RETROSPECTIVE STUDY OF MORTALITY IN DORCAS AND GRANT'S GAZELLES *(GAZELLA DORCAS* AND *NANGER GRANTI)* AT AL WABRA WILDLIFE PRESERVATION, QATAR

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Summary

The necropsy records of 279 dorcas gazelles (Gazella dorcas) and 27 Grant's gazelles (Nanger granti) kept at Al Wabra Wildlife Preservation in Qatar over a period of 8 years were reviewed in order to determine common pathological findings with view to population development and neonatal survival. The most common finding in both species was trauma (41 % in dorcas, 60 % in Grant's gazelles), followed by pneumonia (20 % in dorcas, 35 % in Grant's gazelles). Other common diagnoses included gastrointestinal disorders (15 % in dorcas, 25 % in Grant's gazelles) and nephropathies (11 % in dorcas, 25 % in Grant's gazelles). In dorcas gazelles neonatal mortality can be reduced, and individual animal welfare can be increased (MELLOR and STAFFORD, 2004), if group size is strictly controlled.

Introduction

The dorcas gazelle *(Gazella dorcas)* is one of the smallest gazelle species. Depending on their origin, adult males weigh 15 - 18 kg and females 11 - 15 kg. They are found all over northern Africa and parts of the Middle East, where they inhabit savannahs, dry hills, sub-deserts, and true deserts. Dorcas gazelles prefer stony to rocky terrains, and tend to avoid very sandy and steep areas (YOM-TOV et al., 1995). The species is considered as "vulnerable" on the IUCN RED LIST OF THREATENED SPECIES (2008a). The Grant's gazelle *(Nanger granti)* is a large gazelle (males 58 - 82 kg, females 38 - 67 kg) that is found in eastern Africa from southern Sudan, Ethiopia and Somalia to central Tanzania and Kenya. This species lives in open grass plains in altitudes up to 2500 m (ESTES, 1991) and is classified to the category "lower risk" in the IUCN RED LIST OF THREATENED SPECIES (2008b).

Al Wabra Wildlife Preservation (AWWP) in the State of Qatar is a private breeding and research centre for wildlife. Since AWWP adjusted its focus mainly on threatened species, efforts to maintain a breeding population of Grant's gazelles were limited as compared to investments made in more threatened species, such as the dorcas gazelle. A stocklist evaluation of dorcas and Grant's gazelles showed an overall population decrease since 2002/2003; in particular, the Grant's gazelle demonstrated a very poor population development in relation to its original stocking number (MÜLLER et al., 2009b). The aim of this study was to determine the frequency of main pathological findings in both species with view to population development, and neonatal survival.

Material and methods

Necropsy reports of 279 dorcas gazelles and 27 Grant's gazelles from 2001 to 2008 were evaluated to determine the frequency of pathological findings in a closed population. The pathological diagnoses were summed up into major categories (pneumonia, gastro-intestinal disorders, nephropathy, hepatopathy, and trauma). If no diagnosis was given (e.g. autolysed carcasses), the animal was considered in the category "unknown". Further findings were summarised in the category "others" (minor diagnoses that were not representative, e.g. mineral deficiency), and "culling" (animals that were removed for management reasons). The following definitions for age groups were used: neonates up to 10 days, juveniles 11 days to 1 year, adults over 1 year. Due to the small number of necropsy reports (27), the evaluation according to sexes or age classes was not useful in the Grant's gazelle. Additionally, stock data of dorcas gazelle was used to evaluate the population development, annual mortality rates and neonatal mortality (proportion of dead neonates up to 10 days of life from all born animals).

