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FROM THE EDITOR...

The New Year 2009 has arrived with hopes and wishes of change for global economies, global warming, and world peace. This edition of GNUSLETTER Volume 27 #2, keeps us on track, completing our 27th year as the world's information resource for antelope.

With great help from Richard Estes and his wife Runi, who dusted off and gathered all their GNUSLETTER files, we are in the process of scanning all past GNUSLETTER volumes into electronic format, for eventual inclusion on the ASG website. Thanks to Pascal Mesochina for keeping the site current.

This edition of GNUSLETTER highlights some great antelope projects and work being done across Africa, including some historic contributors (Richard Estes!) as well as some new projects and names. I hope in the future to get more feedback and articles for GNUSLETTER from some of our colleagues working in Asia. Sincere thanks to all the contributors and encouragement to any hopeful contributors for future GNUSLETTERs.

Steve Shurter **Gnusletter Editor**



GNUSLETTER

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A trio of bachelor Soemmering's rams in Giriyad Plains between Hargeisa and Djibouti. Look for a report on Somali antelopes from Abdi Jama in the next issue of the Gunsletter.

Antelope Specialist Group News

IUCN / SSC Antelope Specialist Group Barcelona Meeting

ASG Chair Philippe Chardonnet reported that the ASG Knowledge Café meeting held in Barcelona was a success.

Attendees: Carlos Bento, Christine Breitenmoser, Philippe Chardonnet, Serge Darroze, James Deutsch, John E. Fa, Hugo Fernandez, Amy Gambrill, Mike Hoffman, Ferdinand Kidjo, Jean Francois Lagrot, Francois Lamarque, Sebastien LeBel, David Mallon, Carlos Martinez, Roland Melisch, Jan S'Migoliski, Kate Schonecker, David Scott Silverberg, Tim Snow, Mark Stanley Price, Chris Thouless, Nathalie Van Vliet, Aurelie Viellefosse, Bill Wright

IUCN/SSC Antelope Specialist Group Red List Assessment

The new red list assessments for antelope can be found on the IUCN website:

www.iucnredlist.org/search and type in antelope in your search.

ASG Website

Thanks to Pascal Mesochina (pascalmesochina@yahoo.fr) who continues to maintain the Antelope Specialist Group website. Please contact him if you have any questions or concerns or contributions.

Please visit the Antelope Specialist Group website at: http://www.iucn.org/about/work/programmes/species/about_ssc/ specialist_groups/directory_specialist_groups/directory_sg_mammals/asghome/index.cfm

Saiga Alliance

An international working group Saiga Alliance, concerned with saiga conservation in range states, has a website http://saiga-conservation.com/saiga_news.html and has been sending out regular e-newsletters, Saiga News, in Chinese, English, Russian, Uzbek, and Kazakh languages, which can be downloaded from the site. Contact Elena Bykova esipov@sarkor.uz



Regional Rundown

International Giraffe Working Group

Congratulations to Richard Fennessy as the new chair of the International Giraffe Working Group. Here are excerpts from a recent letter to ASG Chairs from IGWG past acting chair Tom DeMaar.

Dear Philippe and David:

As co-chairs of the IUCN ASG the International Giraffe Working Group would like to update you on recent activities. In

addition to producing the next version of Giraffa (ably gathered, edited and produced by Dr. Julian Fennessey), there are several items for your information.

1) The IGWG has approved a TOR regarding governance.

2) The IGWG has begun fund raising using a USA based 501-C-3

(non profit organization) umbrella offered by Gladys Porter Zoo. 3) The IGWG has begun planning a dedicated website for giraffe conservation. One goal of this website is to create an interactive giraffe information and census database. We hope that the census portion would allow information gathering from a multitude of web users and corroboration of data by repeatability in a sort of web site visitor census device.

4) A new management structure has been appointed. The new officers of the IGWG are:

Chair: Julian Fennessey

Deputy Chair: Rick Brenneman

Secretary: Russell Seymour

Treasurer: Tom deMaar

5) We have introduced a new member to the IGWG: Jean-Patrick Suraud who is presently involved in giraffe conservation in Niger. We would like to add him to the ASG rooster of the IUCN SSC. With your permission I will ask Mr. Suraud to communicate directly with you to confirm his address and other details.

The year of 2008 saw blooming of activity in the IGWG. I hope that 2009 will see it grow.

Thomas W. deMaar, DVM, IGWG Past Acting Chair

The IGWG also published their newsletter *Giraffa*, Volume 2, #1, December 2008. Please contact editor Julian Fennessy, julian.fennessy@gmail.com.

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Antelope in the News . . .

Tunisia Slender-horned gazelle surveys. ZSL & CMS. BBC July 2008

Searching for Saharan gazelles

A team of Tunisian and British biologists have carried out the first survey of its kind to focus on the slender-horned gazelle (Gazella leptoceros). Very little is known about the endangered species, which is unique to the northern Sahara, as a result of the hostile environment it inhabits. "It is a specialist sand-living species, among the dune sheets" explained Tim Wacher from the Zoological Society of London. "They walk a tight-rope in order to survive."



The survey was sponsored by the International Convention on Migratory Species (CMS) together with the Tunisian government, which wants to integrate conservation measures with existing human activities within Djebil National Park. Dr. Wacher said "Part of this study was about looking at ways to organize tourism in the future so that there will not be 4X4s bashing about the place, leaving areas of tranquility for people and gazelles."

