

## Camera-trap Assessment of the Hawf Protected Area, Yemen

### Abstract

The natural history of the Arabian leopard is little known due to the various threats it faces in its home range. Of the four subspecies in the Arabian Peninsula, the *Panthera pardus nimr* is the sole survivor and occurs in restricted pockets across the peninsula. Local cultures and social values combined with a lack of education and understanding of the intrinsic value of biodiversity, threaten the survival of this species in Yemen. A two month field survey was conducted in Hawf, Southern Yemen as an initial step to assess the status of the Arabian leopard. Preliminary survey results from 58 trap nights using twelve camera-traps and a systematic sign survey revealed that despite prime habitat and a good prey density, the leopard may have been pushed to the fringe of its natural range. The caracal appears to have taken over the role as apex predator in parts of the region.

**Keywords:** Arabian Leopard, Yemen, Hawf Protected Area

### 1. Introduction

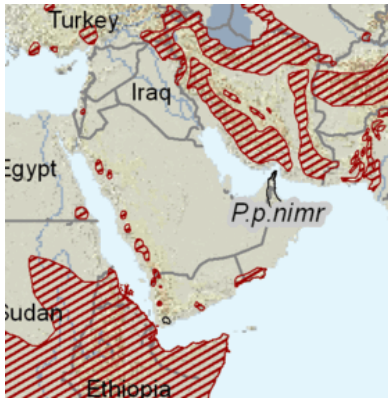
Non-invasive techniques of camera-trapping are commonly used to determine the presence or absence of a particular species or species assemblages in a given area. A better understanding of the ecology of a species and its intra- and interspecific interactions within its niche can lead to effective management plans for the target species.

The Arabian leopard *Panthera pardus nimr* is classified as "Critically Endangered" on the IUCN Red List 2006 and listed in Appendix I of CITES (1,2). It is one of the most endangered feline species on the Arabian Peninsula. Little is known about the natural history of the Arabian Leopard in the wild. The combination of a lack of data and multiple threats contribute to inappropriate protection of the Arabian leopard in Yemen. A preliminary analysis was conducted in the Hawf Protected Area to determine if the Arabian leopard still dominated the food chain. The adjoining protected area of Jebel Samhan in the Sultanate of Oman, is home to 17 individuals that have been monitored since 1997 (Spalton et al 2006). The Hawf Protected area is a biological continuation of the Dhofar region broken only by the security border fence

running along the frontier between Oman and Yemen and is about 4 km long.

This species plays a crucial role as super predator in maintaining the health of the niche it occupies by affecting the population dynamics of its prey species. It has been declared the national animal of the Republic of Yemen since 2008. It can play an important role as a flagship species in the future of conservation in the country.

The Arabian Leopard is the smallest of the leopard species and is assumed to have occurred in the mountainous regions of the Middle East [Cat News]. Today isolated populations occur in parts of Saudi Arabia, Oman, Yemen and the United Arab Emirates (Fig.1).



**Figure 1: Current distribution of the Arabian Leopard *Panthera pardus nimr***

Leopards are solitary and territorial; the area of their territory depends on the prey availability and can extend over several square kilometres in areas of low prey density. The leopard is an opportunistic feeder and will prey on available species especially in areas with low prey densities. Female leopards are mature around the age of two and can produce litters of up to four cubs.

### Study Area

The study was carried out in the region of Al Mahra in South Eastern Yemen, in the Hawf protected area, between lat/lon 16°37'/16°41' N and lat/lon 52°55'/53°04' E (Fig.2).