Results

In juvenile and adult animals of both species, the most common finding was trauma (41 % dorcas, 60 % Grant's gazelles) followed by pneumonia (20 % dorcas, 35 % Grant's gazelles). Other common diagnoses were gastrointestinal disorders (15 % dorcas, 25 % Grant's gazelles), nephropathies (11 % dorcas, 25 % Grant's gazelles), and hepatopathies (6 % dorcas, 10 % Grant's gazelles; Fig. 1). Trauma was slightly more often diagnosed in male (43 %) than in female (36 %) dorcas gazelles, whereas the incidences of pneumonia (20 % males, 19 % females) and gastro-intestinal disorders (both sexes 15 %) were similar in both sexes.

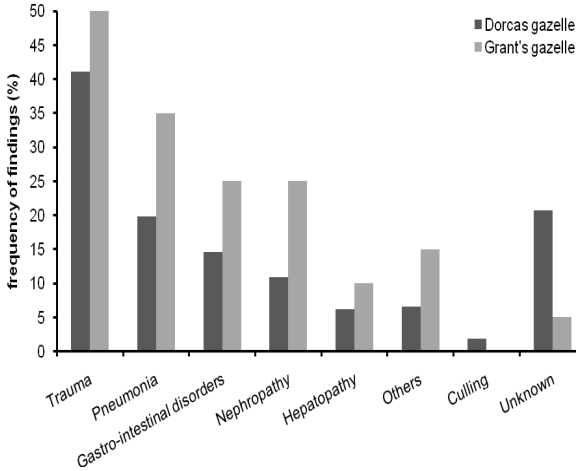

Figure 1: Frequency of pathological findings in 212 dorcas gazelle and 20 Grant's gazelle examined at Al Wabra Wildlife Preservation, Qatar from 2001 to 2008. The most common finding in both species was trauma (41 % dorcas; 60 % Grant's), followed by pneumonia (20 % dorcas; 35 % Grant's). Neonates (up to 10 days) were excluded.

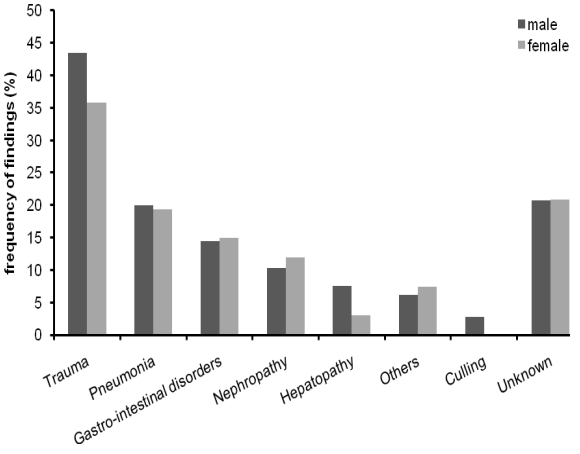

Figure 2: Frequency of pathological findings in 145 male and 67 female dorcas gazelles examined at Al Wabra Wild-life Preservation, Qatar from 2001 to 2008. Neonates (up to 10 days) were excluded.

Interestingly hepatopathy was much more often diagnosed in male (8 %) than in female (3 %) dorcas gazelles (Fig. 2). Comparing pathological findings between age groups, trauma was the most important finding in juvenile (39 %) and adult (42 %) dorcas gazelles (Fig. 3). Slightly more cases of pneumonia were reported in juveniles (22 %; 19 % adults) whereas nephropathies (3 % juveniles, 14 % adults) and hepatopathies (0 % juveniles, 9 % adults) were more often diagnosed in adult individuals. Neglect was the most frequent cause of deaths in neonates (dorcas 37 %; Grant's 43 %); other frequent diagnosis were trauma (9 % dorcas) and lung infections (4.5 % dorcas). In order to reduce the initial high stocking number of dorcas gazelles at AWWP, breeding was limited in this species between 2003 and 2007. In this respect single-sex male and female groups were established in 2003. Some of the females in the single-sex groups were pregnant and gave birth. To avoid the problem that some of the male offspring grow up and sire offspring themselves, neonate males were culled on the first day of life. Thus, culling made a high contribution to neonatal mortality in dorcas gazelles (22 %).

