact on habitat quality and prey availability. Intense rainfall could cause erosion of sand dune habitats.

3.3.7. Fragmentation

Urban development, agricultural expansion and road construction are increasingly fragmenting natural habitats into smaller patches. It is easy to suspect that population fragmentation could be a problem for sand cats, but there is no evidence to support or disprove that. In fact, recent genetic analysis showed

that individual specimens from Tadmor in Syria, and Sweihan in Abu Dhabi held by Al Ain Zoo are genetically close so there may still be gene flow throughout the region. Continuing habitat fragmentation could change this and further investigation is needed.

3.3.8. Hybridization

Hybridization with feral domestic cats has been reported to affect Gordon's wild cat *Felis sylvestris gordonii* in the Arabian Peninsula (Mallon and Budd, 2011). There are no reported cases of hybridization between sand cats and other species.

3.3.9. Lack of Awareness

Lack of appreciation and the low priority given to biodiversity conservation remain important underlying factors at all levels of society, from decision makers to the general public. The negative attitude towards carnivores and lack of awareness of the rarity and particular local value of the sand cat are further impediments.

3.3.10. Other Gaps and Constraints

The most significant gap concerns the lack of knowledge of so much basic information which hinders conservation planning. Research is required on distribution, population size and trend, ecology, habitat requirements, diet, behaviour and investigation of threats. A long-term commitment to field research is required to address these knowledge gaps.

3.4. Problems Analysis— Captive Populations

3.4.1. Disease

Captive sand cats are highly sensitive to respiratory diseases. Infection of the upper respiratory tract has been the main cause of recorded deaths, with the most common disease being infectious rhinotracheitis. These illnesses were seen less in populations in Arabia due to the warmer more arid climate and have also declined elsewhere due to husbandry improvements. Sand cats have also died from enteritis, bronchitis, degenerating liver disease, myocarditis and toxoplasmosis (Breton, 2013). Toxoplasmosis has been a particular problem in at least one Arabian collection whilst in others the causes of death are unknown. Research in toxoplasmosis is being carried out at the Friedrich-Loeffler Institut in Greifswald, Germany.

3.4.2. Husbandry Issues

Mortality of young animals tends to be high and there is a lack of husbandry guidelines to inform captive management. Guidelines are under creation in the European region and will be published during the Spring 2014 following a questionnaire process begun in early 2013.

3.4.3. Genetic and Demographic Issues

Most captive populations are small. The number of founders is limited and there is often little founder information. Poor record keeping and historical records have until recently affected some collections in the region. On a wider scale, there is a need for increased collaborative breeding and full compliance with recommendations of the International Studbook.



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4. Conservation Strategy for the Arabian Sand Cat

4.1. Vision and Goal

The Vision is a statement of the ideal situation for the species that sets the long-term context for the strategy while the Goal is a concrete and more short-term step on the way to reaching it. Draft versions were formulated in small groups then discussed in a plenary session. The common elements were identified and a final version of each was agreed.

Vision

The sand cat is a high profile and well understood species; self-sustaining populations thrive along with its prey in natural habitats, coexisting with people throughout its range.

Goal

To establish coordinated conservation, research and monitoring programmes in all range states and an ex situ regional Population Management Plan.

4.2. Objectives

The Objectives address the main threats represent the steps needed to attain the Goal. Each one is accompanied by a set of actions. Objectives and Actions were again first developed in working groups then reviewed and refined in a general session. Eight Objectives were agreed, as follows:

- Objective 1. A regional Population Management Plan is developed and implemented.
- Objective 2. A husbandry manual is developed.
- Objective 3. A conservation research programme developed and implemented.
- Objective 4. An Arabian sand cat network established.
- Objective 5. Legislation and law enforcement are reviewed and enhanced.
- Objective 6. Awareness of the species and its conservation is increased.
- Objective 7. The strategy is adequately resourced.
- Objective 8. An implementation mechanism is in place.

The full conservation strategy, including actions, responsibilities and timelines is presented in log frame format below.



