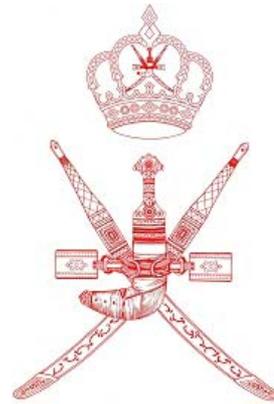


EXPEDITION REPORT

Status of the Arabian leopard (*Panthera pardus nimr*) in the mountains of the Musandam peninsula, Sultanate of Oman.

Expedition dates
15 January – 24 February 2006
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Report published:

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Abstract

The Arabian leopard (*Panthera pardus nimr*) has disappeared from much of its former range on the Arabian peninsula. Its last stronghold is Oman's Dhofar region. There is also a population across the border in Yemen, but this is highly threatened and needs much more study. The leopard enjoys legal protection in Oman. Long-term study, protection and conservation measures in the south have enabled the leopards to survive and thrive, but a question mark hangs over whether Arabian leopard survives anywhere else in Oman. Arabian leopard is no longer thought to be present in the Hajar range, although Arabian tahr is still present in small numbers. Arabian leopards were known to be present on the Omani territory of the Musandam peninsula until 1997, but there have been no records of leopards since. It was therefore important to survey this region to establish whether the Arabian leopard still survived in the north of Oman and how much, if any, of its prey base remained. To this end Biosphere Expeditions conducted the first Arabian leopard survey in Musandam in collaboration with The Office of the Adviser for Conservation of the Environment, Diwan of Royal Court (OACE) in 2006. The survey lasted two months. No sign of Arabian gazelle or tahr were found, but possible sign of Arabian leopard was found at the end of the 2006 survey, in February. Although these were not conclusive, it was decided to continue the survey the following year. Biosphere Expeditions thus returned in 2007 and firm evidence of Arabian leopard was found during this survey. However, the population is thought to be very small and probably not viable. The research also showed that Arabian tahr and gazelle, two important leopard prey animals, are no longer present or at very low numbers, probably due to competition pressures from goat livestock, nor is Arabian wolf, probably due to overhunting. Habitat degradation and encroachment through livestock and human disturbance are ubiquitous.

الخلاصة

انقرض النمر العربي من معظم نطاق عيشه في شبه الجزيرة العربية، ويتمركز وجوده حاليًا في محافظة ظفار بسلطنة عمان. كما تعيش مجموعة منها على الحدود اليمنية ولكنها مهددة بالانقراض وبحاجة إلى المزيد من الدراسة. ويحظى النمر بحماية القانون حيث مكنت الدراسات طويلة الأمد وإجراءات الحماية وصون الطبيعة في جنوب عمان إلى بقاء النمر واستمرارها، ولكن يبقى السؤال الذي يطرح نفسه هل تعيش النمر العربية في أي مكان آخر بالسلطنة إذ يسود اعتقاد بأنه لم يعد يوجد بسلسلة جبال الحجر بالرغم وجود أعداد قليلة من حيوانات الطهر العربي. كما أنه من المعروف وجود النمر العربي في الأراضي العمانية بمحافظة مسندم حتى عام 1997م، إلا أنه لم يتم تسجيل النمر بها بعد ذلك العام. وعليه، كان من الأهمية بمكان إجراء مسح للنمر العربي للتأكد من بقاءه في شمال السلطنة وعن أعداد الحيوانات التي يتغذى عليها - إن وجدت. وعليه أجرت شركة بيوسفير اكسيديشنز أول عملية لمسح للنمر العربي بمحافظة مسندم بالتعاون مع مكتب مستشار حفظ البيئة بديوان البلاط السلطاني في عام 2006م والذي استمر لمدة شهرين دون دلالة على وجود الغزال العربي أو الطهر ولكن وجدت مؤشرات إيجابية على وجود النمر في نهاية المسح في فبراير 2006م. وعلى الرغم من أنه لم تكن دلائل قاطعة، تقرر عودة الحملة الاستكشافية لتكملة المسح العام الحالي. وعليه، عاد فريق بيوسفير اكسيديشنز في عام 2007م حيث عثر على أدلة قوية على وجود النمر العربي في هذا المرة، بيد أنه من المرجح أن تكون أعداد النمر في مسندم قليلة وغير قابلة للحياة. كما أظهر المسح ندرة حيواني الطهر والغزال وهما من أهم الحيوانات التي يتغذى عليها النمر العربي، وإن تواجدت فبأعداد قليلة جدًا والسبب على الأرجح يعود إلى منافسة قطعان الأغنام لمناطق عيشها. كذلك لم يسجل المسح وجود الذئب العربي ربما بسبب الصيد الجائر، كما بات تدهور الموائل نتيجة الرعي الجائر للمواشي والإزعاج البشري منتشرًا.

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1. Expedition Review

M. Hammer (editor)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with two expeditions to the Musandam peninsula of Oman that ran from 15 January – 24 February 2006 and 14 January – 9 February 2007 respectively. The expeditions researched the status of the Arabian leopard in the area as it was unknown whether the Arabian leopard survives in the rugged mountains of the Musandam peninsula. Anecdotal accounts told of a strong leopard presence in the area in the past and Biosphere Expeditions collaborated with the Office of the Adviser for Conservation of the Environment of the Diwan of Royal Court to assist in removing this gap in knowledge so that future conservation efforts can be directed effectively.

The Arabian leopard is a flagship species for Oman's mountain habitats. It once occurred throughout the mountainous regions of Oman, Yemen, Saudi Arabia, the United Arab Emirates, Palestine and Jordan. However, by the 1990s the leopard became locally extinct in most areas of the Arabian peninsula and if viable populations remain, they are most likely to be found in the high mountains of Oman and Yemen.

The Arabian leopard is the largest surviving cat species of Arabia. Listed as "critically endangered" in the IUCN List of Threatened Species, it is on Appendix 1 of the Convention on International Trade in Endangered Species (CITES), which strictly regulates international trade in listed animals.

In 1997 the Office of the Adviser for Conservation of the Environment of the Diwan of Royal Court began a survey of the Arabian leopard in Jabal Samhan Nature Reserve in the southern region of Oman, Dhofar, where a strong population has been shown to exist. However, the one other area of Oman where the leopard may survive, the Musandam peninsula in the northern parts of Oman, had not been surveyed until Biosphere Expeditions was asked to survey the area for leopard and its prey species. As the natural prey species in the Musandam region of Oman are likely to be at very low levels, leopards often have to turn to domestic stock, mainly goats, for food. The socio-economic interaction with local people and herders were a further area of investigation for the expedition.

1.2. Research Area

The Musandam peninsula (sometimes also called the Norway of Arabia) is the northernmost part of Oman jutting out into the Strait of Hormuz at the entrance to the Arabian Gulf. The province, or Governorate of Musandam as it is officially known, is separated from the rest of Oman by various parts of the United Arab Emirates including Ras al Khaimah and Fujairah. The Musandam more or less begins where the mountains rise from the plains of Ras al Khaimah.



Map of the Musandam peninsula showing town base of Khasab. An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at [Google Maps](#).

The remote and rugged mountains, which rise straight out of the sea creating fjords and stunning landscapes, have had isolated communities for centuries. Many coastal villages can be reached only by boat, as there are no roads on much of the peninsula. Pockets of flat land support subsistence agriculture. The population of approximately 29,000 is concentrated in the capital, Khasab (18,000 in 2004) in the north and Dibba (5,500) on the east coast. Fishing is the principal economic activity supported by employment in government jobs.

Geology

Rocks of the Hajar supergroup in the north appear to be flat-lying but are actually folded in a north-south trending anticline. Thinly-bedded yellowish-orange dolomitic limestones and mudstones indicating a near-shore environment progress upwards into highly fossiliferous shelf limestones. Shell fragments, brachiopods and micro-fossils in limestone indicate continental shelf conditions. These limestones were deposited from the early Jurassic to the Cretaceous period and are reckoned to be older than 65 million years.

Way of life

Occasional flat ledges of land have been terraced for small-scale agriculture. Low walls are built round the cultivated areas to trap surface run-off. Silt settles from the water flattening the profile of the land and adding to soil. Three dams protect Khasab town from flash floods.

Stone houses, several centuries old, can still be seen hugging the mountainsides in some of the wadis. Rock art made by pecking boulders with a stone implement, can be seen in Wadi Qida and elsewhere. Date palm groves lie to the west of the inlet from the sea at Khasab and at the entrance to the wadis.

The Portuguese built Khasab fort at the beginning of the 17th century at the height of their naval presence in the region. Unlike many forts built on higher ground with a defensive purpose, Khasab fort was a supply point for dates and water to Portuguese ships sailing through the Strait of Hormuz. The harbour gave shelter from rough seas and access by land was virtually impossible. Until quite recently, the Wali (the local governor) used the fort as an official residence.

“Round the bend”

The British arrived on a lump of rock they called Telegraph Island in the fjords back in the mid-19th century, staying for five years. They were laying a telegraph cable from India to Basra in Iraq. Taking the cable "round the bend" of the Gulf gave rise to the expression, since living on Telegraph Island in the extreme heat of summer must have sent them crazy! These days, the island is noted for its rich underwater life and dhows (the local type of fishing boat) stop off here for snorkelling (and so we did on our day off).

1.3. Dates

The expedition ran over a period of ten weeks over two years divided into three two-week slots in 2006 and two two-week slots in 2007. Each slot was composed of a team of international research assistants, scientists and an expedition leader. Slot dates were:

15 - 27 January | 29 January - 10 February | 12 - 24 February 2006
14 - 26 January | 28 January - 9 February 2007

Winter dates away from the extreme heat of summer were chosen for best weather and working conditions.

1.4. Local Conditions & Support

Expedition base

The expedition team was based in a fully furnished villa town base with all mod cons. Field base was a Bedu style tent camp (of a Bedu mess tent and more modern two person dome tents for sleeping in).

Field communications

There was telephone and internet at the town base and mobile phones worked in and around Khasab and in some field locations. In the field, two-way radios were used for communication between research teams whenever possible.

Transport and vehicles

Team members made their own way to the assembly point, which was Muscat in 2006 and Dubai in 2007. From there onwards and back to the assembly point all transport and vehicles was provided for the expedition team, for expedition support and emergency evacuations. Courtesy of Land Rover in Dubai, the expedition had the use of three LR3s and exceptional support from Land Rover throughout.

Team members wishing to drive the Land Rovers had to be older than 21, have a full clean driving licence and a new style EU or equivalent credit card sized driving licence document. Off-road driving and safety training was part of the expedition.

Medical support & insurance

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. The standard of medical care in Oman is high and further medical support was available at a hospital in town. All team members were required to carry adequate travel insurance covering emergency medical evacuation and repatriation. Emergency evacuation procedures were in place but did not have to be invoked. There were no serious medical incidents. There were some cases of blisters and a bruised shoulder due to a fall.

1.5. Expedition Scientists

Local scientists

The local scientists comprise a team from the Office of the Adviser for Conservation of the Environment based in Muscat. The team is headed by Dr Andrew Spalton and assisted by field assistant Hadi Musalam al Hikmani.

Andrew Spalton came to Oman in 1987 to work on the reintroduction of the Arabian oryx. After six years at the project field headquarters in central Oman he left for Aberdeen (Scotland) to complete his PhD on the ecology of the oryx. Returning to Oman in 1995, Andrew took up a new post in Muscat. While continuing to help oversee the oryx project, he undertook new work with the Arabian leopard and Arabian tahr. He set up the Arabian Leopard Survey which collected the first information on the ecology of the highly endangered Arabian leopards. Using camera traps and later satellite collaring, Andrew and his team have mapped the occurrence and range of the Arabian leopard in southern Oman. Andrew now works as Adviser for Conservation of the Environment and oversees a team of scientists and rangers working on the Arabian oryx project, Arabian tahr project and the Arabian Leopard Survey as well as the Oman Botanic Garden that is currently in the design phase. His other interests in Oman include whale watching, diving, trekking and camping in the interior.

Hadi Musalam al Hikmani was born near Jabal Samhan, Dhofar. He joined the Office of the Adviser for Conservation of the Environment in 2001, working first as a volunteer and then since 2002 as a full time field assistant. He quickly became the local expert on Arabian leopard and is today responsible for the field work of the Arabian Leopard Survey. He has also worked on the sand cat and joined expeditions to India where work is ongoing on the snow leopard.

The expedition's field scientist was Tessa McGregor. Tessa was born in Paris and educated in England. She read Biology at King's College, London and specialised in animal behaviour and ecology. Her life-long passion for wildlife and wild places has motivated her personal and professional life. Tessa has worked in remote places, as a wildlife biologist, environmentalist and in the media - TV, radio and journalism (including BBC Natural History Unit, Radio 4, World Service and Discovery). She is an expert on big cat biology and has worked extensively on tigers in Bangladesh and India, and (with Biosphere Expeditions) on snow leopards in the Altai. She loves sharing her passion for the natural world with others and has organised many field trips and wildlife projects. Tessa joined Biosphere Expeditions in 2003 and currently lives in Scotland. Her other interests include riding, diving and photography.

1.6. Expedition Leaders

The 2006 expedition was led by Dominic Hall. Dominic studied Mathematics at Nottingham University and has been recovering ever since. His rehabilitation has involved flitting between life as an editor for an educational publishing company, and going on expeditions, mainly in the tropics of Central America and South East Asia. He fell in love with expedition life on a gap year programme after university and has now led a large number of expeditions with a variety of organisations, most recently to the remote Maliau Basin, deep in the rainforests of Borneo. He is a qualified Mountain Leader and spends every spare minute walking and climbing around his Lake District home.

The 2007 expedition was led by Peter Schütte. Born in Germany, he studied geography and cartography at the University of Bremen (Germany) and Göteborg Universitet (Sweden) and geoinformatics in Salzburg (Austria). He has worked on several mapping and remote sensing projects all over the world. In 2004 and 2005 Peter was involved in wildlife conservation projects in Namibia, where he joined Biosphere Expeditions as member of the team of local scientists and was promptly bitten by the wildlife expeditions bug. He has travelled in Scandinavia, Iceland, Southern Africa, North America and Central Asia. Peter holds First Aid and Off-Road driving certificates and has worked in Namibia, Altai and Oman for Biosphere Expeditions.

1.7. Expedition Teams

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds.

15 – 27 January 2006

Jelle Boef (The Netherlands), Robin Glegg (UK), Brian Green (UK), Veronica Hegarty (Australia), Claudia Hosp (Germany), Ute & Winfried Mohr (Germany), Brian Murphy (UK), Michel Oellers (The Netherlands), Angela van Etten (The Netherlands).

Also (from the media): Andreas Hub (Germany), Charles Graeber (USA), Fritz Jantschke (Germany), Florian Leo (Germany), Dirk Steffens (Germany), Jan Biekehoer (Germany), (from Land Rover): John Lloyd (UK), Wouter Kingma (The Netherlands), (from Biosphere Expeditions): Matthias Hammer.

29 January – 10 February 2006

Rosemary Bowker (USA), Lucy & Peter Eggleston (UK), Andreas Eichhorn (Austria), Wendy Harrell (USA), Jim Reid (UK), Francoise & Bernard Schmitter (France), Marsha Shmalo (USA), Adrian Winn (UK).