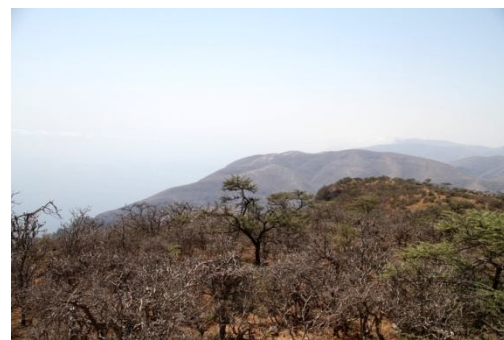
**Figure 2: Location of Hawf Protected Area**

The Hawf Protected Area covers approximately 300 km<sup>2</sup>. The area is characterised by cliffs rising upto 1200m asl, covered in a variety of habitats. The major vegetative types range from moist cloud

mountain forests to dry scrub and thorn landscapes (Fig.3, 4, 5, 6).



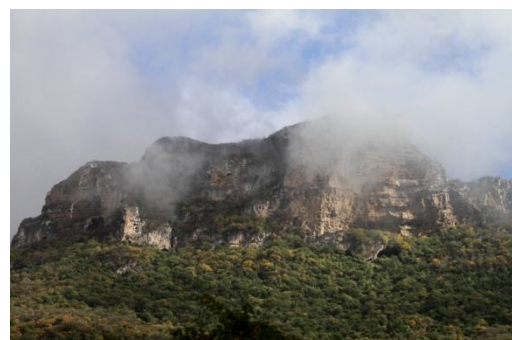
**Figure 3: View of the Hawf Protected Area**



**Figure 4: Scrub and thorn habitat at 900m asl**



**Figure 5: Hilly desert landscape in the Hawf Protected Area**



**Figure 6: Montane cloud forest, a particularity of the Hawf region**

## 2. Material and Methods

### Camera Trap Surveys

The data was collected in the Hawf Protect Area between the months of October and November 2010. A set of 12 trail cameras were deployed and monitored during 58 trap nights. Three different models of camera traps were used- Bushnell Trophy Camera, Reconyx RC60HO and PIRPIC04 systems developed by the Centre for Electronics Design and Technology (CEDT), a department in the Indian Institute of Science (IISc), Bangalore, India. All three systems use passive infrared (PIR) motion detection that reacts to the heat emitted by the body of animals passing front of the camera trap. While the CEDT trail cameras use conventional xenon flash, the Bushnell and Reconyx use InfraRed (IR) LED night vision lighting which is almost invisible to the human eye. Corresponding batteries and memory cards were used and extra material was stored at the base camp. The stations were single-trap stations to cover a greater area and determine fauna movement. Paired-camera stations were envisaged to be installed once there was proof of existence of the leopard. Coordinates was recorded for each station using a handheld Magellan GPS. Additional information about the vegetation, habitat and personal observations were entered into a field notebook.

Scent lures were used in several trap stations to attract animals via their sense of smell. These exploit the various senses and behaviour of various species- territorial marking, hunger, mating habits etc. A preparation of several mL of Chanel N°5 and Calvin Klein 'Obsession' were sprayed into separate film roll canisters which contained cotton wads dipped in honey. The honey was used as an evaporation retardant. These canisters were placed in close proximity of the camera-traps.

Additional information on the movement of the Arabian Leopard was obtained through interviews with villagers from 10 hamlets within the protected area. Stories of encounters with the leopard were often divulged during our time spent in the village of Hawf.

### Picture Processing

All pictures were systematically uploaded into folders corresponding to the location and camera-trap serial number. The folders were named as 'XXXnnn Dmmm', where 'XXXnnn' is the waypoint number (XXX=HPA for Hawf Protected Area), and 'Dmmm' is the camera trap serial number available on the base of each system. Besides standard software like Microsoft Excel™, we used only freeware tools and applications available for download like Picasa™, GPS Trackmaker™ and Google Earth™.

### Key-wording

All the pictures were opened in Picasa™ and each picture was examined and assigned an appropriate keyword. Keywords were either the name of the species present in the picture or a pre-determined set-up word.