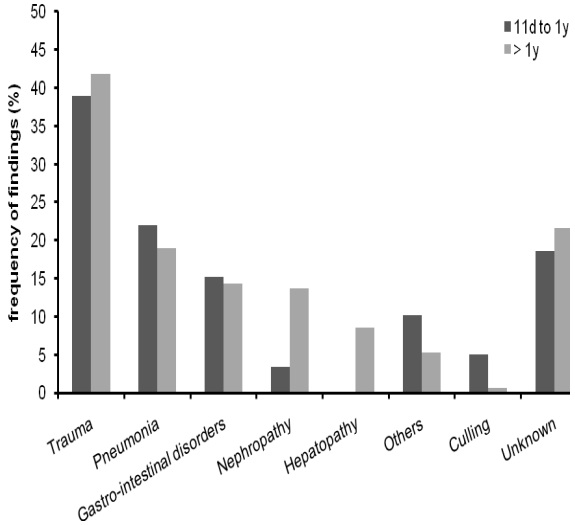

Figure 3: Frequency of pathological findings in dorcas gazelles by age groups (10 days to 1 year, n = 59; over 1 year, n = 153) examined at Al Wabra Wildlife Preservation, Qatar from 2001 to 2008.

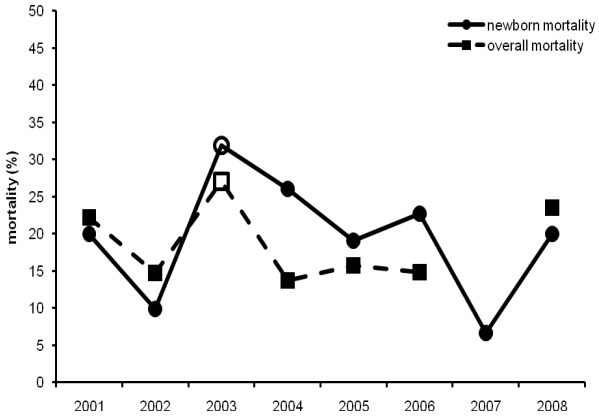

Figure 4: Development of neonatal mortality (percentage of neonates that died within the first 10 days of life) and overall mortality in the dorcas gazelle at Al Wabra Wildlife Preservation, Qatar from 2001 to 2008. The mortality peak in 2003 (open symbols) can be explained by a performed culling program to reduce the population size in this species. As several animals were transported to another facility in 2007, no overall mortality rate could be determined for this year.

Overall mortality of dorcas gazelles at AWWP ranged between 13.7 % and 27.0 % (mean 18.8 % ± 5.3 %) and neonatal mortality between 6.7 % and 31.9 % (mean 19.5 % ± 8.1 %; Fig. 4). The correlation between these parameters was not significant. The mortality peak in 2003 (32 % neonatal mortality, 27 % overall mortality) can be explained due to a performed culling program (see above). Even though many animals (140 out of 202) were transported to another facility in 2007 and population size

thus dropped to 24 individuals (01.01.2008), neonatal and overall mortality stayed at a high level (20 %, resp. 24 %) in 2008. Neither neonatal nor overall mortality was correlated to population size (data not shown).

Discussion

Like in other captive groups of gazelles, panic escapes with running into fences, and fighting especially amongst males, occur regularly in dorcas and Grant's gazelles at AWWP, resulting in trauma being the main cause of death in these species (HAMMER et al., 2008; MÜLLER et al., 2009a). Surprisingly, differences in the frequency of traumatic findings between sexes during necropsy in dorcas as well as in Soemmerrings' gazelles (*Nanger soemmerringii*) were only small (MÜLLER et al., 2009a). It is likely that trauma in females is mainly a result of panic escapes and attacks from aggressive males, but aggressions amongst females also occur frequently. Unfortunately the necropsy reports often did not provide any information about the course of the injury, i.e. about the involved opponents.