Also from the media: Martin Amanshauser (Austria).

12 – 26 February 2006

Holm Augustin (Germany), Yasmin Aziz (USA), Anil Kumar T (India), Jutta Lauf (Germany), Pedro Pons (Spain), Mani Puthuran (UK), Rose Stow (UK), Jens Warstat (Germany).

Throughout the 2006 expedition:

Cooks Barney and Salid.

14 – 26 January 2007

Inge & Ingulf Becker-Boost (Germany), Kate Curnow (Australia), Malika Fettak (Germany), Petra Heppeler (Germany), Christopher Lucy (USA), Jennifer Tondu (USA), Gillian & George Walker (UK), Robyn Yucel (Australia).

Also (from the media): Amanda Sathon (UK) and (from Biosphere Expeditions): Matthias Hammer.

28 January – 9 February 2007

Andrea Baumgärtner (Germany), Iain Buchanan (UK), Julie Noller (Switzerland), Wilma Oehlenschläger (Germany), Petra Olschekwski (Germany), Sibylle Reichmann (Germany), Anja Sparrer (Germany), Sven Strohschein (Germany), Daniela Tindl (Austria), Lothar Wand (Germany), Frances Williams (UK), Helga Zimpel-Erler (Germany).

Also (from the media): The “Land Rover press pack”, journalist James Reinl and his photographer Chandra Balan, and Marcelle Safar from Land Rover.

Throughout the 2007 expedition: Khalid Hikmani as an assistant guide to Hadi Hikmani. P.J. Poly our incredible field cook!

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1150 (in 2006) or £1190 (in 2007) per person per two week slot. The contribution covered accommodation and meals, supervision and induction, special non-personal equipment, all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	60,311
 Expenditure	
Base camp and food includes all board & lodging, base camp equipment	22,324
Transport includes boat fuel & oils, taxis	3,245
Equipment and hardware includes research materials & gear etc purchased in UK, Dubai & Oman	2,923
Biosphere Expeditions staff includes salaries, travel and expenses to Dubai & Oman	7,844
Local staff includes cooks, helpers, guides and other locally staffed services	2,091
Administration includes registration fees, visas, sundries etc	1,829
Team recruitment Azores as estimated % of PR costs for Biosphere Expeditions	7,900
 Income – Expenditure	 12,155
 Total percentage spent directly on project	 80%

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members, who are listed above and who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff, also mentioned above, were central to making it all work on the ground. Thank you to all of you and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank Land Rover for outstanding support in-country in terms of vehicles and support, especially from Wouter Kingma and Marcelle Safar who both helped well above the call of duty. A big thank you also goes to Shell Oman who kindly sponsored the expedition's fuel and in particular to Abdulwahid Al-Farsi and Sethuraman K. from Shell Oman who supported us throughout. We would also like to thank Motorola, Buff®, Cotswold Outdoor, Globetrotter Ausrüstung and Gerald Arnhold for their sponsorship. A special thanks to Johan Viljoen for making the first approach at the ITB in Berlin and from there progressing the project from mere idea to actual research expedition. For their help and support in-country we thank the Royal Oman Police, the Royal Air Force of Oman, the Office of the Governor of Musandam, the Ministry of Environment & Climate Affairs and the local people. For his help with the bird list, we thank Roger Bunce.

1.10. Further Information & Enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Arabian Leopard & Prey Survey

Tessa McGregor
Biosphere Expeditions

2.1. Introduction

The Arabian Leopard *Panthera pardus nimr* is a subspecies of the 'common leopard' *Panthera pardus*. It is listed as critically endangered on the International Union for Conservation (IUCN) Red Data List (2004) and cited on Appendix 1 of the Cites Convention on International Trade in Endangered Species (CITES). The Arabian leopard has disappeared from many of its former ranges in Arabia but there is still a genetically viable population in Oman and possibly Yemen. In Saudi Arabia evidence of a continuing presence of Arabian leopard is lacking (Spalton & Hikmani 2006).

The Yemen population is highly threatened. There is an urgent need for fieldwork to establish the current status of the leopard and its prey in Yemen. Protection is also critical to avoid local extinction.

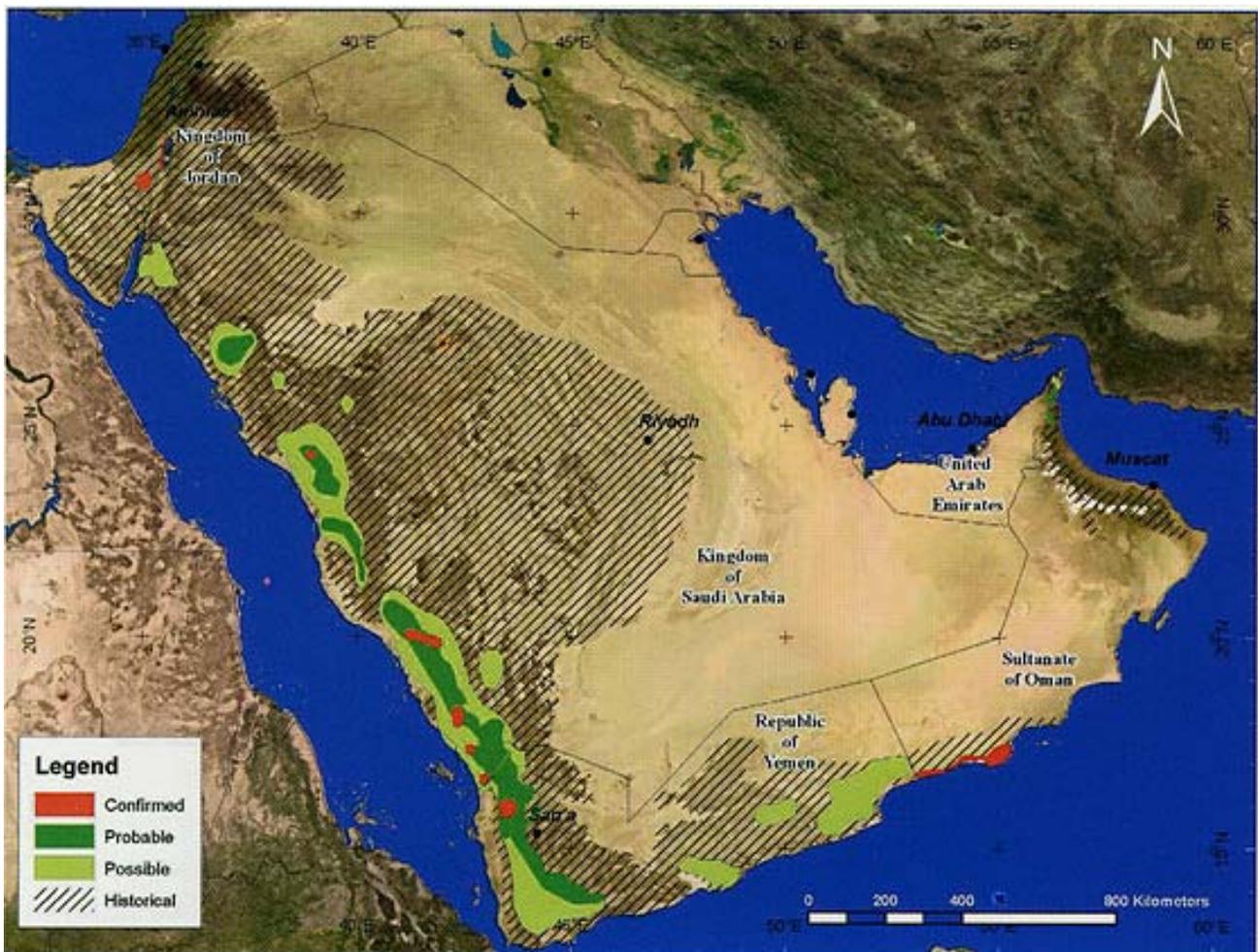


Figure 2.1a. Former and current (since 1990) distribution information for the leopard on the Arabian Peninsula. Confirmed records include confirmed evidence such as dead specimens (with body, skin, etc. available), camera trap pictures and genetic analyses. Probable records include those confirmed by any evidence or by a trained person. Possible records include all non-confirmed or not confirmable records including hearsay and direct observations by untrained persons. From Spalton & Hikmani (2006).

In Oman, the best remaining habitat for leopard is found in the Acacia dominated scrub of the southern escarpment of Jebel Samhan and the semi-desert of the interior and the northern aspects of Jebel Samhan, Dhofar. These areas still have good wild herbivore populations: Nubian ibex, (*Capra ibex nubiana*), Arabian gazelle (*Gazella gazelle cora*) and hyrax (*Procavia capensis*). People and livestock densities are relatively low. Jebel Samhan was declared a Nature Reserve in 1996, but it is the only protected area within the range of existing leopard population in Oman.

While the leopard is officially a protected species in Oman, most of its habitat is not protected. Arabian leopard used to be present in the Hajar range (Harrison 1968), but few records exist for this large region and the last confirmed report was of a dead animal in 1976 (Anon 1997). The leopard is now considered to be absent in the Hajar range (Anon 1997).

There is an on-going Arabian leopard study in the Dhofar region in the south of Oman (Spalton et al. 2006a). This is where the first remote camera trap photos of Arabian leopard were obtained by David Willis in 1995 (Spalton & Willis 1999). These results encouraged an extensive Arabian leopard survey, carried out by Andrew Spalton, David Willis and aided by Hadi Hikmani (Spalton et al. 2006b). Seventeen individual leopards were recorded using camera traps between 1997 and 2000 (Spalton et al 2006a). The study continued and expanded, adding satellite GPS radio tracking and faecal collection and analysis (Spalton et al 2006b). The results of this study have made a major contribution to our knowledge about Arabian leopard behaviour and conservation measures in Dhofar, but no systematic study had been done in Musandam; a remote region that until recently was difficult to access. The construction of roads in the early 1980s and sudden interest in tourism post-2000 meant the area was, and is, changing fast. A wildlife survey was needed to provide benchmark data for the future and to establish whether the Arabian leopard was still present on the Musandam peninsula.

Historical records indicated that Arabian leopards had always been present in Musandam. Leopards were seen and killed in this region. The number of reported killings, usually linked to concerns over livestock safety, increased sharply in the 1970s and 1980s with further killings reported in the 1990s. The last record was of two leopards caught in a leg-hold trap and then shot by Ra's al Khaymah citizens on Omani territory in October 1997. There were no further records of sightings or killings from then onwards (Spalton et al. 2006b). That was the position before the first survey in 2006, described here and undertaken as a joint collaboration between The Office of the Adviser for Conservation of the Environment, Diwan of Royal Court (OACE) and Biosphere Expeditions. The 2006 survey was followed by a second survey in 2007 to complete the work.

The Musandam habitat

The mountains of Musandam are considered marginal habitat for leopard, as herbivores, particularly gazelle, have gone from many areas due to over-hunting and human disturbance. Hyraxes do not occur in northern Oman, so medium sized prey is virtually absent. Over-browsing and over-grazing by livestock, changing agricultural practices and the rapid expansion of road and house building have all contributed to habitat degradation. Arabian leopard and wild primary prey species in Musandam such as Arabian gazelle and Arabian tahr are deemed to be very rare and elusive or locally extinct.

The aim of the survey was to implement Spalton and Bait Said's (2005) recommendation VI., namely 'to accurately establish the status of the Arabian leopard in Musandam and on the Oman-UAE borders'.

In addition to this aim, a further goal of the expeditions was to establish the status of the leopard's primary prey animals, in this case, Arabian gazelle and Arabian tahr.

At the beginning of the expeditions, we were very much aware that we might find a total absence of sign of any of the target species, but even this result would have been a very necessary addition to the data about Arabian leopard distribution.

2.2. Background information on Arabian leopard

Unlike many other big cats, leopards can live surprisingly close to humans, especially if their wild prey is scarce (Sunquist & Sunquist 2002). They are adept at turning their 'hunting by stealth' skills to domestic livestock. This often results in high levels of human/wildlife conflict. Leopards usually suffer unsustainable losses when wild prey populations decline so dramatically that they become wholly reliant on domestic livestock. Traditionally, pastoralists could not afford to tolerate leopard presence when it impacted on their livelihoods. Arabian leopards were hunted in the past for trophy value (skins, teeth, and claws) and killed by herders. Although they now enjoy legal protection in Oman, poaching is still a problem.

Legal status & subspecies

In Oman the Arabian leopard is protected from hunting and capture by Royal Decrees. The penalty for hunting or capture of leopard, an Appendix 1 species is imprisonment from six months to five years and a fine of between RO1000 and RO5000 (approx. £2000 - £10000).

Of the key prey species, the Arabian gazelle and Nubian ibex are also on Appendix 1 of the Royal Decree (6/2003). Other species, including tahr also have legal protection.

There are four subspecies of leopard in Arabia:

Panthera pardus jarvasi: occurs in Sinai and is probably a local variant of *nimr*, but has a darker coat.

Panthera pardus tulliana: occurs in Syria, Jordan and Israel. This sub-species is tawny and darker than *nimr*.

Panthera pardus saxicolour: occurs in Kurdistan & Iraq. It is a larger form with thick, soft coat, which is long and hairy in winter and more like snow leopard. It is paler in colour than *tulliana* and the rosettes are smaller, thicker-ringed & less annular.

Panthera pardus nimr is the smallest subspecies of leopard. It has a pale coat with dark rosettes. Like all leopards, it is a powerful predator. It inhabits mountainous and hilly terrain and seldom ventures into open plains (unlike cheetah). It is scarce now, but, like all leopards, was traditionally feared by humans; for their own safety and that of domestic flocks. The Arabian leopard has been hunted extensively. Hunters have been known to eat the raw heart of their victim believing they derive strength from it.

Life history

Female leopards give birth to a litter of two to four cubs after a thirteen week gestation period, usually in a cave or secluded lair amongst boulders. Males and females associate only for mating. Cubs stay with their mothers for at least 12 months. More research is needed to determine their territorial needs, home range and behaviour across their remaining range.

2.3. Methods

The survey was conducted in the winter period of January/February 2006 and 2007. The total area of Musandam surveyed was 2244 km². The survey area was sub-divided into four blocks, within which survey routes covered as much of the area as time and terrain allowed (see Fig. 2.4.1a). Surveys were conducted on foot, but survey areas were accessed by vehicle (LR3s courtesy of Land Rover). Some survey sites could only be accessed by boat.

Survey routes were planned to cover the best potential wildlife habitats and maximise chances of finding sign of leopard and prey species. The surveys were conducted by a team made up of two field scientists, an expedition leader and a team of between ten and twelve international volunteers (team members). Team members received thorough training in GPS usage, compass and map-reading skills, wildlife/sign identification and sign collection protocol, before participating in the surveys. They were invaluable in helping collect the necessary data in the time available.

Presence/absence surveys, using modified International Snow Leopard Trust (ISLT) snow leopard information management system (SLIMS) No.1 forms, were conducted throughout the survey area. Elevations within the survey area ranged from sea level to over 1400 m. The best potential wildlife habitat areas were given priority, as it was impossible to cover all of the total area due to its size and ruggedness. Data were collected on a daily basis, although not all wildlife sign was found on designated survey routes. In addition to work done on official survey routes, much of the remaining geographical area was covered during reconnaissance visits to identify the best areas to survey. Time was also spent with local people in their villages, settlements and surrounding areas.