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4.3. Conservation Strategy for the Arabian Sand Cat- Actions and Responsibilities

Table 4: Conservation Strategy for the Arabian Sand Cat

VISION			
The sand cat is a high profile and well understood species; self-sustaining populations thrive along with its prey in natural habitats, coexisting with people throughout its range.			
GOAL			
To establish coordinated conservation, research and monitoring programmes in all range states and an <i>ex situ</i> regional Population Management Plan.			
Objectives	Actions	Responsibility	Timeframe
1. A regional population management plan is developed and implemented	1.1. Identify all current Arabian sand cat facilities	AAZ (Hessa al Qahtani)	May 2014
	1.2. Obtain pedigree information, if not in the International Studbook	AAZ (Myyas al Qarqaz)	May 2014
	1.3. Carry out genetic analysis (cost estimate and contact lab)	AAZ (Lisa Banfield)	May 2014
	1.4. Make recommendations on breeding/transfer (based on pedigree/genetics)	BCEAW (Jane Budd)	August 2014
2. A husbandry manual is developed	2.1. Survey facilities for current husbandry practices	ABZC (Rozaan de Kock); AAZ (Rashed al Qazmi)	July 2014
	2.2. Review existing manuals from other regions	BCEAW (Jane Budd)	December 2014
	2.3. ID institutional representatives for each section of manual	BCEAW (Jane Budd)	December 2014
	2.4. ID research needs for each section	Institutional Representatives	June 2014
	2.5. Produce draft manual	BCEAW (Jane Budd)	December 2014
3. A conservation research programme developed and implemented	3.1. Develop survey and monitoring methods	EWS/WWF (Jacky Judas)	June 2014
	3.2. Assess the distribution and abundance of sand cats	<i>Iraq:</i> <i>Jordan:</i> <i>Kuwait:</i> <i>Oman:</i> <i>Qatar:</i> AWWP <i>Saudi Arabia:</i> NWRC (Moayyad Sher Shah); TU (Mohammed Shobrak) <i>Syria:</i> <i>UAE:</i> AAZ (Lisa Banfield); EAD <i>Yemen:</i>	Dec 2015
	3.3. Assess habitat requirements of sand cats and conflicts with development	AAZ (Lisa Banfield); EAD; IUCN CSG (Christine Breitenmoser).	December 2015
	3.4. Establish long-term ecological studies in selected sites	<i>Iraq:</i> <i>Jordan:</i> <i>Kuwait:</i> <i>Oman:</i> <i>Qatar:</i> AWWP <i>Saudi Arabia:</i> NWRC (Moayyad Sher Shah) <i>Syria:</i> <i>UAE:</i> AAZ (Lisa Banfield); EAD <i>Yemen:</i>	December 2015
	3.5. Assess impact of threats on ASC.	In parallel to 3.1.-3.3.	

Table 4: Conservation Strategy for the Arabian Sand Cat

Objectives	Actions	Responsibility	Timeframe
4. An Arabian Sand Cat network is established	4.1. Assess existing networks and draft TOR	IUCN CSG (Christine Breitenmoser)	May 2014
	4.2. Develop website, library and communications tools.	AAZ (tbc)	??
	4.3. Develop a Sand Cat database	EWS/WWF (Jacky Judas)	June 2014
	4.4. Develop a field ID guide and monitoring manual.	EWS/WWF (Jacky Judas); TU (Dr Mohammed Shobrak)	December 2014
5. Legislation and law enforcement are reviewed and enhanced	5.1. Review existing national laws	Oman: OWABC (Khaled al Rasbi) UAE: AAZ (tbc) + UAEU (Dr Safir Muzaffar) Yemen: Iraq: Jordan: Kuwait: Qatar: Saudi Arabia: Syria:	May 2014
	5.2. Recommend specific legislation for where gaps are identified	All stakeholders	> 20 years? Much less if done by decree.
	5.3. Engage with government authorities for purposes of law enforcement and legislation.	Country by country	
6. Awareness of Sand Cat and its conservation is increased	6.1. Review and analyse gaps in education and awareness activities within the region	Working group	
	6.2. Develop a comprehensive public education and awareness program (targeted at schools, camel herders, rangers, farmers decision makers, government leaders)	Working group	
	6.3. Promote Sand Cat as a flagship species for sandy desert habitats in Arabia	Working group	
7. The strategy is adequately resourced	7.1. Develop a budget and funding plan	Working group	
	7.2. Train adequate staff for all <i>in situ</i> and <i>ex situ</i> efforts	Working group	
8. An implementation mechanism is in place	8.1. Set up an ASC Working Group	AAZ	
	8.2. Develop National Action Plans for sand cats	Working group	
	8.3. Gain endorsement for the strategy at regional and national levels	Working group	
	8.4. Draw up a Monitoring and Evaluation Plan	Working group	