Juveniles and adults were equally affected from traumatic injuries. This result is contrary to studies on other species, for which a higher frequency of trauma in adult individuals (MÜLLER et al., 2009a, Soemmerring's gazelle; SCHENK et al., 2009, Speke's gazelle *(Gazella spekei)*) was observed. Adult males start to attack juvenile males when they reach an age of 4 - 6 months. In captivity, these fights are often fatal, as space limitations prevent that the submissive young males can escape the attacks of adult males. Therefore removing (or culling) male offspring at young ages (i.e. after weaning) may be helpful to prevent juvenile traumatic deaths. At first sight, one may argue that it makes no difference whether animals die due to fights or due to culling. As high standards of animal welfare and a minimisation of distress for the individual animal are proclaimed goals of the international zoo community (WAZA, 2003), a culling program for surplus males should be preferred instead of just "letting them fight it out themselves". In the wild, fights among adult males are seldom fatal - the inferior male takes flight. The limited space in captivity precludes this possibility and can explain the high incidence of deadly fights among adult males. Keeping gazelles in harem systems with only one adult male would consequently reduce the incidence of deaths due to trauma. Such a management harbours the problem how to deal with surplus males. These can either be castrated to reduce their aggressiveness so that they can stay within the breeding group (although this procedure does not guarantee a reduction of aggressiveness), or they should be taken out of the group by either placing them in other facilities/ enclosures, or culling (GLATSTON, 1998). Another possibility is keeping single-sex bachelor groups in big, well structured enclosures, which did not prevent males from fighting in a mixed species bachelor group at AWWP, but frequency of fatal fights decreased drastically (HAMMER and HAMMER, 2006).

Apart from traumatic injuries, pneumonia was often diagnosed during necropsy in dorcas gazelles (20 %) and more frequently in Grant's gazelles (35 %). The incidence of pneumonia in these 2 species were within the same range (gerenuk *(Litocranius walleri)* 20 %; Soemmerring's gazelle 15 % - 30 %) or even smaller (beira antelope *(Dorcatragus megalotis)* 79 %-95 %; Speke's gazelle 30 % - 50 %; Pelzeln's gazelle (*Gazella dorcas pelzelni*) 19 % - 54 %) than reported for other gazelles at AWWP (HAMMER et al., 2008; NAGY et al., 2008; MÜLLER et al., 2009a; SCHENK et al., 2009; WESPI et al., 2009). The high incidence of fibrinous pleuropneumonia combined with high mortality rates in the beira antelope was attributed to a yet unidentified *Mycoplasma ssp.* (NAGY et al., 2008). It seems unlikely that dorcas and Grant's gazelles were affected with *Mycoplasma,* as fibrinous pleuropneumonia (principal lesion of *Mycoplasma*-infections in other species) was not diagnosed in these species. Unex-

pectedly, the incidence of infectious diseases (pneumonia and enteritis) was similar in juveniles and adults in dorcas gazelles, whereas hepatopathies and nephropathies were more important in adult animals.

The group sizes of dorcas gazelles at Al Wabra Wildlife Preservation were reduced drastically in 2007, when many animals were transported to another facility. This should result in subsequent reduction of social stress and in a decrease of traumatic injuries as well as in a reduced mortality rate, but instead, the incidence of fatal traumatic injuries, and mortality rate stayed at a high level in 2008. It must be mentioned that the year 2008 may not be representative due to the low number of deaths (n = 8). Neonatal and overall mortality tend to correlate over the years implying that both rates are influenced by the same biological or environmental factors. Contrary to other results, this study failed to demonstrate a correlation between population density and neonatal mortality (BESSELMANN et al., 2008; HAMMER et al., 2008; MÜLLER et al., 2009a; WESPI et al., 2009), as group sizes of single breeding groups could not be reconstructed. Nevertheless, neonatal mortality was on its lowest rate in 2007 (7 %), when approx. 70 % of animals were transported to another facility. This result may implicate, that neonatal mortality can be reduced, and consequently individual animal welfare can be increased (MELLOR and STAFFORD, 2004), if group size is strictly controlled (by either contraception or translocation of animals) in order to prevent crowding conditions.