Interviewing and involving the local population was an important part of the study. Local knowledge of the area and wildlife made a valuable contribution. Educational literature was distributed to local people. The reasons for the expedition's presence and for surveying the area were explained. Local people were employed as guides on some surveys, as they knew all the best livestock trails. Reliable guides proved to be those who regularly went up into the mountains to look for goats, plants and wild honey. The most productive surveys tended to follow livestock trails into areas of relatively low human disturbance and minimal damage to vegetation by livestock.

Having a large team to help survey was essential to cover a substantial geographical area in a relatively short time. It also meant that chances of finding sign of Arabian leopard and other wildlife in Musandam were maximized by having many people fully engaged in looking for any possible sign.

Thanks to advances in technology, it is possible to build up knowledge of individuals and populations using non-invasive methods such as remote camera trapping, DNA testing using faeces and more controversially, pugmark analysis (Goyal & Johnsingh 2005), although this depends on favourable substrates and good sets of tracks for accuracy.

The survey involved the use of camera traps. Two camera traps were used in 2006, six in 2007, some in remote locations. This was made possible by Royal Air Force of Oman helicopter support. Faecal samples were collected whenever found for identification. Any possible Arabian leopard faecal samples were sent to a laboratory in Muscat for DNA analysis but at the time of writing no conclusive results were available. The material will also be sent to the University of Cardiff for DNA analysis there.

GPS coordinates were taken throughout the surveys to mark important sign of predators, prey and waterholes. Small mammal traps were used to help with small/medium mammal data. Any mammal captured was identified, sexed and scored for condition before release. This was done by observation only as no sedation or physical restraint was used.

Farming methods were documented with particular emphasis on the impact of domestic livestock on the local environment. Levels of habitat degradation due to overgrazing, tree-barking and browsing by livestock were recorded. Direct human disturbance to the environment, e.g. cutting vegetation for fodder or firewood, litter and poaching activities were also noted.

Birds seen during the expedition were recorded as were reptiles and amphibians.

2.4. Results

2.4.1. Mammal sign

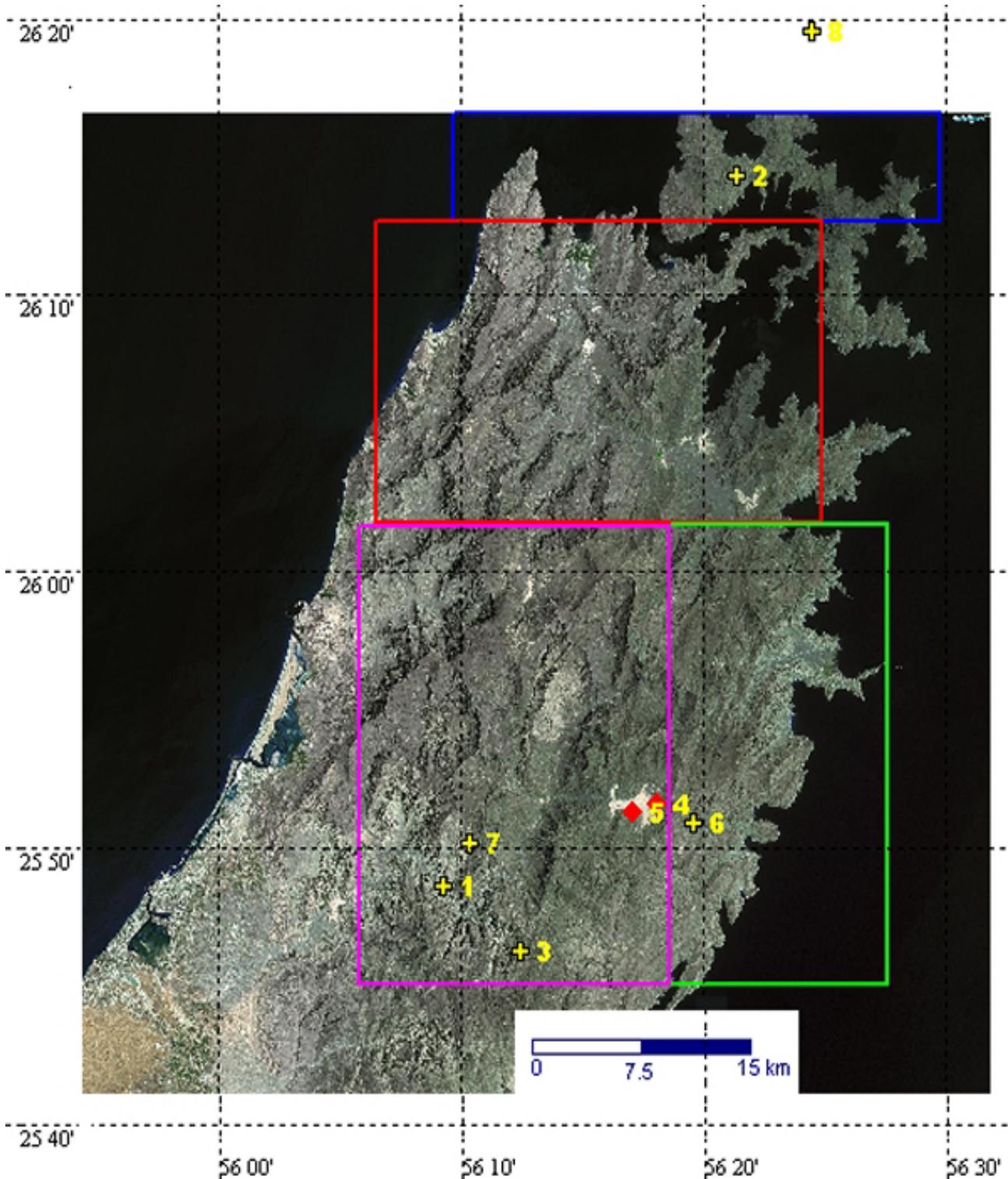


Fig 2.4.1a. Satellite map showing potential and actual leopard sign found in survey area 2006 – 2007. **Survey blocks:** Blue square = survey block 1; red square = survey block 2; pink square = survey block 3; green square = survey block 4. **Sign found:** 1 = 18 Feb 06, PUG? + SC? + K? at altitude 254m with FE? approximately 500 m away and sent off for DNA analysis. 2 = 16 Jan 07, FE? sent off for DNA analysis. 3 = 20 Jan 07, SC? + UR. 4 = 20 Jan 07. V. 5 = 20 Jan 07 PUG. 6= 24 Jan 07, PUG?. 7 = 24 Jan 07 PUG. 8 = 30 Jan 07, SC?. PUG = pugmark/track, FE = faeces, UR = urine, SC = scrape, V = vocalisation, K = kill.

Fig. 2.4.1b shows the total mammal sign found on all surveys in 2006 and 2007. A higher percentage of carnivore sign was found during the 2007 expedition, notably caracal and Arabian leopard. The presence of domestic cat in survey block 3 in 2007 invalidated potential wildcat sign on some surveys. The presence of domestic dogs in 2007 also invalidated potential Arabian wolf data. Domestic cat and dog were not seen in survey blocks 2 – 4 in 2006.

Fig. 2.4.1c shows the percentage of Arabian leopard and caracal sign found in 2006. The percentage of caracal sign found in 2006 was significantly higher than sign of Arabian leopard. Arabian leopard sign found on a sandy ledge under a rock overhang and on the boulder-strew slope below. The slope was sand and gravel and was dotted with acacia trees. The sign found was intriguing, but inconclusive, as the pugmark had been marginally overlaid by goat tracks and there were no faeces or urine detectable at the scrape. The high density of goat tracks on the ledge also made finding further pugmarks impossible. Goat mortality from starvation and disease was very high in 2006. Many domestic goat carcasses were found during the expedition, but the deaths were not caused by predator kills; although many of them had been fed on by caracal and/or fox. The dead goat found near the potential leopard pugmark and scrape had been fed on by a much more powerful predator. The combination of pugmark, scrape and kill in the same location meant we could not discount the possibility of leopard presence in Musandam. This was a major factor in deciding to continue the survey in 2007. Large cat faeces were found 500 m, down in the wadi, but the faecal sample was old and could have been caracal. The sample was sent away for DNA analysis but at the time of writing no conclusive results were available.

Fig. 2.4.1d shows the percentage of Arabian leopard and caracal sign found in 2007. Three definite signs of leopard were found in 2007. A leopard calling was heard by two team members independently, from base camp at 03:00. This vocalisation was heard after a long playback session of pre-recorded leopard calls a few hours earlier. Fresh pugmarks were found under 3 km away, two days later. The pugmarks were found by a local man called Said. He was knowledgeable about wildlife and had worked with the expedition in 2006 as a guide. He came to find the field scientists after seeing the tracks at 07:00. The expedition team was already out in the field, but Said came to get them on their return and led them to the tracks. The pugmarks were positively identified as leopard by both scientists, before nightfall and before heavy rain obliterated them. Two relatively fresh goat kills were found in different areas. One had been killed by leopard and two more possible leopard pugmarks were found in the same survey area, although they were older and damaged by rain.

Fig. 2.4.1e shows the total potential Arabian leopard sign found in 2006 and 2007. There was a significant increase in leopard sign found during the 2007 survey. The fresh pugmarks and vocalisation could not have been made by any other predator. In 2007, local people told us of three sightings in the survey area between December 2006 and January 2007 while in 2006 local people told us there had been no sightings for at least five years.

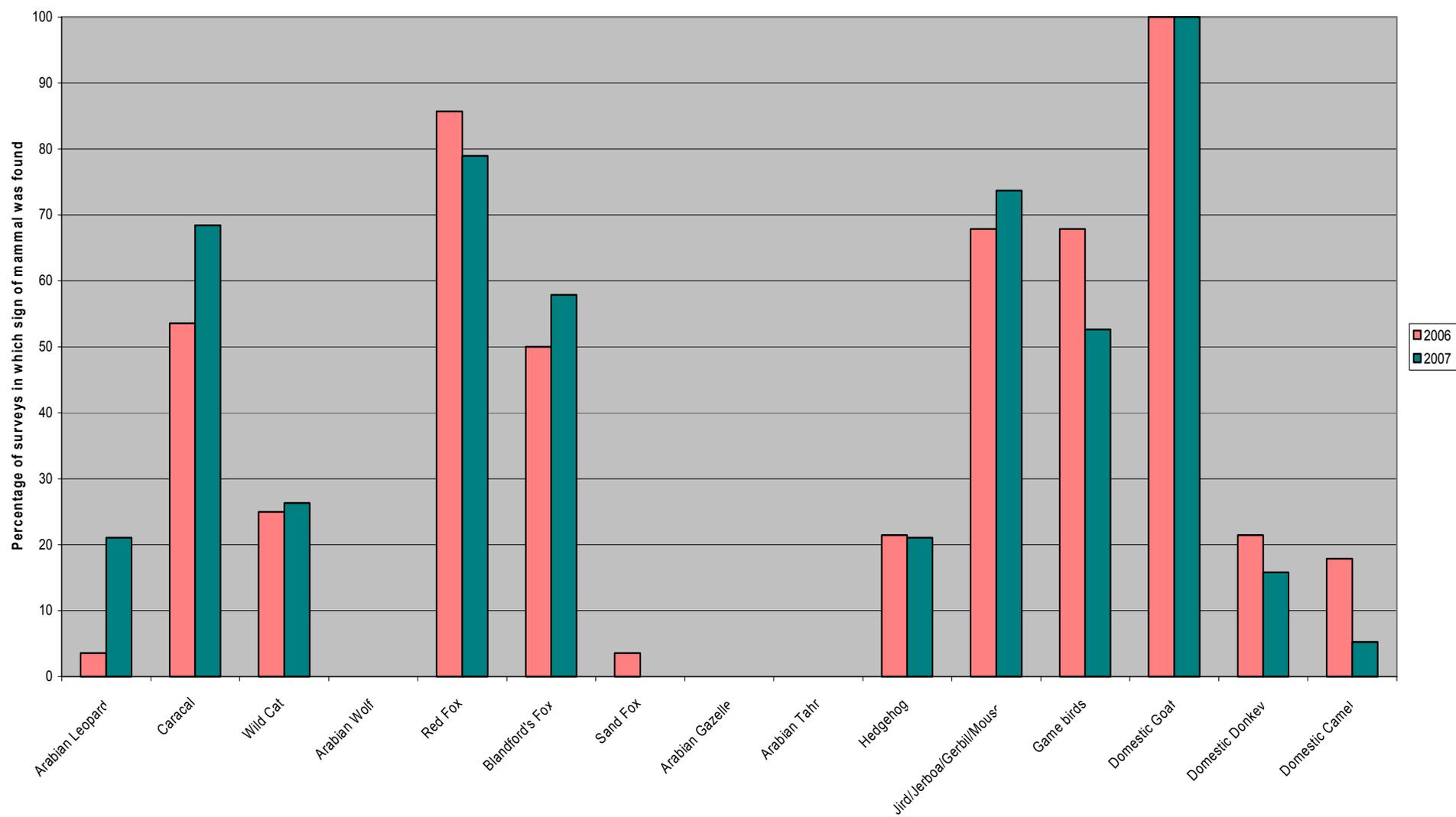


Fig. 2.4.1b. Percentage of surveys on which sign was found in 2006 (pink) and 2007 (green).

