



## Short Communication

# Postmortem Findings in Captive Sand Gazelle and Arabian Oryx at Al-Wusta Wildlife Reserve, Oman

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### ABSTRACT

Al-Wusta Wildlife Reserve (WWR) is the first wildlife reserve in Oman. It was established in 1980 for reintroduction and breeding of the Arabian oryx (*Oryx leucoryx*) and recently other wildlife, which includes the Arabian gazelle (*Gazelle gazelle cora*) and Sand gazelle (*Gazella subgutturosa marica*). These antelopes are only kept in a few countries worldwide. Therefore, only limited information is available on their husbandry requirements and diseases occurring in these species. This study aimed to evaluate the causes of mortalities at WWR. During July to October 2019, fifty mortalities were observed at WWR. These mortalities consisted of 10 Arabian oryx and 40 Sand gazelles. All carcasses were subjected to the detailed post-mortem (PM) examination to find out the potential cause of death. Fatal injuries caused by fighting were the major cause of deaths (n=17, 34%) followed by cyclone related deaths (n=10, 20%), pneumonia (n=8, 16%), old age (n=4, 8%), impaction of stomach caused by foreign bodies (n=3, 6%) and bloat (n=2, 4%). The exact cause of death could not be established in 5 (10%) mortalities. Internal organs were screened for the presence of adult worms. However, no parasite was observed in these animals. These findings demonstrated that more than 50% mortalities could be reduced by only controlling aggression-related injuries and taking precautionary measures against natural disasters like a cyclone. On the other hand, the absence of internal worms could be related to good husbandry conditions at WWR.

#### Article Information

Received 29 January 2020

Revised 21 June 2020

Accepted 27 August 2020

Available online 07 October 2020

#### Authors' Contributions

KG designed the project, performed post-mortems, kept history of all animals. QAR provided all legislative and funding help and reviewed the manuscript. SAB provided facilities for research. HAS helped in identification/capturing of sick and dead animals. SAR took care of environmental factors related with this project. ZAA managed all team members to perform this project. MHH performed statistical analysis. MH helped us in performing post-mortem of studied animals.

#### Key words

Arabian oryx, Sand gazelle, WWR Oman, Postmortem, Cyclone, Parasite.

The white oryx sanctuary, also known as Al-Wusta Wildlife Reserve (WWR) is the first wildlife reserve in Oman. It was established in 1980 for the reintroduction and breeding of the Arabian oryx (*Oryx leucoryx*) and recently other wildlife, including Arabian gazelle (*Gazelle gazelle cora*) and sand gazelle (*Gazella subgutturosa marica*).

The extreme poaching of Arabian oryx led to its extinction in 1972 (Henderson, 1974; Stanley-Price, 1989; Spalton *et al.*, 1999). In Oman, a program for reintroduction of the Arabian oryx was established in the 1980s in Al-Wusta governorate. The reserve contains varieties of geological life and landscapes of unique scientific and aesthetic value. It is the first site in the region to be recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO). WWR is an area within the central desert and coastal hills of the biogeographically regions of Oman. Seasonal fogs and

dews support this unique desert ecosystem whose diverse flora includes several endemic plants. The other breeding sites also found in the Arabian Peninsula are conservation programs of endangered animals such as the houbara bustard (*Chlamydotis macqueenii*), waders (storks and herons), the Nubian ibex (*Capra nubiana*), Arabian wolves (*Canis lupus arabs*), honey badger (*Mellivora capensis*), caracal (*Caracal caracal*) and the largest wild population of the Arabian gazelle (*Gazella arabica*).

Arabian oryx and gazelles are herbivores and belong to Bovidae family. Their compound stomach can digest plants, shrubs and herbs. They can survive without water for long hours which help them to acclimatize themselves with the harsh environment of the desert.

Like other species of animals, these antelopes are suffering from bacterial, viral, parasitic, fungal infections, and metabolic disorders (Anonymous, 2018). Besides, these ungulates are very aggressive and fight for the food and dominance of sex which lead to injuries and high mortalities (Schenik *et al.*, 2009; Anonymous, 2018; Soares *et al.*, 2015).

Humans and wild animals face new challenges for

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0030-9923/2021/0001-0001 \$ 9.00/0

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survival because of climate change. More frequent and intense drought, storms, heat waves, rising sea levels, melting glaciers and warming oceans can directly harm animals, destroy the places they live, and wreak havoc on people livelihoods and communities.