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6. Appendix

6.1. List of Acronyms

AAZ	Al Ain Zoo (UAE)
ABZC	Al Bustan Zoological Centre (UAE)
AWWP	Al Wabra Wildlife Preservation (Qatar)
BCEAW	Breeding Centre for Endangered Arabian Wildlife, Sharjah (UAE)
EAD	Environment Agency Abu Dhabi (UAE)
EWS-WWF	Emirates Wildlife Society-World Wildlife Fund (UAE)
INHM	Iraq Natural History Museum (Iraq)
IUCN	International Union for the Conservation of Nature (Switzerland)
IUCN CSG	IUCN Cat Specialist Group (Switzerland)
KKWRC	King Khaled Wildlife Research Centre (Saudi Arabia)
KZ	Koelner Zoo (Germany)
LPF	Le Parc des Felines (France)
NWRC	National Wildlife Research Center (Saudi Arabia)
OWABC	Omani Wild Animals Breeding Centre (Oman)
RSCN	Royal Society for Conservation of Nature (Jordan)
SWA	Saudi Wildlife Authority (Saudi Arabia)
TSCK	The Scientific Centre (Kuwait)
TU	Taif University (Saudi Arabia)
UO	University of Otago (New Zealand)
ZSL	Zoological Society of London (UK)



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6.3. Workshop Agenda

Wednesday 13.11.13		Thursday 14.11.13	
08:00 – 09:00	Registration at hotel		
	Plenary	Working Groups	
		WG1 (<i>in situ</i>)	WG2 (<i>ex situ</i>)
	Opening and Background Information		
09:00 – 09:15	Welcome and opening ceremony – <i>Ghanim Mubarak al Hajeri, Al Ain Zoo</i>	Research requirements and prioritisation	Population management planning
09:15 – 09:30	Conservation at Al Ain Zoo and background to the Arabian sand cat project – <i>Mark Craig, Al Ain Zoo</i>		
09:30 – 09:45	Facilitator introduction – <i>Dr. David Mallon, IUCN</i>		
09:45 – 10:05	Biology and ecology of the Arabian sand cat – <i>Dr. Christine Breitenmoser, IUCN</i>	Design of field research	
10:05 – 10:25	Current knowledge of the Arabian sand cat in the wild (Arabia and Abu Dhabi) – <i>Lisa Banfield, Al Ain Zoo; Pritpal Singh Soorae and Rashed al Zaabi, Environment Agency Abu Dhabi</i>		
10:30 – 11:00	Coffee/tea break		
	Ex situ Populations of Arabian sand cat		
11:00 – 11:20	Overview of the captive Arabian sand cat population – <i>Gregory Breton, EAZA and Sand Cat International Studbook Keeper (via Skype)</i>	Design of field research	Maintenance of captive populations – Husbandry guidelines, breeding etc
11:20 – 12:00	Presentations by each institution (15 minutes each): <ul style="list-style-type: none"> Al Ain Zoo – <i>Myyas al Qarqaz</i> Al Wabra Wildlife Preservation – <i>Hayley Matthews</i> Breeding Centre for Endangered Arabian Wildlife – <i>Dr. Jane Budd</i> 		Research requirements and prioritisation
12:00 – 12:30	<ul style="list-style-type: none"> Oman Breeding Centre – <i>Dr. Khaled al Rasbi</i> 		
12:30 – 13:30	Lunch		
13:30 – 13:45	<ul style="list-style-type: none"> Kuwait Aquarium – <i>Annabel Resueño</i> 	Resources required for research	Resources required for research
13:45 – 14:00	Summary of <i>ex situ</i> populations – <i>Dr. David Mallon, IUCN</i>	Objectives and Actions	Objectives and Actions
	Assisted Reproduction		
14:00 – 14:20	Assisted Reproduction for Population Management and Conservation of Sand Cats – <i>Dr. Bill Swanson, Cincinnati Zoo</i>		
	In situ Arabian Sand Cat Research		
14:20 – 14:30	<i>In situ</i> research in Jordan – <i>Omar A'abed, Royal Society for Conservation of Nature</i>	Summary presentation	Summary presentation
14:30 – 14:40			
14:40 – 15:00	<i>In situ</i> research in Saudi Arabia – <i>Moayyad Sher Shah, National Wildlife Research Center/ Saudi Wildlife Authority and Dr Mohammed Shobrak, Taif University</i>		
15:00 – 15:30	Coffee/Tea Break		
	Project Planning	Plenary	
15:30 – 16:30	Status review and threat analysis	Summary presentations from each working group and discussion (30 minutes each)	
16:30 – 17:00	Vision and Goal	Wrap-up and Closing- Dr David Mallon	
18:45 – 20:30	Gala dinner at Al Ain Zoo. Bus leaves hotel at 18:45.		