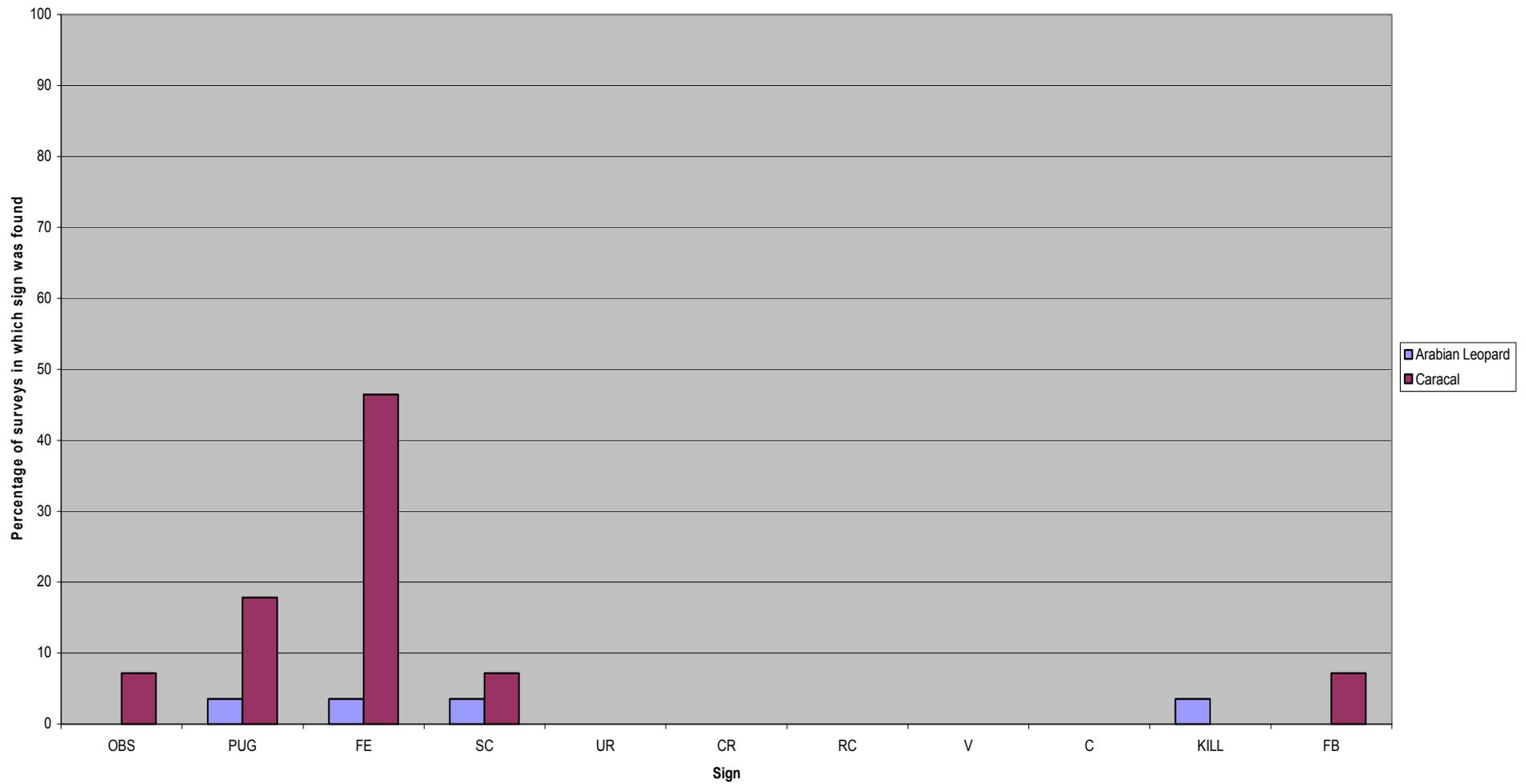


Fig. 2.4.1c. Percentage of Arabian leopard (blue) and caracal (purple) sign found in 2006. OBS = observation, PUG = pugmark/track, FE = faeces, UR = urine, SC = scrape, CR = claw rake, RC = rock scent spray, FB = fur ball, V = vocalisation, CR = carcass, K = kill.

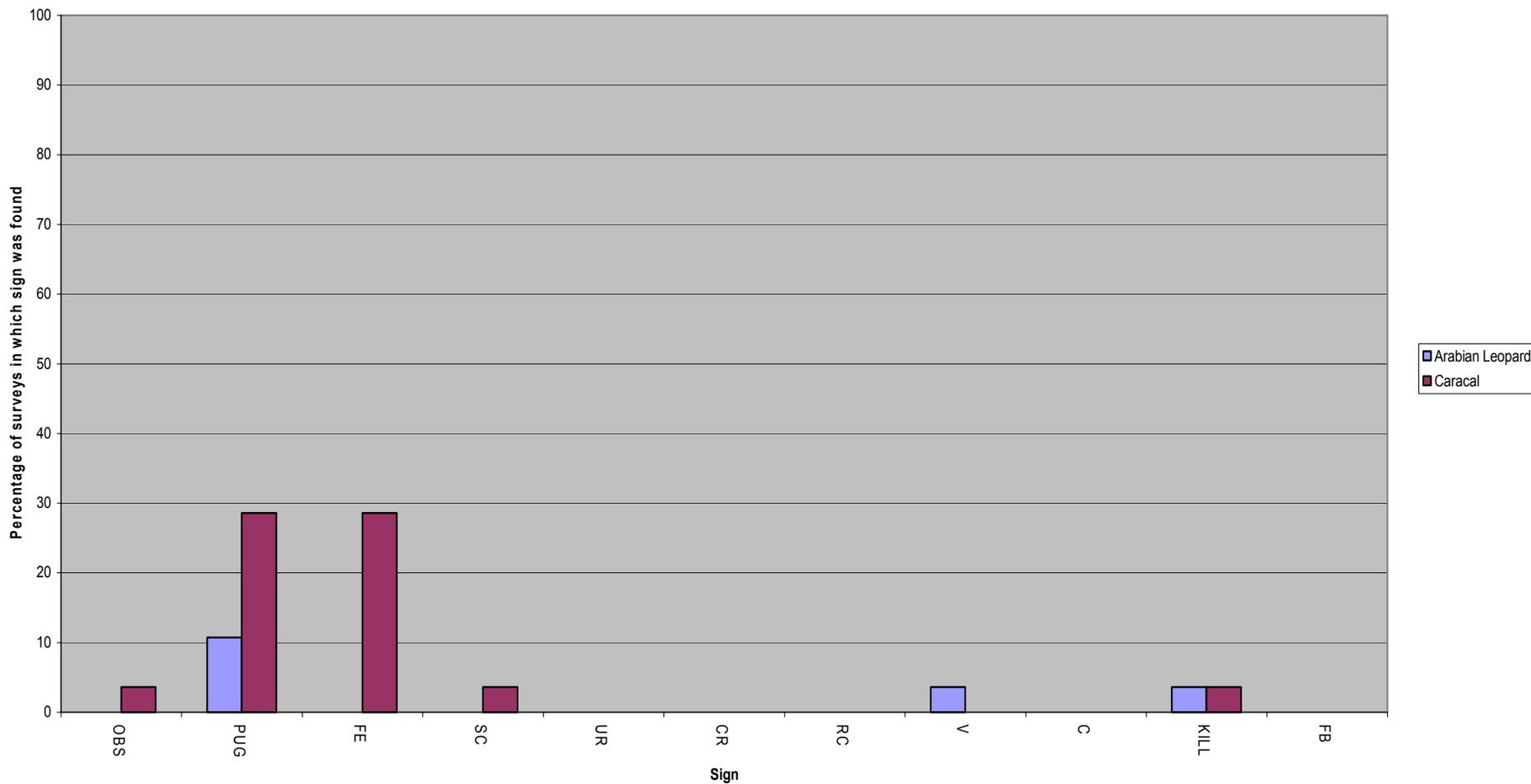


Fig. 2.4.1d. Percentage Arabian leopard (blue) and caracal (purple) sign found in 2007. OBS = observation, PUG = pugmark/track, FE = faeces, UR = urine, SC = scrape, CR = claw rake, RC = rock scent spray, FB = fur ball, V = vocalisation, CR = carcass, K = kill.

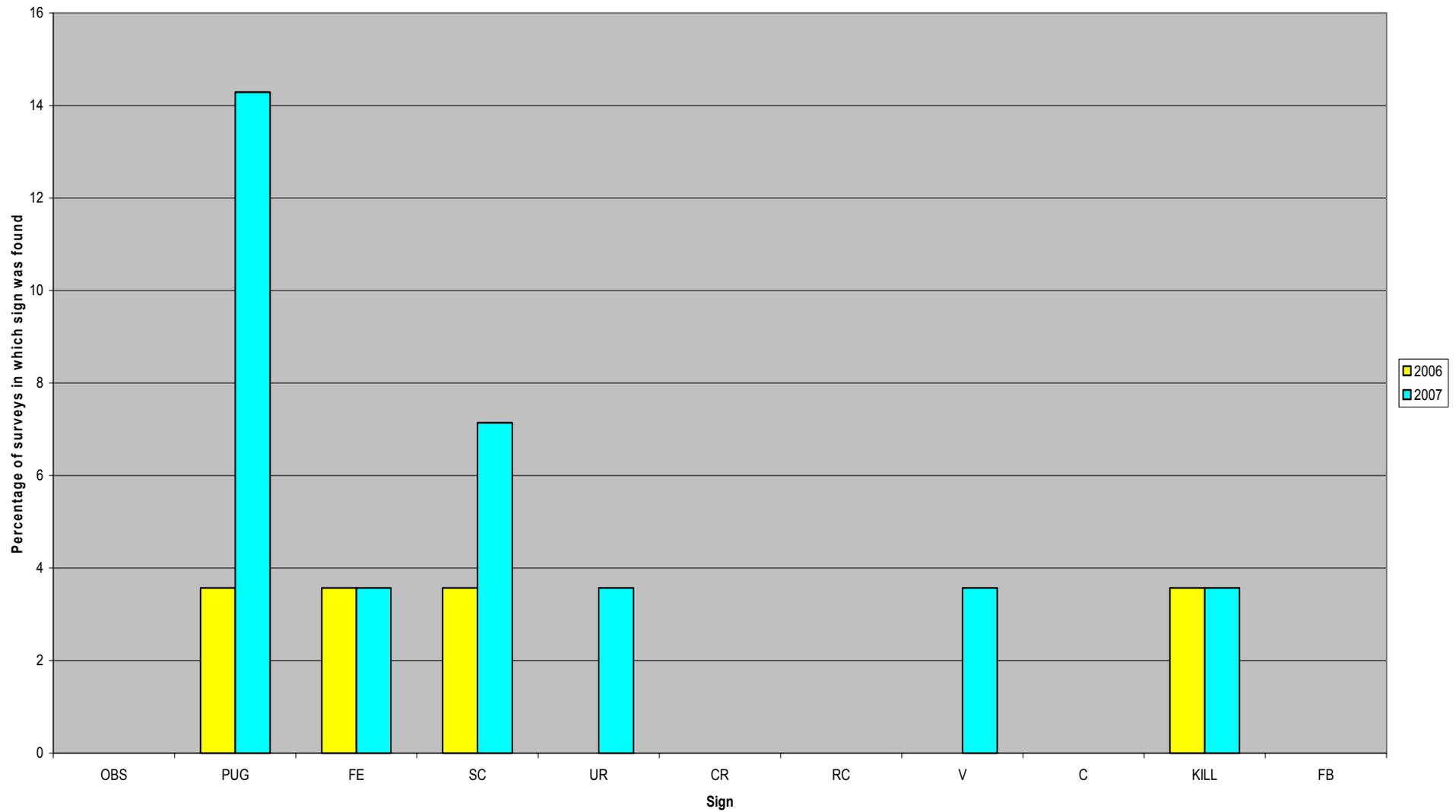


Fig. 2.4.1e. Summary of all possible Arabian leopard found in 2006 (yellow) and 2007 (light blue). OBS = observation, PUG = pugmark/track, FE = faeces, UR = urine, SC = scrape, CR = claw rake, RC = rock scent spray, FB = fur ball, V = vocalisation, CR = carcass, K = kill.

2.4.2. Interviews with local people about mammals

Table 2.4a summarises information gleaned on during the 2006 and 2007 expeditions.

Interviews and discussions with local people throughout the survey period largely corroborated survey results. In 2006, leopard was described as absent. Estimates of the last time a leopard had been seen in the survey area varied from 5 to 10 years. Said, the reliable local guide and herder, reported that the last time he had heard a leopard was in 2002 and that there had been a decline in sightings and calls over the previous 10 years. Local people told us Arabian gazelle and tahr had been absent for 10 years or more due to hunting and drought. We were also told that there had been insufficient rain for the last 8-10 years, depending on who we interviewed. We talked to a wide range of people in all survey blocks.

Table 2.4a. Status of mammals according to interviews with local people conducted in 2006 and 2007.

Species	2006		2007		Presence/absence	Notes
	Absent ≤ 5 years	Absent ≥ 10 years	Absent ≤ 5 years	Absent ≥ 10 years		
Arabian leopard	X				Rare	1 sighting Nov/Dec 2006 & 2 sightings Jan 2007 by reliable secondary source.
Caracal					Rare	
Gordon's wild cat					Occasional	
Arabian wolf		X		X	Absent	
Arabian red fox					Frequent	
Blanford's fox					Frequent	Some confusion between Blanford's & sand fox amongst local people.
Rueppell's sand fox					Occasional?	
Desert hare		X		X	Absent	
Arabian gazelle		X		X	Absent	
Arabian tahr		X		X	Absent	
Ethiopian hedgehog					Occasional	Local people did not distinguish between hedgehog species.
Brandt's hedgehog					Occasional	

In both the 2006 and 2007 expeditions, information obtained from local people largely corroborated survey results. Results for most mammals in 2007 were similar to those of 2006; except for leopard, for which there was a significant increase. In 2007, we were told of three sightings in the survey area between December 2006 and January 2007. This result was surprising given that in 2006 we were told there had been no sightings for over five years.

Mammal sightings were rare for most mammals except fox. Local people knew the difference between red fox and Blanford's fox and saw both species relatively frequently. Many local people said there were three kinds of foxes, but there was confusion in many cases between Blanford's and sand fox. The local people we talked to made no distinction between Ethiopian and Brandt's hedgehog.

2.4.3. Livestock damage and human disturbance

The flora on most surveys showed high levels of damage and degradation due to domestic livestock - overgrazing, browsing and tree-barking. This leads us to suggest that competition from domestic livestock must have contributed largely to the displacement and disappearance of gazelle and tahr.

High levels of human disturbance were visible in the majority of surveys. Evidence of poaching was found in several areas, especially survey block 3. Stone traps were used in the past to catch predators and we found some examples still in use. Most local people have firearms. In survey block 3, we saw people with rifles who were obviously out hunting. They hid their rifles under their clothing as soon as they spotted us and we were unable to catch up with them. We also found dead goats, freshly eviscerated and hung from trees on two occasions in the same survey block. Their purpose could only have been to attract large predators, in this case caracal or leopard, in order to shoot them. Trees were cut for firewood in the past, but we found little evidence of fresh felling during our survey. We did, however, see branches, shrubs and grasses collected for domestic livestock fodder. Litter was routinely found across the entire survey area, most abundantly in the wadis.

There was an apparent decrease in the levels of livestock damage recorded in 2007. This apparent difference is probably due to unusually heavy rainfall in 2007, which meant there was a greater abundance and biomass of vegetation available.

There was an apparent slight increase in the levels of human disturbance recorded in 2007. This may also have been linked to heavy rain replenishing water holes, which resulted in people and livestock using them. Many of these waterholes were dry in 2006, so there was no incentive to visit them.

2.4.4. Inventories of birds, reptiles and amphibians

The expedition also compiled bird, reptile and amphibian inventories drawing on the identification skills of team members, local people and scientists. These inventories are listed in appendices 1 & 2, They are a record of what was seen during our time in the field, but were not the focus of our research, so species present in our survey area in 2006 and 2007 may well have gone unrecorded.

Bird life was less abundant and diverse than anticipated. The filling in of the lagoon in front of the Old Fort and the dramatic expansion of the port in Khasab in the last four years have destroyed the wetland areas. This has had a major impact on the bird life. There remains a healthy chukar (*Alectoris chukar*) population in the mountains. Chukar are an important small prey resource for Arabian leopard and Caracal.

Reptiles and amphibians were more obvious and apparently abundant in 2007 due to increased rainfall.