### Methods

The study followed the guidelines of research permit approved by The Animal Welfare Committee of the Animal Health Research Centre, Ministry of Agriculture, Oman (358/2014).

The WWR is enclosed by two meters high chain-link perimeter fence. It covers 2,824 km<sup>2</sup> tract of open, sparsely-vegetated limestone desert including part of the Al-Huqf escarpment to the east. Today, the field headquarters of WWR has four captive enclosures (Maha1, Maha2, Maha3 and Maha4) for the Arabian oryx (718 individuals) and two captive enclosures (Reem1 and Reem2) for sand gazelles (1150 individuals). The enclosure (each 1km<sup>2</sup>, is connected with corridors through where an animal can be moved and rotated in any of the enclosures) has well-established tree covering such as ghaf (*Prosopis cineraria*), samr (*Acacia tortilis*) and salm (*Acacia ehrenbergina*). The holding pens are provided with additional man-made shading. The gazelles are fed with a mixture of different pelleted feeds. In addition, they receive fresh lucerne (*Medicago sativa*) and grass hay (*Medicago sativa*) *ad libitum*. A mineral lick (calcium, magnesium, sulfur, phosphorus, potassium, and sodium) is available in every enclosure. For drinking, subterranean water drawn by a pump is supplied *ad libitum*.

Reserve has a team of veterinarians, biologists, researchers and other non-technical support staff. Identification and treatment of sick animals are the routine

jobs of an on-duty veterinarian. For this study, dead animals were examined thoroughly from head to tail including mouth, eyes, ears, skin, legs, anus and tail for any apparent injury/trauma/fracture and presence of external parasites. After the physical examination of carcasses, post-mortem examinations were performed by following OIE guidelines (Woodford, 2000). Every organ including abdominal cavity, pleural cavities, lungs, heart, liver, spleen, kidneys, gastrointestinal tract, urinary tract, reproductive tract, lymph nodes and blood vessels were observed for macroscopic pathological changes and adult helminths (worms).

The species, location of a pen, tag number, age, sex and post-mortem findings were recorded for each mortality. Photographs were taken of all cases, and the data were maintained on a Microsoft Excel sheet for the analysis. The IBM SPSS software version 21 was used for the analysis.

### Results

During July to October 2019, fifty mortalities were observed at WWR. These mortalities consisted of 10 Arabian oryx (AO) and 40 gazelles. All carcasses were subjected to the detailed post-mortem examination to establish the potential cause of death. Fatal injuries caused by fighting were the major cause of deaths (n=17, 34%) followed by cyclone related deaths (n=10, 20%), pneumonia (n=8, 16%), old age (n=4, 8%), impaction of stomach caused by foreign bodies (n=3, 6%) and bloat (n=2, 4%). The exact cause of death could not be ascertained in 5 (10%) mortalities (Table I).

In AO, 5 (50%) mortalities were related to the severe weather (cyclone) followed by 3 (30%) due to old age and

**Table I.- Summary of the mortalities observed in the WWR, Oman from July to October 2019.**

Variable	Category	Age-related	Cyclone	Enterotoxemia	Fatal injury	NS	Pneumonia	Stomach FB	Tympany and Bloat	Total
Species	AO	3 (30%)	5 (50%)	0	2 (20%)	0	0	0	0	10
	Sand Gazelle	1 (2.5%)	5 (12.5%)	1 (2.5%)	15 (37.5%)	5 (12.5%)	8 (20%)	3 (7.5%)	2 (5%)	40
Gender	Female	2 (10.5%)	8 (42.1%)	0	4 (21.1%)	2 (10.5%)	1 (5.3%)	1 (5.3%)	1 (5.3%)	19
	Male	2 (6.5%)	2 (6.5%)	1 (3.2%)	13 (41.9%)	3 (9.7%)	7 (22.6%)	2 (6.5%)	1 (3.2%)	31
Age Group	Calf	0	3 (75%)	0	0	1 (25%)	0	0	0	4
	Adult	0	2 (5.6%)	1 (2.8%)	17 (47.2%)	3 (8.3%)	8 (22.2%)	3 (8.3%)	2 (5.6%)	36
	Old	4 (40%)	5 (50%)	0	0	1 (10%)	0	0	0	10
Enclosure	Maha1	1	0	0	0	0	0	2	0	3
	Maha4	1	0	0	3	0	0	0	1	5
	Maha2	0	3	0	0	0	0	0	0	3
	Maha4	1	1	0	1	0	0	0	0	3
	Reem1	0	1	0	1	3	4	1	0	10
	Reem2	0	4	1	12	2	4	0	1	24
	Wild	1	1	0	0	0	0	0	0	2

AO, Arabian oryx; FB, foreign bodies; Maha, Arabic name of Arabian oryx; Reem, Arabic name of sand gazelle.