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References

*BESSELMANN D, SCHAUB D, WENKER C, VÖLLM J, ROBERT N, SCHELLING C, STEINMETZ H, CLAUSS M (2008): Juvenile mortality in captive lesser kudu (Tragelaphus imberbis) at Basle zoo and its relation to nutrition and husbandry. J Zoo Wildl Med **39,** 86 - 91.*

ESTES RD (1991): The behavior guide to African mammals including hoofed mammals, carnivores, Primates. Berkeley, Los Angeles, London University of California Press, 611.

*GLATSTON AR (1998): The control of zoo populations with special reference to primates. Anim Welf **7,** 269 - 281.*

*HAMMER C, HAMMER S (2006): A mixed gazelle and antelope bachelor group in Qatar. International Zoo News **58,** 4 - 12.*

*HAMMER C, STUTZ K, DEB A, ARIF A, TAHA A, CLAUSS M, HAMMER S (2008): Medical management and pathology of captive gerenuk (Litocranius walleri) at Al Wabra Wildlife Preservation (AWWP) from 2001 to 2006. Proc EAZWV **7,** 349 - 351.*

IUCN (2008a): Gazella dorcas, IUCN Red list of threatened species. www.iucnredlist.org, 22.12.2009.

IUCN (2008b): Nanger granti, IUCN Red list of threatened species. www.iucnredlist.org, 22.12.2009.

*MELLOR DJ, STAFFORD KJ (2004): Animal welfare implications of neonatal mortality and morbidity in farm animals. Vet J **168,** 118 - 133.*

*MÜLLER DWH, CLAUSS M, BORER S, HAMMER C, DEB A, ARIF A, HAMMER S (2009a): A retrospective analysis of necropsy reports and stock-data of the Soemmerrings's gazelle (Gazella soemmerringii) at Al Wabra Wildlife Preservation (AWWP), Qatar. Proc Int Conf Dis Zoo Wild Anim **2009**, 279 - 283.*

*MÜLLER DWH, HAMMER S, HAMMER C, CLAUSS M (2009b): Up, over the top, or down? Population development in closed captive populations of wild ruminants. Proc Int Conf Dis Zoo Wild Anim **2009**, 48 - 50.*

*NAGY A, GULL JM, DEB A, ARIF A, HAMMER C, WERNERY U, CLAUSS M, VERHOEVEN S, HAMMER S (2008): Retrospective evaluation of necropsy reports for beira antelopes (Dorcatragus megalotis) at Al Wabra Wildlife Preservation, Qatar - with special focus on the occurrence of a fibrinous pleuro-pneumonia syndrome (FPPS). Proc EAZWV **7,** 277 - 286.*

*SCHENK F, DEB A, ARIF A, TAHA A, HAMMER S (2009): Causes of mortality in captive Speke's gazelle (Gazella spekei) at Al Wabra Wildlife Preservation (AWWP) Qatar from 2001 - 2007. Proc Int Conf Dis Zoo Wild Anim **2009**, 325.*

WAZA (2003). WAZA code of ethics and animal welfare. 58th Annual Meeting, of the World Association of Zoos and Aquariums. San José, Costa Rica, WAZA.

*WESPI B, CLAUSS M, DEB A, ARIF A, TAHA A, HAMMER C, HAMMER S (2009): Comparison of an unmanaged population of Pelzeln's gazelle (Gazella dorcas pelzelni) to an intensively managed population at Al Wabra Wildlife Preservation (AWWP), Qatar. Proc Int Conf Dis Zoo Wild Anim **2009**, 340 - 344.*

*YOM-TOV Y, MENDELSSOHN H, GROVES CP (1995): Gazella dorcas. Mamm Species **491,** 1 - 6.*