2.5. Discussion

The combination of the Musandam peninsula's topography, geology and remote location must, in the past, have provided an important refuge habitat for Arabian leopard and local prey species - Arabian gazelle and Arabian tahr. The peninsula still offers large areas of potential habitat for Arabian leopard and wild ungulate prey, but the habitat has been severely degraded over the past 20 years. Road construction through the mountains in the early 1980s, followed by a rapid expansion of local house building, put heavy pressure on Arabian leopard and wild ungulate populations alike. Increased levels of hunting, thanks to easy vehicle access to previously inaccessible sites, exacerbated by changing farming practices has reduced leopard and prey species to critically low levels. Social patterns have also changed over the last ten to fifteen years. Transhumance, the seasonal movement of men and animals between different grazing grounds from lowlands to uplands, is no longer practiced in the research area and 80% of goats are left in a semi-feral state throughout the mountains, causing severe habitat degradation. Arabian tahr are particularly sensitive to domestic livestock presence and are easily displaced. Many goats are kept around permanent human settlements in the wadis - overgrazing, browsing, tree-barking and erosion result. Wild ungulates are unable to tolerate such high levels of competition and human disturbance. Results showed no sign of Arabian gazelle or Arabian tahr during the survey period of 2006 and 2007 and this report argues that they are now locally extinct.

Local people were divided on whether Arabian tahr had ever been present in the area and local information consistently reported tahr as absent for over 10 – 20 years, depending on the source. The survey found no evidence of tahr. They are still present in the UAE but only in more favourable habitat with more abundant, permanent water holes and less livestock. This leads us to conclude they are now absent from the survey area. Most of our survey area did not seem favourable for tahr, as the permanent water they depend on was absent and livestock densities were too high. Arabian gazelle had been present in the past and in good numbers, according to local people and expatriates who had worked in Musandam in the 1980s, but no sign was found throughout this survey and local people all reported gazelles had been absent for at least five years. The habitat would be suitable for Arabian gazelle if livestock numbers were reduced and hunting pressure was removed.

The only large prey that remains for leopard and caracal is domestic goat and this is what must sustain any surviving leopards. Predation on domestic livestock of course exacerbates human hostility towards predators. The result is that local people kill predators whenever possible and are resistant to their presence.

As stated earlier, involving local people in this survey was a very important part of the work. They were very hospitable in the majority of cases and initially curious about the team's presence. They were all aware it was illegal to hunt leopard, gazelle and tahr and regretted their disappearance. Local people were more hostile towards caracal than leopard. They said leopard only killed livestock in the mountains; but caracal preyed on livestock in the wadis, even close to their houses, although the fact that caracal numbers are so much higher than leopard numbers probably accounts for this attitude. Caracal are routinely trapped and shot and poisoning cannot be ruled out. Nevertheless the interviews and personal observations give us reason to believe that caracal numbers are stable despite persecution. This may be because caracal are now occupying a niche vacated by the leopard.

Foxes used to be trapped, but local people no longer bother. They are not deemed a serious risk to livestock. We only found evidence of scavenging by foxes. The increase in Blanford's fox sign found in 2007 coincided with heavy rainfall and greater insect and reptile activity. Blanford's fox faeces contained high proportions of plant and insect material, unlike red fox faeces. One dead sand fox was found, placed in an Acacia tree in Wadi Rowdah, survey block 3. It was old and completely desiccated and could have originated from another area. Local people were interested in the expedition's presence in the area. They contributed valuable information and showed genuine interest in the leopard survey booklets and posters they were given.

Arabian leopard is still present in Musandam, but numbers are so low that the population is probably unviable. It is possible that no females remain as females with cubs and young leopards are more likely to succumb to poaching and hunting pressure than adult males. Camera traps were left in strategic locations at the end of the survey in February 2007. At the time of writing (November 2007) they are still operational and checked regularly, but so far have yielded no records of leopard, caracal, tahr or gazelle.

Tourism is a rapidly increasing sector in Musandam. Its effect on wildlife, local infrastructure and culture is already noticeable. Foreign visitors and currency are actively encouraged, but catering for the needs of a rapidly expanding tourist market is already putting pressure on Musandam's fragile ecosystem and natural resources. Environmental awareness and responsible attitudes need to be fostered among tour operators and visitors alike.

2.5.1. Recommendations for action and further studies

1. A long-term camera-trapping programme in the survey area up to Ras Al Khaimah and Fujairah UAE borders. Combine camera traps with additional methods to attract leopard to the camera site, such as play-back of vocalisations, baiting (using dead bait) and use of scent taken from a captive specimen on heat.
2. Recruiting and training local people to survey wildlife and monitor camera traps as well as collect data on a year-round basis. This would include collection and storage of possible leopard faeces for subsequent DNA analysis.
3. A veterinary/livestock care and education programme to improve livestock management and health and encourage a reduction in livestock numbers. Excluding domestic livestock from most favourable habitats in the long term.
4. Collaboration with the newly refurbished Khasab Museum. Sharing data and furthering local participation and educational opportunities. Creating a database to input information from local people, students, visiting scientists and tourists.
5. Creating a forum involving local people, the environment ministry and tour operators to raise environmental awareness and address any conservation problems or human/wildlife conflict incidents.
6. A botanical survey to assess the impact of degradation caused by livestock.
7. An accurate census of livestock numbers in the study area.
8. Place greater emphasis on anti-poaching measures.
9. Compile an inventory of hunting trophies of Arabian leopard and ungulate prey species shot in the Musandam region. Possible collection of trophy samples for eventual DNA analysis.

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Appendix 1. Bird inventory compiled by the expedition in 2006 and 2007.

Common Name	Latin name	Seen in 2006	Seen in 2007
Egyptian vulture	<i>Neophron percnopterus</i>	X	X
Steppe eagle	<i>Aquila nipalensis</i>	X	X
Osprey	<i>Pandion haliaetus</i>	X	
Peregrine falcon	<i>Circaetus gallicus</i>	X	X
Lesser kestrel	<i>Falco naumanni</i>	X	X
Kestrel	<i>Falco tinnunculus</i>	X	X
Desert eagle owl	<i>Bubo bubo ascalaphus</i>	X	X
Little owl	<i>Athene noctua</i>	X	X
Hume's wheatear	<i>Oenanthe alboniger</i>	X	X
Isabelline wheatear	<i>Oenanthe isabellina</i>	X	X
Desert wheatear	<i>Oenanthe deserti</i>	X	X
Red-tailed wheatear	<i>Oenanthe xanthopyrna</i>	X	
Rock thrush	<i>Monticola saxatilis</i>	X	X
Blue rock thrush	<i>Monticola solitarius</i>	X	X
House bunting	<i>Emberiza striolata</i>	X	
Rock dove	<i>Columba livia</i>	X	X
Chukar	<i>Alectoris chukar</i>	X	X
Sand partridge	<i>Ammoperdix heyi</i>	X	X
Desert lark	<i>Ammomanes deserti</i>	X	
Desert warbler	<i>Sylvia nana</i>	X	
Brown-necked raven	<i>Corvus ruficollis</i>	X	X
House crow	<i>Corvus splendens</i>	X	X
Lichenstein's sandgrouse	<i>Pterocles lichensteinii</i>	X	X
Yellow-vented bulbul	<i>Pycnonotus xanthopygos</i>	X	
Graceful prinia	<i>Prinia gracilis</i>	X	X
Purple sunbird	<i>Nectarinia asiatica</i>	X	X
Indian roller	<i>Coracias benghalensis</i>	X	
Laughing dove	<i>Streptopelia senegalensis</i>	X	X
Little green bee-eater	<i>Merops orientalis</i>	X	X
Barn swallow	<i>Hirundo rustica</i>	X	X
Red-rumped swallow	<i>Hirundo daurica</i>	X	X
African rock martin	<i>Ptyonoprogne fuligula</i>	X	

...continued on next page

Common Name	Latin name	Seen in 2006	Seen in 2007
Crested lark	<i>Galerida cristata</i>	X	X
Black-crowned finch lark	<i>Eremopterix nigriceps</i>	X	X
Masked shrike	<i>Lanius nubicus</i>		X
Arabian babbler	<i>Turdoides squamiceps</i>	X	X
Desert lesser whitethroat	<i>Sylvia curruca minula</i>	X	X
Common mynah	<i>Acridotheres tristis</i>	X	X
Pale rock sparrow	<i>Petronia brachydactyla</i>	X	X
House sparrow	<i>Passer domesticus</i>	X	X
Ring-necked parakeet	<i>Psittacula krameri</i>	X	X
Stonechat	<i>Saxicola torquata</i>	X	
Grey heron	<i>Ardea cinerea</i>	X	X
White pelican	<i>Pelecanus onocratalus</i>	X	
Great white egret	<i>Egretta alba</i>	X	
Black redstart	<i>Phoenicurus ochruros</i>	X	X
Common sandpiper	<i>Actitis hypoleucos</i>	X	
Little-ringed plover	<i>Charadrius dubius</i>	X	
Redshank	<i>Tringa totanus</i>	X	X
Teal	<i>Anas crecca</i>	X	
Mallard	<i>Anas platyrhynchos</i>	X	
Widgeon	<i>Anas penelope</i>	X	X
Sandwich tern	<i>Sterna sandvicensis</i>	X	X
Great black-headed gull	<i>Larus ichthyaetus</i>	X	
Sooty gull	<i>Larus hemprichii</i>	X	
Slender-billed Gull	<i>Larus genei</i>	X	
Black-headed Gull	<i>Larus ridibundus</i>	X	
Caspian Gull	<i>Larus cachinnans</i>	X	
Cormorant	<i>Phalacrocorax carbo</i>	X	

Appendix 2. Reptile and amphibian inventory compiled by the expedition in 2006 and 2007.

Common name	Latin name	Seen in 2006	Seen in 2007	Notes
Jayakar's Oman lizard	<i>Lacerta jayakari</i>	X	X	Seen in survey blocks 1 - 4
Blue-tailed Oman lizard	<i>Lacerta cyanura</i>	X	X	Seen in survey blocks 1 - 4
Bar-tailed semaphore gecko	<i>Pristurus celerrimus</i>		X	Seen in survey block 3
Spotted toad-headed agama	<i>Phrynocephalus maculatus</i>			Seen in survey block 2
Snake sp?		X	X	Shed snake skins found but unable to identify the snakes from them - survey block 3
Yellow-bellied sea snake	<i>Pelamis platurus</i>		X	Dead specimen on shore in fishing settlement in survey block 1
Green turtle	<i>Chelonia mydas</i>		X	Dead specimen on shore in fishing settlement - survey block 1
Dhofar toad	<i>Bufo dhofarensis</i>		X	Tadpoles and adults found in one water hole - survey block 3

Appendix 3. Summary of mammal sign found by the expedition in 2006 and 2007.

Common Name	Latin name	Sightings & signs of mammal in 2006	Sightings & signs of mammal in 2007
Arabian leopard	<i>Panthera pardus nimr</i>	PUG + SC + K + FE?	CALL + PUG + K + FE?
Caracal	<i>Caracal caracal</i>	OBS + PUG + SC + K + FE?	OBS + PUG + K + FE
Gordon's wild cat	<i>Felis silvestris gordonii</i>	OBS + PUG + K? + FE	PUG? + FE?
Arabian wolf	<i>Canis lupus arabs</i>	OBS – road K cub?	No evidence
Arabian red fox	<i>Vulpes vulpes arabica</i>	OBS + PUG + FE + K + V	PUG + FE + K + V
Blanford's fox	<i>Vulpes cana</i>	PUG + FE	OBS + PUG + FE
Rueppell's sand fox	<i>Vulpes rueppellii</i>	OBS - desiccated, dead specimen placed in tree	OBS + PUG + FE
Desert hare	<i>Lepus capensis</i>	No evidence	No evidence
Arabian gazelle	<i>Gazelle gazella cora</i>	No evidence	No evidence
Arabian tahr	<i>Hemitagus jayakari</i>	No evidence	No evidence
Ethiopian hedgehog	<i>Paraechinus aethiopicus</i>	PUG + FE + OBS (dead remains of carnivore kills)	PUG + FE + OBS (dead remains of carnivore kills)
Brandt's hedgehog	<i>Paraechinus hypomelas</i>	PUG + OBS (dead remains of carnivore kills)	No evidence
Wagner's gerbil	<i>Gerbillus dasyrus</i>	OBS + PUG + FE	PUG + FE
Baluchistan gerbil	<i>Gerbillus nanus</i>	OBS + PUG + FE + burrows	OBS + PUG + FE + burrows
Sunderval's jird	<i>Meriones crassus</i>	PUG + FE + burrows	OBS (dead specimen) + PUG + FE + burrows
Libyan jird	<i>Meriones libycus</i>	OBS (dead specimen) + PUG + FE + burrows	PUG + FE + V + burrows
Lesser jerboa	<i>Jaculus jaculus</i>	SIG?	OBS + SIG
Egyptian spiny mouse	<i>Aconys cahirinus</i>	SIG?	SIG?

OBS = observation, PUG = pugmark/track, FE = faeces, UR = urine, SC = scrape, CR = claw rake, RC = rock scent spray, FB = fur ball, V = vocalisation, CR = carcass, K = kill.

Appendix 4. Expedition leader diary 2006 by Dom Hall and Matthias Hammer.

3 January

Welcome to the Oman diary. This is Matthias Hammer, your expedition leader for the first slot. It may surprise some of you to hear that I am the expedition leader, not Dom Hall, so let me explain. This year Oman is running for the first time and Dom will be assisting me on the first slot before taking over slots two and three, and this diary. This is our usual way of doing things whenever there is a new expedition. I started Biosphere Expeditions in 1999 and more about me is at www.biosphere-expeditions.org/staff.

But enough of the introductions; let me tell you about the expedition. Just before Christmas I was in Oman for a final reconnaissance visit and tomorrow, Dom, Tessa (field scientist), Barney (cook) and I will be flying out to start setting things up. Over the last few weeks, we've been ordering in equipment, liaised with the authorities, recruited local staff, etc. When we arrive, we have some interviews for the local press to give (who have taken a keen interest in the expedition), pick up the Land Rovers (three shiny V8 Discoveries, so this should be our most comfortable field rides ever!) and then go shopping for pots and pans, water canisters, food and all the other bits and pieces that we'll need over the next few weeks.

Hadi, one of our local field guides and right-hand man for Andrew Spalton, our chief scientist from the Diwan of Royal Court in Muscat (the conservation department comes under the wings of the Diwan in Oman), will be meeting us in Dubai with a pick-up for the shopping, before we drive over to the Musandam.

That's the plan anyway, which I am sure will change as things happen. "Nothing is as constant as the change of plan" (on expedition), someone once said, and this is the attitude you should arrive with please.

I'll be keeping you updated as we set things up and I look forward to meeting the first slot at the Oman Dive Centre in Muscat. Remember that we will wait by the diving pool at the Dive Centre at 20:00 in the evening of 14 January, the day before the assembly date. The plan is to have an informal dinner - anyone who turns up is welcome to join in.

6 January

Did I say "nothing is as constant as the change of plan"? We arrived in Dubai to the news of the recent demise of an important sheik and with the region in mourning. In Arabia this means that everything shuts down: festival cancelled, Dubai marathon cancelled, shops shut, government offices shut FOR A WEEK!. This means that we could not collect all the shiny Land Rovers, nor could we go for our shopping spree in Dubai. So we've all come to Khasab (the expedition base) to hatch a new plan. No reason to be alarmed at all though - in true expedition style, we'll get there (eventually) by a different route. And the desert stars are too good to be missed anyway, so be prepared for nights under the stars in the field camps ;->

On the note of field camps: PLEASE MAKE SURE that you bring a set of warmer clothing as per the dossier (where it says "remember that it can drop to freezing at night on the very tops of the mountains it can even snow on very rare occasions"). Our Land Rover contact recently camped at high altitude and tells me that the temperature dropped to about 4 degrees Celsius, so please come prepared for this! Also remember that if you get cold easily, your sleeping bag should reflect this.