2 (20%) related to fatal injuries.

In sand gazelles, 15 (37.5%) death were caused by fatal injuries, 8 (20%) by pneumonia, 5 (12.5%) by cyclone, 3 (7.5%) by foreign bodies inside stomach, 2 (5%) by bloat and 1 (2.5%) each due to enterotoxaemia and old age. The cause of 5 (12.5%) deaths could not be ascertained and was regarded as not specific (NS).

The highest number of mortalities were recorded in Reem-2 enclosure (n=24, 48%) followed by Reem-1 (n=10, 20%), M-4 (n=5, 10%) enclosures and other enclosures (n=3, 6% each in M-1, Maha-2 and Maha-4). Two deaths were recorded in the AO from the wild.

In total, 3 out of 4 (75%) calves died due to cyclone and 1 (25%) due to unknown reason. Majority of the adults (n=17, 47.2%) died due to the fatal injuries followed by pneumonia (n=8, 22.2%), stomach foreign bodies (n=3, 8.3%), bloat (n=2, 5.6%), cyclone (n=2, 5.6%) and enterotoxaemia (n=2, 5.6%). Cyclone (n=5, 50%) and old age (n=4, 40%) were the major causes of death in older animals.

In total, 62% (n=31) of the recorded mortalities were males and 38% (n=19) were females. In females, cyclone (n=8, 42.1%), fatal injuries (n=4, 21.1%) and old age (n=2, 10.5%) were the major cause of deaths. Whereas, in males, fatal injuries (n=13, 41.9%), pneumonia (n=7, 22.6%), and cyclone (n=2, 6.5%) were the major cause of deaths.

All animals were subjected to the thorough post-mortem examination, and internal organs were screened for the presence of adult worms. However, no parasite was observed in these animals.

### Discussion

Postmortem is an integral part of a disease investigation. When mortality or morbidity in a wildlife population is observed, the investigator must collect as much general and local information as possible, including any evidence of similar mortality or morbidity in domestic stock. A thorough inspection of the surroundings of a sick or dead animal is vital (Woodford, 2000).

We found that major causes of deaths in this study were injury/trauma (34%), weather (cyclone) related (20%), lung infections (16%) and gastrointestinal related problems (12%). Similar was documented in captive antelopes in other parts of the world (Müller *et al.*, 2010; Soares *et al.*, 2015). Cyclone/weather-related mortalities and morbidities are less documented in captive breeding of oryx and gazelles, but the impact of weather on human and animal health are well-acknowledged around the world (Forman *et al.*, 2008; Acharya and Dhakal, 2016; [www.wwf.org](http://www.wwf.org)).

Sand gazelles are very nervous animals which require careful and gentle handling to avoid panic escapes and running into fences. Additionally, injuries due to aggression

occur regularly. Thus trauma-related deaths are frequent in these antelopes (Anonymous, 2018). In Qatar and Saudi Arabia, 30-50% of deaths in gazelles were reported due to injuries and trauma (Schenik *et al.*, 2009; Soares *et al.*, 2015). Numbers of deaths increased in the breeding seasons for mating competition (Schenik *et al.*, 2009).

Arabian oryx is less sensitive and nervous as compare to gazelles. Arabian oryx are more resistant to pathogens than gazelles. Trauma is a leading cause among the other factors that are responsible for the causalities of oryx population. According to Anonymous (2018), 42% mortalities in oryx population were attributed toward trauma. In our examined animals, 20 % of oryx died because of fatal injuries.