### Geo-tagging

All GPS information collected in the field were downloaded into GPS Trackmaker. All the waypoints were selected and they were exported into Google Earth™ using an in-built menu button (Fig.7). All the pictures were then opened in Picasa and pictures belonging to the same waypoint were selected. Using the 'GeoTag'tool in the menu of Picasa, the selected pictures were assigned a tag corresponding to the waypoint on Google Earth. In Picasa all pictures that have been Geo-Tagged carry a small green icon at the bottom right of the picture. Through this process, the GPS coordinates are transferred in the EXIF part of the jpg file of each picture.



**Figure 7: Distribution of camera traps in the Hawf Protected Area**

### Data-Extraction

The above steps ensure that we have a complete database of pictures, in jpeg format, with each individual picture containing in its EXIF section all the required data, such as longitude, latitude, date, time and species photographed.

Picxtract2t.exe was used to extract all the data from the EXIF section and export them into a text file in “csv” format, compatible with Excel™. This program was used on the Hawf Protected Area master folder, thus generating an Excel containing all pertaining data.

## 3. Results

### Capture Frequencies and Species List

The camera-trap survey yielded 351 useful pictures obtained in 58 trap-nights. Of these, 321 were pictures of mammals and 30 of birds. The traps recorded 10 mammal species and 6 bird species (Table 1). The sequences of pictures in each species worksheet were segregated into “events”. The definition of an “event” is in some way arbitrary, but it is essential to avoid simply counting pictures, as the same animal during the same visit at a trapping station may get photographed many times. An event shall be defined as the visit of a given animal(s) or species at a trapping station within a given time. It was decided that two photographs at the same trapping station belong to two different events if either they are from different species, or they are separated in time by more than a pre-decided time gap. In this case the time gap was set at 30 minutes.

Additionally, scat evidence of the presence of the Arabian hare was found but there was no

Species Common Name	Latin Name	Number of pictures	Number of events	Number of trap stations	Trapping rate (Event per 1000 trap night)
Caracal	<i>Caracal caracal</i>	32	9	6	155
African Small spotted gennet	<i>Genetta felina grantii</i>	3	1	1	17
Arabian Wolf	<i>Canis lupus arabs</i>	137	21	2	362
Striped Hyena	<i>Hyaena hyaena sultana</i>	100	29	5	500
Red Fox	<i>Vulpes vulpes</i>	3	1	1	17
White tailed Mongoose	<i>Ichneumia albicauda albicauda</i>	3	1	1	17
Indian Crested Porcupine	<i>Hystrix indica</i>	16	5	3	86
Honey Badger	<i>Mellivora capensis pumilio</i>	4	2	2	34
Rock Hyrax	<i>Procapra capensis</i>	23	9	2	155
Gerbil	<i>Gerbillus sp.</i>	2	2	1	34
Arabian Partridge	<i>Alectoris melanocephala</i>	17	7	3	121
Stone curlew	<i>Burhinus oedicnemus</i>	3	1	1	17
Hoopoe	<i>Upupa epops</i>	5	1	1	17
Isabelline Wheatear	<i>Oenanthe isabellina</i>	4	2	2	34
Houbara Bustard	<i>Chlamydotis undulate</i>	1	1	1	17
Laughing dove	<i>Streptopelia senegalensis</i>	3	2	1	34
Black start	<i>Cercomela melanura</i>	2	1	1	17
Yellow-vented Bulbul	<i>Pyconotus xanthopygos</i>	1	1	1	17

**Table 1: Species list and Capture rates**

photographic evidence. Interviews with goat-

herders and people collecting frankincense in the area indicated that the Nubian Ibex *Capra ibex nubiana* once occurred in the area. The current range of this species in Yemen is unknown.

The species accumulation curve is done to see if the sampling technique has been successful and yielded evidence of the presence of a majority of species present in the study area. Between weeks one and eight the graph shows a progressive saturation which indicates that most of the species present have been captured (Fig.8). It can be noted that four new species have been captured in the week nine all of them at new locations where trapping had not been previously done. The capture of these new species, coupled with the scat evidence of Arabian hare indicates that further trapping could yield evidence of more species, covering more areas.