The Musandam is as beautiful as ever and we look forward to having you here. We'll keep you updated on developments....

9 January

Dubai being Dubai, the shops were open again yesterday (Sunday), probably just for a day before shutting again today for an Eid holiday for a few days (Eid holidays follow a moon cycle and are decided by a moon committee - no, I am not joking - at the beginning of a month with intense speculation surrounding the process. This also means that planning anything ahead becomes very difficult).

Anyway, Dom (your expedition leader for slots 2 & 3) and I went on a shopping spree. We left the Musandam at 05.00, ready for the shops opening in Dubai at 09.00, then shopped until we dropped (it was eight or nine

trolleys in the end, I think). You'll be pleased to know that the shop included some tents and even some fold-out stools for the field camp (luxury!), so you may be sleeping under a roof and have something to sit on (if you get there first, that is!). Quite a few Germans on the expedition, so beware those towels going down in/on the tents and stools! But the desert stars are great to sleep under anyway (in your snug sleeping bag). Talking about the field camps, here's an important announcement: **COULD YOU ALL PLEASE BRING A TUPPERWARE BOX BIG ENOUGH FOR YOU TO PUT A LUNCH PACK IN** (bread & water, I mean, a roll, a piece of fruit, some biscuits, etc.). Good quality Tupperware is hard to get and you'll be the best judge of what size box you need for your lunch pack. You'll also have a great story to tell ("my lunch box in Oman") at your next Tupperware party!

Dubai is a crazy place. I am told that half the world's yearly production of concrete is used up here, along with a significant proportion of the world's cranes. Skyscrapers going up everywhere, six lane highways through the desert, five and six star hotels abound, along with three of those "the palm" islands by now and "the world" (where Rod Stewart is rumoured to have bought the British Isles). The whole thing is topped by the world's largest indoor ski slope, yes indoor ski slope (!), inside one of the many massive shopping malls. All pretty unsustainable, of course and I wonder what is going to happen when the oil runs out / the bubble bursts...

Meanwhile at the other end of the universe, Dom and I were driving back to Khasab with the Land Rover packed full of equipment to end our intergalactic shopping trip.

Tessa, our field biologist, has spent the last three days with Hadi getting to grips with the study site, meeting possible guides, talking to local people, investigating wadis worth surveying and assessing possible field camp sites. The weather has been warm (in the mid-twenties going up to thirty degrees Celsius) and dry with the odd cloud build-up, looking like it's going to rain, but never managing to do so. At night it gets chilly and jackets are needed. Higher up it'll be even colder.

Today Wouter from Land Rover is arriving for a few days to let us benefit from his off-road driving and camping experience in this environment. Must remember to visit the local police station to make sure you are all allowed past the mountain checkpoint when the time comes. So long!

11 January

Much of the post-shopping day was spent unpacking and labelling our gear and putting it all up, making sure everything is there and working. The picture shows much of the camp gear. The gazebo will house the field kitchen and the dome tent sleeps two very comfortably, three comfortably and four at a squeeze. We have six of those, so you can do the maths yourself. Notice the absence of the Bedu (mess) tent, which has only been on order for a year, but will be delivered next week (Allah willing!). Also notice Wouter with his head under the bonnet of the Discovery, expertly persuading the car to stop throwing a wobbly after we had tested our 12V DC to 220V AC inverter on its cigarette lighter socket. The Discovery didn't think this was funny and went into a shut-down mode sulk, but the arrival of one of its masters from Land Rover brought it back to heel. Henceforth this green Discovery shall be known as 'Herbie'. Before you get too excited about the Defender in the background, it's Wouter's (who'll be visiting for two days only during slot1)!

Yesterday we went for another reconnaissance drive with Wouter putting us through our off-road paces and giving us valuable tips on camping and desert field craft. Wouter's been working for Land Rover in Dubai for a few years now and often comes to the Musandam for hiking, camping or doing adventure races. We also found a great spot in a wide & open wadi for the slot 1 camp (flat ground, few stones, next to some old stone dwellings and surrounded by steep mountainsides).

The way the slots are shaping up is one day to get to the Musandam, two to three days of training with day surveys in larger groups, then more day surveying in smaller groups interspersed with a rest day, then three nights in a field camp for everyone to cover the remoter survey blocks, back to base and back to Muscat. We may also do some penetration surveys during the day survey days, which means that small groups of those who want to (and are fit enough to do so), can carry their own supplies into the field to sleep out in the open for a night in order to cover a wider area. If you are interested in doing this and have a bivi bag (Biwaksack in German), please make sure you bring it along. During the day surveys, we'll be staying in our town apartment villa; when we are in the field camp, we'll be staying in our tents or under the stars.

12 January

We're getting there. Most of the survey sites for slot 1 are set, camp sites identified, the bulk of the shopping is done and most of the paperwork is finished. Just a few courtesy visits to the military, police, etc. to do, some odd bits & pieces of shopping and then we should be ready for you. I have attached the day-to-day plan as it currently stands, so that you have at least an idea of what's coming (terminology: "base" is the town apartments villa and "camp" is the field camp that we will be setting up on the edge of one of the wadis).

Tomorrow is a day to finish off the odds & ends before we drive to Dubai Saturday 4 a.m. to collect the two remaining Land Rovers and from there straight to Muscat to meet whoever is there from slot 1 for dinner at the Oman Dive Centre. You probably won't be hearing from me again before then, so assume no news is good news!

Looking forward to getting going and meeting you "first slotters" in a few days!

Oh, and the Land Rovers have CD players, so please feel free to bring some along, although the staff reserve judgement and right of refusal on your music tastes ;->

17 January

On 15 January most of the team were there for dinner at the Oman Dive Centre and we were joined by Dr. Andrew Spalton, our chief scientist from the Diwan of Royal Court who filled us in on some of the history of the Arabian leopard study in Oman.

The next day, after a mammoth drive of 12 hours from Muscat to Khasab, we arrived at base at around 19:00. On the way we had the world's slowest one-finger keyboard typer on the Emirates border who accounted for a one-hour delay single fingeredly and a very correct officer on the Omani border getting onto the Musandam who checked each person's passport number, date of birth and name with great diligence before letting us through.

Once on the Musandam the team were rewarded for the long, uneventful drive along dual carriageways by the sudden end of the asphalt and a spectacular drive through the gorges of Wadi Bhi and up and down two mountain passes of the Musandam. High winds blew up and on top of the mountains they were so strong that it was difficult to open car doors and stand up straight, let alone take some photographs!

We spent yesterday going through briefings, datasheets, some of the kit and procedures. We also very studiously went through plaster casts of animal tracks and bags of scat (faeces) of tahr, domestic goat, wolf, leopard, etc., studying, smelling, prodding so that we will hopefully recognise them again in the field.

Later the drivers went on a driving course for a few hours and found it hard to find anything that is a real challenge for the Land Rovers. Tessa took the non-drivers on a foray to find some more guides for the next few days and they were promptly invited in for tea with a family in a small village who eventually produced two guides. Many team members have gone 'native' with Hadi showing them how to wrap the cloth they have brought round their heads in the correct way. Hadi also showed some of the women on the team how to cover their hair correctly out of respect for the more conservative local people in the villages dotted around the campsite.

The winds are still howling around the building and today (I am writing this early in the morning) we will teach people how to use a GPS, compass, re-visit the datasheets, etc. before going out for our first survey foray into the field as a big group, practising newly-acquired skills.

19 January

We've just finished two very good days of surveying. Yesterday we went as a big group to survey a nearby and spectacularly beautiful wadi. On the survey we found a fully articulated fox skeleton, evidence of caracal and of course lots of goat droppings. In the afternoon I took a small group to the end of the wadi and as we were spread out across, I sat down for an observation stop on a ledge and out of sight for the rest of my survey team. As I scanned the mountainside, my binoculars caught the shape of something and as I focused in on it, I could not believe my eyes – it was a caracal sitting high above me in the rocks like a pussycat, seemingly enjoying the afternoon sun. I stared at it for a while until I was sure it was a caracal and then tried to alert the others, which of course made the animal disappear across the ridge! I can't believe how much beginner's luck we've had on this first survey day! On the drive back, when everyone was pretty excited anyway, we also came across a road kill, which we were fairly certain was of a wolf pup (although we are currently seeking a third and fourth opinion on this), a species that is meant to have disappeared from the Musandam long ago. Watch this space for further information on this.

After such an incredible first day, we all thought we would not see anything anymore for the next six weeks, and sure enough today's two survey groups had hard, but non-feline days (apart from a few cats the villages). Tessa had arranged two local guides and one group went up with Tessa surveying one steep wadi, whilst the other group spent a very hard day climbing up some very steep and sharp rocks for five hours without finding a single sign of a carnivore. Admittedly the two wadis were very close to two villages, where the arrival of our Land Rovers filled with westerners in strange clothes and gear caused much excitement and a small village gathering complete with farewell and welcome parties of children as we went into and returned from the mountains.

Tomorrow Dom and I are taking a group out for an overnight survey, which means we'll go light and carry only food, water, a sleeping mat and sleeping bag onto a high plateau to survey for two full days, sleeping out in the open in between. I'll let you know how that went in a couple of days...

22 January

Our overnight survey took us to a high plateau intersected by beautiful narrow wadi gorges and framed by spectacular cliffs of limestone. Eight of us descended from a high point on the road down onto the plateau and then went on to split into many small survey teams, covering the wadi gorges, ledges, ridges and surrounding peaks, uniting at intervals and for our overnight camp. We found very few signs of predators, but ubiquitous sign of goat. We also came across five people living in a small village, who seem to look after the four or five areas of terraced fields and date palms that are dotted around the plateau. These areas were once villages with many more people in them. We found abandoned stone houses, graveyards, traditional irrigation channels and water cisterns. Nowadays water is brought down by black pipes running over the plateau and fed by tanks high up and close to the road. That way only a few people can look after fields and date palms that once took whole communities to literally scratch a living from rocks. No sign of leopard on this plateau, but we found a great observation spot overlooking the next valley and a multitude of cliffs and rocks over a wide area.

It was a spectacular two days of walking and surveying with a cold night (down to 0.5 degrees Centigrade) out in the open in our sleeping bags. The memories of the silence at night, the stars, the pitch black darkness, the amazing landscape, the scrambles up and down the wadis and up to the ridges and tops, I am sure will stay with our survey team for a long time.

We have put a few pictures of the last few days since the start of the expedition on www.biosphere-expeditions.org/oman+, so please feel free to have a look.

29 January

Much has happened in the week since I last wrote. The team spent a relaxing Sunday on a dhow cruise, while we had time to catch up on some admin and a little rest. We then moved into our field camp, which entails packing up everything and moving it deeper into the mountains on a one and a half to two hour drive, and then putting up camp at the end of a wide wadi (we'll put some pictures of the camp up on the website soon and let you know).

Once at camp, we surveyed the mountains and wadis around. No sign of leopards, sadly, but plenty of fox and caracal. I spent much of my time with the VOX film crew and two team members out on surveys and taking shots – great fun and I look forward to seeing the result (to be aired in Germany at the end of March). Dom and Tessa took the rest of the team on some hardcore (mountain) surveys. I often returned to camp in the afternoon to see exhausted but happy faces at camp.

I think everyone really enjoyed the nights out. The temperature drops to eight degrees Centigrade during the night, so quite comfortable for most people in their tents and sleeping bags. A few brave people also slept out in the open, moisture covering the outside of their sleeping bags in the morning. At night it is pitch black dark, you can hear vixens and owls calling whilst you sit around the campfire.

On Thursday we moved back to base, cleaned up the equipment ready for the next slot and packed up our own gear. Friday's drive back to Muscat was spectacular (through the mountains) but uneventful, except for Dom's problems at the border with stamps in his passport, which were quickly resolved by taking a little detour.

This brings me to the end of my diary. Dom will be taking over from here and I wish him and the incoming teams a great time and successful surveying. So long everybody – Matthias.

30 January

As explained in the last diary, I am Dom and I am now taking over the ropes from Matthias. The first slot has flown by in a whirl of scat, sun, scrambly wadis, hardcore ridges and happy memories. As ever there are the usual mixed feelings at the change of teams. It is sad to see a great team leaving - they have surveyed some very challenging terrain with great determination and persistence, and of course the required sense of humour - a thousand thanks to you. On the other hand there is the excitement of a new team arriving and so they did yesterday morning in Muscat - they were greeted by one shiny Discovery - courtesy of the Muscat car wash, and one which hadn't made the car wash and bore the battle scars and dust of a fortnight in the wadis. The team looked from one to the other and began to realise what was to come. Before they had a chance to change their minds we whisked them all into the cars and hit the road to Khasab. Despite our high hopes of cutting some time off the journey from the last slot and far more rapid border crossings we still managed to shave only about an hour off the time, but at least this was enough to mean we arrived with the fading light and could fully appreciate the beautiful drive through the study area and the gorge at Wadi Bih. The team are now swimming in new information with risk assessments, scientific information, datasheets and new 4x4 skills. It's a lot to take in, but everyone is eager to cram this all in and get on with the business of surveying.

Aside from the all important training and survey news, the most important update is that we now have two CDs - of course it is two more than we had before but if I tell you that one is John Denver you will begin to see into my world of despair - so anyone coming on slot three please immediately chuck out any other things you have packed in your rucksack and fill it with CDs!

2 February

Hardly possible to believe we are into February already but the routes marked all over the map are testament to how much is already done and over the last few days the second team, now fully trained up and raring to go have started to add their imprint to the map. Their first full day surveying resurveyed an area which had provoked interest during the first slot and this beautiful wadi (now further furnished with flowering Arabian almond) provided the perfect place to work together as a whole team and put those surveying skills into action. Game birds were again sighted along with the first sighting of a pair of lesser kestrels. Sadly I was dragged away to try to sort out our malfunctioning Land Rover which has been on strike and has had to be carted off to Dubai to be plugged into some high powered computer which will hopefully sort out its transmission fault. Unbelievably Land Rover were able to send someone out from Dubai the same day to pick up the vehicle, although the fact that they did not arrive until 2 am leaves me feeling pretty knackered today.

At least it left the way clear for me to join the team on a beautiful survey today. We headed out for the first time into survey block one - the northerly peninsular cut off from the roads and the rest of the Musandam.

Therefore we bounced out on two speed boats around the headland and through the deep blue Arabian Gulf. Perhaps the hottest sun so far beat down on us as temperatures reached the high 30s and it was hard work climbing up from the village of Kumzah. Slot three must prepare themselves for rising temperatures through February (I suggest climbing uphill with your head pressed between two hot plates to get in practice). But the heat could not take away from a wonderful day's survey. We found a fox carcass and ideal, textbook leopard and tahr terrain. From the top of the wadi the views out over the fjords and across the sea were truly breathtaking and I'm sure these views and the memory of bouncing back in the speed boats as the light faded to that beautiful evening mountain light and the sun dropped in to the sea will stand out as a highlight of the expedition for everyone.

It was Hadi's birthday today so we have introduced him to the intricacies of British birthday celebrations. He extinguished the candles like a pro and we all head to bed now tired but happy. Tomorrow I take some of the team into the hills for a two day overnight survey - of which more on my return.