6.4. Delegate Feedback

(3) Delegate Feedback				
	Travel Arrangements	Hotel stay and service	Conference room setup	How do you rate the topics covered in the workshop?
Excellent	6 (75%)	8 (72%)	13 (87%)	14 (93%)
Good	2 (25%)	3 (27%)	1 (7%)	1 (7%)
Satisfactory	0	0	1 (7%) (too cold)	0
Unsatisfactory	0	0	0	0

Which topic(s) were you most interested in and why? In no particular order:

- Embryo transfer and artificial insemination.
- *In situ* research and results from Saudi Arabia.
- Research and monitoring.
- Research gaps.
- Genetics studies.
- Disease and mortality.
- Disease research.
- Linking *ex situ* with *in situ* knowledge and vice versa.
- Population management planning.
- Objectives and actions.

Which topic(s) would you have liked to discussed more and why? In no particular order:

- *In situ* conservation, research and monitoring.
- Habitat preferences and requirements of sand cats in the wild, sightings, densities, home ranges etc.
- Policy and incorporation of stakeholders.
- Scientific approach/thinking on predator management.
- *Ex situ* management of the sand cat – covered but more detail needed in the future.
- Breeding including standard veterinary approaches.
- Wildlife diseases.
- Genetics.
- Persecution.
- Not enough time to work on activities.

Which other topics do you think should be covered by the workshop? In no particular order:

- Behaviour of the sand cat.
- Nutrition.
- Handling practices.
- Other wildlife biodiversity that is/might be affecting the sand cat.
- Emphasis on research publications or journals and not just internal reports to make information more widely available.
- Other stakeholder views eg livestock herders, policy makers and legal experts.

Were the 2 days sufficient to achieve the aims of the Sand Cat workshop?

Yes	13 (92%)
No	1 (8%)

Suggested timeframe to next workshop:

Yearly	9 (69%)
2 Years	3 (23%)
2+ Years	1 (7%)

Do you recommend any other Individual or Organization to be invited to the next workshop? In no particular order:

- Research institutions.
- Government ministries and environment agencies from the region.
- Ministry of Water and Environment (UAE).
- Funding agencies.
- Dubai Desert Conservation Reserve (Greg Simkins).
- Kuwait Zoo.
- Kuwait Institute of Scientific Research.
- Rangers and people who frequent the desert more frequently and likely to encounter sand cats.
- Dubai Zoo (Dr. Reza Khan).
- Policy makers and legal experts.
- Veterinary centres.

Any other comments or recommendations:

"We had an excellent facilitator – Dr Mallon you did an excellent job, thank you".

"Delegates were free to exchange and share information".





حديقة الحيوانات بالعين
AL AIN ZOO