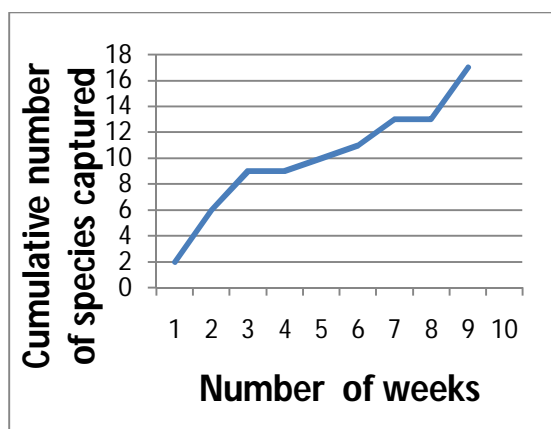


Figure 8: Species Accumulation Curve for Hawf Protected Area

Among the bird species, the Blackstart *Cercomela melanura*, Isabelline wheatear *Oenanthe isabellina*, Arabian partridge *Alectoris melanocephala*, and the Stone curlew *Burhinus oedicephalus* were recorded photographically. The trapping effort also yielded pictures of the rare Houbara Bustard *Chlamydotis undulata* (Fig.9).



Figure 9: Photographic Evidence of a Houbara Bustard *Chlamydotis undulata* in the Hawf Protected Area

#### 4. Discussion

As there is little information available on the species that occur in the region of Al Mahra, the species captured were compared to a list from the Dhofar region in Oman. The two areas are a biological continuity with similar habitats and human occupation. During this preliminary study, the camera traps in Hawf Protected Area recorded 60% of the species known to be present in the general area of Dhofar.

One of the peculiar aspects of the area is the lack of natural springs and water holes. Wild and domestic animals share man-made water points; this can lead to a bilateral transmission of diseases.

The area has been defined as a protected area; yet there has been little change in the activities of the local people concerning the use of natural resources and land use. Certain human activities have contributed significantly to the reduction in biological diversity. Cattle, camel and goat compete with wild herbivores for resources. Domestic animals are in close proximity with wild predators and are generally more accessible, easier prey. The constant presence of humans and domestic animals in a protected area can affect the behaviour of wildlife. There may be a spatial avoidance of species in which wild species change their feeding strategies and

activity patterns to reduce interactions with domestic animals. They may be forced to be more nocturnal or diurnal or exploit a different resource which may not be optimal for their survival.

The trapping effort was concentrated in a relatively small area of the protected area and for a short duration. Leopard territories in this region may be so large that animals do not visit a particular location for several months.

The interviews yielded several important facts and figures about the leopards. Several elderly gentlemen assured us that since the introduction of firearms in the region leopards were rarely seen. There were at least 4 records of leopards killed; most of them 20 years ago. There were three recent records of caracals killed between 2008 and 2010. Goat herders spoke of killing ibex and hyenas but did not mention the date or number of animals.

## 5. Conclusion

The camera-trap assessment of the Hawf Protected Area was successful in documenting the existing species and their distribution. In spite of a low density of individuals, the species accumulation curve appears to be saturating indicating that almost all species present in the area were captured.

All the villagers interviewed uniformly feared the leopard, not for their own lives but for the life of their livestock. However, very few animals have been preyed on in recent years. At least 90% of villagers interviewed have never seen a leopard and those that claimed they did mistook hyenas and the African small spotted genet for the leopard.

In view of the short duration of this initial camera trap survey and the very limited area covered, it is essential to pursue the effort in the Hawf Protected Area to arrive at a realistic

assessment of the status of the Arabian Leopard in this region.

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Figure 10: A Caracal photographed by a camera trap



Figure 11: An Arabian wolf in the Hawf Protected Area



Figure 12: A striped Hyena in the Hawf Protected Area

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- (14) Distribution map: <http://www.iucnredlist.org/apps/redlist/details/15958/0>