5 February

As we headed out laden with full rucksacks for our overnight survey we soon decided that the heat wave of the day before was perhaps not a blip. With the thermometer already into the thirties before 11.00 we knew we were going to have a hard few days. We skipped from one patch of shade to another as we slogged up the seemingly never ending goat trail leading from the guide's house to the plateau at just over 1000 metres. The plan was that myself with my two (previously) willing victims Jim and Andreas would slog up onto the plateau, sleep up there and then use the second day to survey the ridges and plateau at the top. The rest of the team followed along behind us out only for the day and slowly surveying the goat trail itself. They found caracal sign on the trail and our last radio contact saw them heading home after a good day's surveying though everyone was suffering with the heat.

As they headed off back to showers and we began to cook and settle down for the night, I think we were all wondering if we had made some terrible mistake! Our spirits warmed however by the traditional noodle soup and the blanket of stars spreading across the sky things didn't seem so bad. One upside of the hike in temperatures was that a night out in just a sleeping bag was far warmer than on the previous slot, though perhaps the heat radiating from our reddened faces was at least partly responsible.

We were woken in the morning by the stunning sunrise that such occasions demand and sprung out of bed with enthusiasm for an early morning in the mountains. The plateau seemed less overgrazed than others we had visited and the views out over the sea were stunning. Disappointingly, however, sign was very thin on the ground and by 11, already over three hours of surveying under our belts and the pleasant morning temperatures again supplanted by searing heat we began to long, and head for home. Again skipping from shade to shade we crouched down in another tiny patch as the guide wandered on ahead. Suddenly he started to shout excitedly, "come quick, caracal". Of course we did, and of course it was gone. The caracal had rushed across his path within 20 metres of him and sped across the plateau and out of sight! We had to satisfy ourselves with collecting a caracal scat further along the plateau which confirmed the guide's story and were left with a wish we could have carried on another 20 metres before our break and a tale of what might have been! Nonetheless this observation combined with our sign and that of the team yesterday confirms that caracal are active in this area, so a good addition to the picture we are forming.

Today is the team's well-earned day off and I think a shady dhow is just the place to spend it to recharge batteries and get ready and raring to head out for three full days in the field camp next week. We continue to adapt our plans to fit the needs of the science and the conditions. We will put the day back a bit to make more use of the cool mornings and for slot three will look to alternate big wadi walks with the interviewing we must do to complete the picture we are forming of the area and which will allow some much needed breaks in the shade as well. As I will be away in the field for the next four days, this is my last diary for a while - slot three please prepare for steaming heat, beautiful views and fascinating culture - bring CDs, news of Liverpool Football Club and a good sense of humour!

7 February

UPDATE FOR FRIENDS & FAMILY WHO MAY BE WORRIED ABOUT THE SITUATION IN OMAN POST DANISH MOHAMMED CARTOON.

You are probably wondering what the situation is like in Oman after having seen the pictures of unrest in the Arab world. To put your mind at rest, I have copied below the answers we have received from our local partners in Oman.

=====

Absolutely nothing here that I am aware of except that I cannot get Danish butter.

Oman remains very very safe.

Andrew

Diwan of Royal Court

Office of the Adviser for Conservation of the Environment PO Box 246, Muscat 113, Sultanate of Oman

=====

Here in Dubai, there have not been any reports of violence related to the Danish cartoons. The government has only embargoed Danish products in the supermarkets etc. But besides that it's business as normal.

To be honest Khasab is too remote, too small and non European influenced that one would expect any unrest. I wouldn't be worried concerning your expeditions.

Regards

Wouter Kingma

Land Rover Middle East

9 February

I am now fresh from a much needed shower back at base and sit down to reflect on slot two's period out at camp. I guess the themes will be becoming familiar now – fabulous scenery, baking heat and hard but rewarding days out surveying.

On arriving in camp we had everything set up in record time – our beautiful Bedu tent once more in situ in the wadi and into it everyone collapsed to hide from the midday sun. As the temperatures started to cool off in the late afternoon we headed up a wadi near camp and set up a camera trap by a cave which we had surveyed in slot one. We will collect the camera during slot three and fingers crossed that by then we just might have captured something interesting on film.

The next day we were up and out by seven having shifted our daily schedule back to make the most of the cool morning air. The intention was to return to base correspondingly early though the wadi had other ideas. We climbed a beautiful ridge up onto a high mountain plateau and everyone's attention was focused by some precipitous drops on either side. The ridge showed new and interesting vegetation and most excitingly what we think to be a wild cat scat and track. By 11.30 we neared the top of the plateau and the sun was beginning to reach its peak once more. We surveyed for a while on the plateau where another potential cat scat was found. The guide – armed with the ever present flipflops was adamant that we could take an alternative wadi down but as we neared the top of it we feared that our boots, let alone his flip flops were ill suited for the descent. Nevertheless we made our way slowly down very difficult ground stopping occasionally to stare in disbelief either at where we had come from or what was still to come. Nonetheless everyone arrived happily and safely back in the wadi – we tried to reassure the team that our intention in starting the day earlier was not to trick them into a few hours extra surveying but they were not convinced! It was a very interesting day's survey, however, revealing a very interesting wildlife area and some good results.

The next day we took a break from the uphill ridges and headed out in smaller groups to cover a larger, wider wadi near camp. This time we were off surveying again by 7 but returned to camp at 2.30 to beat the worst of the sun – this proved to be just as well as the temperatures here are now touching 40. By breaking up into smaller teams we were able to cover a large area along the length of this wadi and into its side wadis and we are building up a really good overall picture of the Musandam.

Back at the apartment Tessa and I completed plotting slot two's surveys on the map and setting a final plan for slot three, targeting the few remaining areas we have to cover. A big thanks to the team members from this slot who again have clocked up distance and some very good surveying in an area and in temperatures which are far from easy. We depart for Muscat early tomorrow morning with a tired but happy team and look forward to meeting the third and last slot at the Dive Centre (remember dinner at the Dive Centre Saturday night for anyone who is around – otherwise no later than 8 on Sunday morning – it's a long drive so if people can make it even earlier and we can get off at 8 on the dot – all the better.)

15 February

The team for slot three all arrived at the Dive Centre in good time for departure though their luggage was not so successful. Amazingly three out of the eight team members arrived without luggage. Two were lucky that theirs was retrieved by the guilty airline in time to travel with us to Musandam. One, now four days later, remains an ongoing saga with hourly phone calls to the airline and many half truths about the luggage's location including a driver going to Dubai especially to pick up the luggage only to be told that it was now in Muscat. As I speak another driver is winging his way to Dubai again (the luggage is apparently there and not in Muscat). Hopefully by this evening we will have a full set of belongings.

All else on the journey back to Musandam went smoothly - the border crossings are getting quicker despite the fact that on the Emirate border we were all hauled in for iris recognition. My guess is the border guard had a new toy he was desperate to try out. Nonetheless we made it back to base a further half hour ahead of our previous record time.

Since arriving we have been busy with the now familiar training program and the team are now armed with new GPS, map reading and surveying skills.

Tessa and Hadi meanwhile carried out a very successful recce to Wadi Bhi - all Hadi's hard work with the border permissions is finally paying off as he and Tessa were waved through the crossing with only a brief stop for the border guard to invite them in for lunch!

We have just returned from our first full day survey and a very interesting and exciting one it was. We walked through a wadi near Khasab which we had visited with both previous teams. This time we therefore walked for an hour and a half before beginning to survey so we could survey the further reaches of this area. Not long after beginning our survey we came across what looked to be a large cave which on further inspection turned out to be a tunnel through to another hidden wadi. With thoughts of the hidden valley buzzing in their heads four of the team members rushed down the wadi to investigate. A little later there was a call on the radio to say they had found a waterfall. They hastened to add that it was tiny - and probably not worth the rest of the team coming over to see - but being the first running water we have found in the mountains I headed there with the remainder of the team. The waterfall was indeed small but beautiful and definitely a viable drinking spot for wildlife. It was amazing to feel so excited to find this small running water. Two months ago at home in the lakes such an amount of water would barely have registered in my mind, but Musandam is so dry that I ran around excitedly taking photographs and exploring. Nearby we found a likely caracal scat and this confirmed our feeling that this place was a potential attraction for wildlife in the area.

Though thankfully the heat has eased off slightly the days remain tough, but rewarding. Time is racing by and before we know it this last slot will be over so I look forward to a busy week ahead of surveys to fill the gaps on our map.

17 February

The last two field days have been perhaps amongst the highlights of the expedition so far taking in a variety of scenery, cultural interaction and information. Yesterday we headed off on another survey with a big mountain route on our minds. We were happily waylaid, however, for an hour by the inhabitants of the village where we began who made us coffee and dates and gave us a tour around the village. There we saw some fantastic old houses, long since deserted and in occupation around 150 years ago. The tiny wooden beamed and stone walled buildings were incredible and I felt we got a real insight into what life must have been like in the past in these mountains. The warmth and enthusiasm with which we were greeted was wonderful and we reluctantly headed off up the mountain already an hour behind schedule. A familiar pattern of heat and up up up, punctuated with cries of "come on, come on" from the guide ensued as we headed slowly but surely towards the peak. For more than two hours the guide Said reassured us that it was only an hour to the top and by the time we finally hit the ridge we knew that after four hours of climbing it was going to be a long day. And so it proved as we eventually crawled out of the wadi at 5.30 to be greeted again by news that dinner was on its way and we must stay. A fabulous dinner of freshly cooked goat and rice with such open and welcoming hosts was the perfect end to a day, which offered everything a survey day could – chatting with the locals, incredible scenery and historical insight all in one. Then for further contrast we headed out today to survey by boat. The speed boat ride, as it had been in the second slot, was a great way to start the day. By using the boats we were again able to reach a remote part of the peninsular - this time focusing on the thin ridge of land which links the peninsular to the main land. Aside from again stunning scenery this area proved as we had hoped a hotspot for animal activity. We were falling over ourselves with scratch marks and scats. Most were fox with some possible caracal but this was enough to show that animals were using this land bridge extensively and marking it - if there were a leopard using that area we should have found sign but it was sadly lacking. Nonetheless it proved an excellent survey day whereby focusing on one small area we are able to learn a lot about the wildlife in this peninsular.

We have one more day to go before a well earned day off. After that it will be out to the campsite for one last time to survey in Wadi Bhi and collect our camera trap. It seems amazing to think that for this reason it might not be until I return from camp - and the expedition finishes that I write my next and final diary entry.

25 Feb 06

I am sat now overlooking the sea back at the Oman Dive Centre to write my last diary entry of Oman 2006. We have had a hectic last week in camp. Heading out for our now familiar camp site we were joined by a press pack of a TV crew and three print journalists who stayed with us for two days at the camp site. Our first task was to retrieve the camera trap set up in slot two. This made for an interesting introduction for the press to our work here and an introduction to the sort of terrain we have been dealing with. Sadly the trap had only captured goats but nonetheless it was an interesting experiment and I believe the first at camera trapping in Musandam.

The next morning we woke in utter amazement to rain, and significant rain at that – a grey / black sky and a persistent and heavy drizzle which showed no sign of surrender. It was not possible therefore to head high into the hills and instead we headed out to do some very revealing interviews. As ever we were very warmly greeted and by the time we had negotiated the ever present coffee and dates and then the interview proper it was nearly lunchtime and the rain had slightly abated allowing us to spend the afternoon tracking in the wadi around camp. For our last survey of 2006 we returned to the Wadi Bhi area and spent a full day exploring some beautiful wadis. Wadi Bhi is dominated by dramatic gorges and cliffs and also far more fully grown trees than in other areas with resultant increased birdlife. We even found some waterholes but sadly predator sign on this, our last day, was in short supply.

And so the following morning we began to pack up camp and prepare to leave. I am now familiar with the emotions associated with this – on the one hand the feelings of happiness and relief that the expedition is coming to a safe and successful conclusion, on the other the sudden and horrible realisation that you are leaving behind a beautiful place and more importantly the people who have made this expedition. The following day was a blur of cleaning, packing and emotional good byes to the guides, officials and shop keepers who for the past two months have been our companions and the people who have made the success and enjoyment of this expedition possible. Thank you to everyone!

Our final drive out through the mountains and back to Muscat was suitably melancholic as the clouds once more rolled in over the mountains. Bathed in cloud the mountains were truly majestic and I was glad to see them in this new mood before we left. The dramatic scenery of the Musandam will stay with me for a long time as will the warmth and enthusiasm with which we were continually greeted. I think two months in Musandam has been far from easy. It is a difficult area to survey in and it has stretched the teams physically and mentally. However, we leave with a far clearer idea of the habitat of the Musandam and its suitability for wildlife. We leave with enthusiasm for the future prospects of Musandam and finally with huge warmth for this stunning area and its people. For the last week of the expedition to be blessed with possible leopard sign seems a fitting note to end this diary on – a reminder as it is both of hope for the Arabian leopard and the fragility with which it and other animals cling on. I hope you've enjoyed the diary. So long & hope to see you on another expedition some time. - Dom Hall.

Appendix 5. Expedition leader diary 2007 by Peter Schuette.

6 January

Hello everyone and welcome to the Oman 2007 diary. I'm Peter, your expedition leader, and you will be hearing from me regularly over the next few weeks. We're all packed up and will be boarding a flight to Dubai later today. The message from Land Rover in Dubai is that the vehicles are ready and waiting for us. Most of the equipment is in storage in Muscat and if all goes well, then we'll be heading there in the new cars by tomorrow to meet up with Hadi, our local guide and to have some meetings with the Diwan and sponsors.

Also with me are Tessa (McGregor), field scientist, and Dr. Matthias (Hammer), our founder and managing director, who is helping to set things up but will be with us for a week or so only.

All "Insha'Allah" of course, a phrase you are about to become very familiar with... It translates roughly as... 'If Allah wills it' and is a marvellously useful term of complete fatalism and one which has no direct English equivalent. The nearest thing would probably be '...but on the other hand I might get hit by a number 73 bus tomorrow' - uttered in tones of sodden dejection by a clinical depressive with a strong Solihull accent.

Anyway, we all look forward to meeting you in Dubai soon. My Oman mobile number (FOR EMERGENCY USE ONLY OR IF YOU ARE ABOUT TO BE LATE FOR ASSEMBLY) is +968 92700497 and I'll see you in the Ibis lobby.

So long

Peter Schuette
Expedition leader

8 January

Yesterday we arrived in Dubai. Wintertime, 22°C, sunny. Crazy place, with all these shopping malls, hotels and skyscrapers - they don't stop construction.

We picked up the Land Rovers from Wouter, their "3D Communications Manager", who had everything perfectly organised – cars prepped up and ready and with a full tank sitting there waiting for us! After the procedure to get the driving licenses, there followed a 6-hour drive to Muscat. Lunch close after the border to Oman in Arabian style (sitting down and eating with our hands). Arrival in Muscat in the early evening, short meeting with Dr. Andrew Spalton, chief scientist from the Diwan of Royal Court, dinner in Italian style (sitting on chairs and eating with knives and forks – well, at least some of us). Our Muscat base for the next days is a house of the Diwan of Royal Court.