Wild animals face new challenges for survival because of climate change ([www.wwf.org](http://www.wwf.org)). Recently, in Australia, nearly half a billion animals have been impacted by the fires (<https://edition.cnn.com/2020/01/07/australia/australia-fire-wildlife-deaths-intl-hnk-scli/index.html>). We found that 50% of studied AO and 12.5% gazelles died because of cyclone related injuries. Cyclones hit Al-Wusta region once or twice in a year ([https://en.wikipedia.org/wiki/List\\_of\\_Arabian\\_Peninsula\\_tropical\\_cyclones#2010%E2%80%932019](https://en.wikipedia.org/wiki/List_of_Arabian_Peninsula_tropical_cyclones#2010%E2%80%932019)). The cyclone destroyed trees, fences and killed many animals overnight and after-effects of the cyclone lead to some nervous signs in many animals and finally death (personal observation). Appropriate weather forecast and shelter to the animals can reduce the weather-related causalities. Cyclone/weather can affect all ages but most of the affected were calves (75%) and old age (40%); might because of less immunity and tolerance than adults.

Pneumonia is the second leading problem of these antelopes (Soares *et al.*, 2015). Lung infections can occur in any season, but the prevalence of lungs related infection were high in September and October (Personal observation; Soares *et al.*, 2015). In this study, 20% mortalities in gazelles were found due to lung infections. Proper vaccination and antibiotics as feed additives can minimize lungs infection. Secondly, there is a need to investigate the specific pathogen (viral, bacterial, parasitic, fungal *etc.*) so that treatment and prevention can be planned.

In gazelles, gastrointestinal conditions lead to 15% mortalities including impaction due to foreign bodies, bloat and enterotoxaemia. WWR has a clean and hygienic environment, but sometimes wastes like; plastic bags and other plastics cups thrown by the visitors, and feed containing some waste contents like a binding rope can lead to the accidental ingestion of these foreign materials. Therefore, the installation of the covered waste bins in each enclosure and feeding store were recommended. Workers responsible with feeding were instructed to check the grass and pellets thoroughly for the presence of any

foreign bodies before offering it to the animals.

During these postmortems, every organ was examined for the presence of adult helminths (Urquhart, 1996). Surprisingly, there was no parasite found in any of the animals at PM examination. Absence of parasites has arisen many questions including; season, the geographical location of the WWR, breed or species resistance, deworming history etc. Necropsies of gazelles at King Khalid Reserve from 1998 to 2011 did not mention any account of a parasite as well (Soares *et al.*, 2015). Although eggs of *Strongylus* (*Strongylus vulgaris*, *Angiostrongylus cantonensis*), *Trichostrongylus* (*Haemonchus contortus*, *Camelostrongylus smentulatus*), *Trichuris* (*T. leporis*, *T. ovis*, and *T. discolor*), *Isospora* (*Isospora gryphoni*) and *Eimeria* (*E. zuernii* and *E. bovis*) have been reported in the feces of *Oryx dammah* in the USA by using microscopy and PCR based techniques (Pauling *et al.*, 2016), but limited literature is available on the adult stages of these parasites inside the body of an oryx. Only the presence of the adult stages of worms inside various organs of a host can confirm the definite host-parasite relationship (Urquhart *et al.*, 1996; Soulsby, 2012). Therefore, studies are recommended on the host-parasite relationship in Arabian oryx and gazelles to build a suitable deworming schedule.

#### Conclusion

Male fighting is a trait of antelopes. This fighting gets amplified with mating and food competition, resulting in injuries, fractures and death. Management of surplus males in captive breeding is a challenge for managements. Furthermore, wild animals face new challenges for survival because of climate change. More frequent and intense cyclones directly harm animals, destroy the places they live. Weather forecast and precautionary measures can reduce the damages. Lungs and gastrointestinal related infection/disorders are more prevalent in gazelles as compared to Arabian oryx; diagnosis of specific pathogens is necessary for the disease control program. Surprisingly, during studies of organs at necropsies, no adult worms were detected in Arabian oryx and gazelles at WWR. More research is warranted on host-parasite relationships in these antelopes to build suitable research-based deworming plan.

#### Acknowledgements

We are highly thankful to the Office for Conservation of the Environment (OCE), Diwan of Royal Court, Oman for their continuous support and funds; especially the subterranean interest of Mr. Yasser Al Salami (DG of OCE) and Dr. Mansoor Hamed Al Jahdhami. We are grateful to the team of WWR without their sincere efforts this work

was not possible.

#### Statement of conflict of interest

The authors have declared no conflict of interests.

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