Today Matthias and I checked the kit list, kitted the cars out with emergency water cans, shovels, first aid kits, etc. and did some shopping. Tessa checked our datasheets over and prepared the meeting with Dr. Andrew Spalton and Hadi, our local guide and scientific assistant.

Dinner at the Oman Dive Center (ODC) with Filip, Steffi (who run it) and Andrew (Spalton). Good discussion about (eco)tourism in Oman.

Tomorrow we will be busy with shopping again, then loading all the equipment into the cars for Wednesday's drive to Khasab on the Musandam peninsula. Last but not least we will have another meeting with Andrew and Hadi to sort things out for this and the 2008 expedition.

And finally I would like to introduce all of you to a new document that we will be distributing to all team members in future (attached). It is meant to be a general guide that is applied on all our expeditions. We have field tested it Brazil last year and adapted it and Oman is the first expedition to get the final version. But of course we are always keen to have your comments and we look forward to discussing it with you.

9 January

Today is the last day here in Muscat with broadband internet access, so this may well be the last entry for the next few days. Hadi, our local biologist and guide, has arrived and we all discussed how the expedition will work on a day-to-day basis. More about this in a few days.

The storage room is empty now and the cars are packed for the drive to Khasab tomorrow early morning as you can see at <http://www.imagestation.com/album/index.html?id=2098768871>. We've put a couple of pictures on there including one of (left to right) Hadi, Matthias, myself and Tessa. Don't forget to add yours once you've survived the survey work ;->.

14 January

Yesterday Matthias left Khasab early for shopping in Dubai. Tessa and me left at 5:30 to be in Dubai for a press meeting at 9:00.

At 10:00 we met the first slot team. First briefing in Dubai, drive to Khasab and we arrived at town base at around 14:00. On the way we had the world's slowest one-finger keyboard typer on the Omani border.

After everybody settled in the apartments, we spent the afternoon going through briefings, risk assessment, some of the kit and procedures. In the evening we went to "our" Musandam restaurant for dinner.

15 January

After breakfast and Matthias' introduction into "How do I use a map, put "Fred in the shed" and "where should I go when I am lost?", Tessa held her science talk and explained the datasheets. We also very studiously went through plaster casts of animal tracks and bags of scat (faeces) of tahr, domestic goat, wolf, leopard, caracal and fox, studying and smelling (yum!), so that we will hopefully recognise them again in the field!

Later the drivers went on a driving course for a few hours. Everybody did very well. Tessa took the non-drivers to the Khasab museum (restored in the Khasab fortress) to collect what remains of the botanical collection of plants collected by the Royal Botanical Gardens of Edinburgh in 1987. This will go to the Diwan of Royal Court.

Later on we all met up again for a scramble and introduction to the terrain.

16 January

Today we split into three groups. Tessa took one to check waterholes between Khasab and Wadi As Sayh. The others went by speedboat to the Shamm peninsula and to the Bay Khwar Humsi to survey wadis and ridges. The first real survey day was successful. One large predator scat was found, probably wolf or leopard! But the specimen was perhaps one or two years old. Signs of fox and one caracal scat were also spotted. So quite a success for today! Robyn and Kate did well collecting information from some local people! Not to forget the wildlife like bottlenose dolphins, jellyfish, snakes and a turtle.

But there was still time for creating new names which make sense... So is Amanda now OMANda!

Now everybody has sore legs and is packing their stuff, ready to move into field camp in Wadi Rawdah.

20 January

We've moved into our field camp in Wadi Rawdah, about two hours drive from Khasab along a spectacular mountain road. Shortly after arrival and having put up the Bedu mess tent (which takes all hands to erect), an intrepid group of eight led by Matthias went on an epic overnight survey into the high mountains. We climbed to the top of a ridge overlooking field camp and slept out in the open on a ledge, strung up like beads in our sleeping bags, a several hundred foot drop on one side below and only the stars above. The next day we split into smaller teams and continued our survey by scouring the next valley and slopes for sign. We brought back some sizeable scats that Tessa still has to pass verdict on.

"Comfort zone" is rapidly becoming the phrase of the overnights with estimates ranging from "within" to "several hundred miles out". Everyone pushed themselves really hard and can be justly proud of their achievement on the slopes.

Meanwhile in the valley, Tessa and Hadi led the rest of the team in setting up the small mammal traps and cameras on the lower slopes. Whilst having dinner at camp, Patrick kept eyeing up the slopes hoping to see a flash of a camera trap triggering.

Matthias has left us now and gone back to Europe and we look forward to the next five days of solid research work in and around field camp.

21 January

The team members spent a relaxing day off on a dhow cruise with sunbathing, swimming, book reading and watching dolphins, mantas, sharks and turtles. Unfortunately the day started cloudy but the afternoon was sunny. Tessa and me had time to do some admin and shopping. After everybody had a nice hot shower at town base, we moved back to camp in the evening relaxed and ready for surveying in the following days. Hadi was very busy with organising the helicopter drops, estimating percentage (between 5 and 95%) of likelihood every hour.

22 January

At 2:00 in the night whole camp was woken up by a helicopter flying over base camp and disappearing! In the morning Hadi's found out that there will be no heli drop today because there was an emergency in the night. But Tessa always has a plan A, B and C, so the whole team went out to survey two wadis close to the military check point of Wadi Bih. We set up a camera trap on one of the numerous ledges and caves. We have a team of extraordinary good surveyors, so we spotted lots of signs of fox, caracal and human disturbance. And finally Tessa spotted a caracal on a ledge for a second!!! How exciting!

Back in camp, Sahid (one of last year's guides) showed us a fresh track right before heavy rain began. Tessa was sure: "This is a leopard track from this morning!" The track could be followed for ca. 500 m. This is conclusive evidence that the Arabian Leopard still clings on in Musandam! In addition to this, local people report leopard sightings in the last years and months.

After this exciting news back in camp we enjoyed Poli's fish BBQ. In the evening we held presentations on Namibia and Altai to let everybody dream of the next expedition with Biosphere.

24 January

After heavy rain in the night, the morning was cloudy and chilly. Altogether in the last days the temperatures were very pleasant for hiking - 20 to 25 degrees centigrade!

We headed out one more time to Wadi Bih splitting into small groups and surveying the big open wadi and two small narrow wadis close to the ledge where Tessa found a leopard pugmark and scratch last year. But - no luck- no signs this year!

Beautiful sunny morning and today it happens! The helicopter arrives at 7:30 taking Hadi and Tessa with two camera traps to drop on the plateau east of base camp and for a second drop on the Wadi Bih plateau. After whirling dust into all tents and almost breaking them down, the heli disappears with an incredible noise. Everybody snaps plenty of pictures. I then take the team to the wadi where we meet Tessa and Hadi in the afternoon coming down from the plateau. We spot several goat kills and interesting ledges with caves. In the upper part Tessa spots three old leopard pugmarks.

So after these exciting findings in the last days there can be no doubt that against all the odds the leopard is still hanging on in there in the remote parts of the Musandam peninsula.

26 January

Yesterday after breaking down camp, we moved back to Khasab. On the spectacular drive back, one tyre was completely shredded. Good work Jennifer and it's all Tessa's fault of course ;-> Not only tyres got shredded, several boots reached their demise after two weeks in this terrain also, including mine.

In the apartments everybody was packing - sad but true - the end of slot one is close! Last dinner and little celebration in town.

At 8:00 we left for Dubai dropping the team members at 11:00. A big thanks to the team members for being here and surveying so well! Without you the status of the Arabian leopard would still be a big unknown on the map of Oman.

We are looking forward to Inge's movie and everybody's pictures. Don't forget to share them via www.biosphere-expeditions.org/pictureexchange

After visiting Arabia's Wildlife Centre in Sharjah and watching Arabian leopard, caracal, ibex, gazelle, Blanford's fox, sandcat and all the other wildlife, we are now back in Khasab preparing everything for slot two. Khalid, Hadi's assistant, is now with us and will stay the rest of expedition and we are looking forward to picking up the second team tomorrow!

30 January

After the second team's arrival, getting familiar with equipment, cars and terrain ("up" is definitely the winner versus "down") in the last days, we went by speed boat to Kumzar in the very north of the peninsula. Led by Abdulwahid (our guide for this day) we passed the village, where each square centimeter of the narrow wadi is used, and witnessed big wedding preparations like boiling soup in huge pots in the middle of the street. We climbed up the steep part of the wadi following and surveying innumerable ledges to the incredibly green plateau (obviously there was a lot of rain in this area) on the top. Stimulated by this, the lunch break turned into a football game, luckily an old ball lay around. On the way back the wedding party had already started with music and gun shots being fired! In the village "public viewing" was in preparation, as the final of the Arabian Cup UAE vs. Oman was about to happen that evening.

By the way, after all these exciting things, a scrape was spotted today, possibly leopard, but old! Caracal sign were seen, lots of fox and small mammals like hedgehog and jird.

Back in town, we once more got the best dinner in town in "our" restaurant like "Chicken 65", dhal and falafel, not to forget the fish!

Bad luck for Tessa on a ledge - unfortunately her camera bag came lose from the rucksack and fell into the wadi. Ian could only save the damaged rest. Can you imagine our field scientist without her camera?

UAE - Oman 1:0 (so no car convoy, no spinning wheels, no V8-noise in Khasab!)

1 February

Yesterday we moved into base camp. Everybody did well packing up all the stuff, but we had to wait for the permit to access Wadi Bih for two more hours! After erecting camp, Tessa and Hadi explained the traps and went out with the whole team to place two new mammal traps in the cave above camp. The way up and down on difficult ground took the rest of the day, but eventually everybody arrived happily and safely back at base camp. We had a fantastic dinner again, Poly's fish BBQ!!!

Today the whole team headed out to Wadi Bih. We split into small groups checking camera traps, placed a new one on a promising looking ledge and surveyed three smaller wadis. Old signs of caracal and fox were spotted by team members confirming the high presence of these animals in Musandam. The camera trap on the "leopard ledge" had shot all its pictures, so we look forward to seeing them once they are developed, especially because we found a caracal track on the ledge. In the afternoon we started the "every day activity - traps and tracks". Checking all mammal traps close to base camp and tracking in three areas in Wadi Rawdah.

4 February

During the last few days team members were busy with "traps and tracks" and surveying smaller wadis. Caracal and fox (probably Blanford's fox, too) signs were also spotted. We are working on a mammal and a bird list and they become longer every day. Unfortunately we also always find many signs of human disturbance like litter or (stone) traps.

Friday afternoon heavy rain stopped the surveys. It happened right after dinner when we were sitting around the campfire. Suddenly the clouds burst above camp and we had to scramble for cover and start digging ditches to protect the big Bedu tent! That's wintertime in Musandam! After everybody rescued their sleeping bags, we met in the almost dry Bedu tent listening to Ian's fantastic voice singing. Because of the heavy rain we have seen water running in one wadi – a rare event!

After a cold and wet night all team members came back to Khasab to relax on a dhow cruise today and to be ready for the last few days of field work from tomorrow onwards.

5 February

During the night there was an incredible thunderstorm. Almost everybody had to dry their sleeping bags and tents.

And, of course, no helicopter drop, the weather was too changeable. Unfortunately we also had to cancel the overnigher, which was planned up to the plateau close to Wadi Bih. Instead we went with the whole team to the wadi we have been to ten days ago (also close to Wadi Bih) to set the last camera trap on a promising looking ledge. Some tried to reach the top, but it was very difficult because the heavy rain had loosened the rocks. But team members did well and surveyed a lot of ledges and caves.

Amazingly there was now running water, water falls and filled rock pools in the wadi! After the thunderstorm of the night, the morning turned out to be glorious! In the afternoon on the way down, with Hadi singing, we found a frog in a rockpool. This may be the first found in Musandam! In the evening Hadi and Tessa left for Khasab to give a talk the next day at the Ministry of Environment and Tourism.

6 February

Today we split in to two teams. I did "traps and tracks" with Anja, Sybille and Julie. We set the mammal traps with pet food and while tracking we got really excited about some tracks and pugmarks. We looked forward to showing them to Tessa in the afternoon! The rest of the team went with Khalid back to Wadi Selhad where heavy rain stopped us on Friday! Lots of much human disturbance in this wadi, so not much was found. Our tracks turned out to be domestic dog, so no excitement there. But one track looked like a leopard hind pug, even Tessa agreed!

What a pity!

In the evening James from Dubai, a journalist, came to base camp, Tessa, Hadi, some team members and I headed out one more time to show him the mammal traps and the tracking area. On the way back, already after sunset, while the team was waiting for supper, we saw two Blanford's foxes crossing the road!

Back in base camp Poly's comment about the kitchen tent - he had to fight with the wind during the day - was "tomorrow this garbage"! And so it was! Under the stars we sat on the campfire up to midnight waiting for the moon - stunning!

7 February

Beautiful morning! After a late breakfast Tessa, Hadi and I went with the helicopter to the plateau east of base camp. After the steepest descent of my life, we changed films in the two camera traps that had been set on the first helicopter drop! Pictures on the film - we look forward to seeing them developed! Khalid took the team one last time to Wadi Bih to survey a big wadi. After the arduous climb up to ledges and a long walk, unfortunately not much was found in this wadi - too much human disturbance. The "trap and tracks" team came back to camp to take us to the mammal traps, catching up the survey team on the way.

One mammal trap was closed with a Blanford's fox inside! Tessa determined it was a female. In the pouring rain we released the animal! Now the whole team has seen a Blanford's fox, and we have spotted three in the last 24 hours. Plenty of good evidence that they are still around.

In the late afternoon we went to Sahid and Khasoum to say goodbye. One last time we enjoyed Poly's best dinner in base camp.

10 February

On Thursday we split into three teams. Two checked and brought back the mammal traps. The rest of the team helped pack up base camp. After heavy rain during the whole night - I know this from northern Germany, but didn't expect it in Oman - we had to dry the tents and clean everything. The team did very well and so we finished at 10:00. The drive back to Khasab took us more than 3.5 hours as the road was washed away by the rain. We shredded two more tyres, but luckily we arrived safely!

And so the following afternoon everybody began to pack and prepare to leave. We had to say goodbye to the Esra team, the restaurant, the shop keepers and everyone who has helped in the last month and made this expedition a success and hugely enjoyable. Thank you to all of you.

After leaving four team members in Khasab (where they stayed on for a bit of holidaying), we drove to Dubai to drop the rest of the team. Then straight on to Muscat where we arrived in the late evening, unloaded the cars and stored the equipment for another year.

I have just finished wrapping up everything and would like to say thank you to everyone who participated in this year's Oman expedition. Thank you for your hard work, good surveying, enthusiasm, laughter, singing...

It has been a great success - we covered a lot of ground and we found conclusive evidence that the Arabian leopard is still clinging on in Musandam! We found leopard pugmarks, claw rakes and scrape, spotted many signs of caracal and fox, saw one caracal, three Blanford's foxes and one camera trap picture of a Blanford's fox.

The camera traps stay in place, hopefully there will be some results coming in. Tessa will be busy analysing all the data and writing the report. A big thank you to Hadi and Khalid - it was great to have your company! All of you were a fantastic team and I am already looking forward to next year's expedition down in Dhofar!

Don't forget to share pictures at www.biosphere-expeditions.org/pictureexchange.

Good luck to you all and hope to see you again!

Peter Schuette
Expedition leader