The five-strong scientific team covered 190 km, averaging 12-15 km a day, through the Erg Oriental, southern Tunisia. Two members recorded key plant species, while the other three counted frequency of animal signs. "One of the results we found was that there was a network of three of four wells about 30 -40 km apart", recalled Dr. Wacher. "The further we got from those wells, the more signs of gazelles we saw; they avoid human contact."

The team recorded tracks and signs of the gazelles in 75% of the



area covered by the expedition. And along 66% of the route there were signs of vehicles – mostly from tourist jeeps, but also from hunters, who now use quad bikes to follow the gazelles. During the entire survey only seven gazelles were sighted.

Rain storms at the start of the survey helped the team of scientists because the wet sand helped preserve animal tracks. Locations of animals and their tracks, vegetation and human activity were recorded by GPS. Dr. Wacher said the gazelles were a "boom and bust" species. "They are geared up to breed very fast, but they are dependent on being able to move freely where there is the best food," he explained.

The team concluded that a small but vital population of slenderhorned gazelles inhabited the Tunisian Erg Oriental. But numbers had fallen considerably as a result of habitat disturbances and hunting, they added. Dr. Wacher said future plans included an aerial survey of the area, and developing a patrol system to gather further data on the movements of the gazelles.

Antelope "knee clicks". Science Daily, Nov. 2008 (ZSL)

Jakob Bro-Jørgensen from the Zoological Society of London and Torben Dabelsteen from the University of Copenhagen studied antelopes within a 400km2 area of Kenya. They found that the males (bulls) use a selection of signals to make competitors aware of their fighting ability, based on three different factors, body size, age and aggression. According to Bro-Jørgensen, "Rivals often use signals to broadcast their fighting ability and thereby settle conflicts without incurring the high costs associated with actual fighting".

As well as the knee clicks, which are shown to be a reliable indicator of body size, the researchers found that the size of a bull's dewlap is related to age. The authors said, "Age is a good proxy for fighting experience and may also demonstrate that a bull has 'nothing to lose' and will therefore be a more risk-prone and dangerous adversary". Finally, hair darkness reflects yet another underlying variable, most likely androgen-related aggressiveness. All of these indicators serve the useful purpose of facilitating assessment by a bull's rivals and avoiding wasteful conflict.

The antelopes' knee clicks, which can be heard several hundred metres away, are thought to be produced by a tendon slipping over one of the leg bones and, according to the authors, this can explain why they correlate with body size, "The tendon in this case behaves like a string being plucked, and the frequency of the sound from a string correlates negatively with both its length and diameter. Thus, most importantly, depth of the sound is predicted to increase with skeletal measures".



Recent Publications

Seasonal reproductive characteristics of female and male Jackson's hartebeest (*Alcelaphus buselaphus jacksoni*). by L. Metrione, T. Norton, D. Beetem, L. Penfold. Science Direct, Theriogenology 70 (2008) 871-879 Abstract

This project examined reproductive characteristics of female and male Jackson's hartebeest (Alcelaphus buselaphus jacksoni). Progestagen concentrations were measured in fecal samples collected weekly for 1 year from three non pregnant adult females in the Northern Hemisphere. When their ovaries were active the females exhibited regular luteal cycles with an over mean cycle length of 21.4 + 4.1 days (n = 31 luteal phases). Peak luteal progestagen concentration was July and from 18 February to 20 August, for three females respectively. Ejaculates were collected by electroejaculation from seven males throughout all seasons, with mean 40 +- 18% motility, 4.1 +- 0.19 progressive motility (scale 0-5) and 42 +- 28% morphologically normal sperm. These data characterized basic reproductive traits for Jackson's hartebeest and established the female as spontaneously ovulating and seasonally polyestrous when housed in the Northern Hemisphere, whereas males produced apparently viable sperm throughout the year.

Evidence for the local depletion of bay duiker *Cephalophus dorsalis*, within the Ipassa Man and Biosphere Reserve, north-east Gabon. by N. Van Vliet, R. Nasi,

L. Emmons, F. Feer, P. Mbazza, M. Bourgarel African Journal of Ecology, 45, 440-443.

Abstract

In spite of its protected status, the Ipassa Reserve (North-East Gabon) has been subject to intense hunting activities. Recent mammal surveys showed that the Reserve still shelters high mammal diversity, but also that densities have dramatically declined in the last two decades. We assessed the changes in diversity of duiker species within the Reserve comparing data gathered two decades ago to data collected in 2005-2006 in the same area. The only two species currently present in the area are the blue duiker and Peter's duiker. Bay duiker was present at a density of 7.1 individuals per km2 in the 80's but seems now locally absent. As hunting for food is the only human activity carried out in the reserve during the last twenty years and Bay duiker is a favorite game species in the region, it is very likely that over hunting is the reason for this local depletion.

Observations on the behavior and ecology of a threatened and poorly known dwarf antelope: the beira.

by N. Giotto, A. Laurent, N. Mohammed, N. Prevot, J-F. Gerard European Journal of Wildlife Research

Abstract

Observations on the behavior and ecology of the beira (Dorcatragus megalotis) were made during spring 2004 in a wild population discovered in 1993 in a low mountain range in the South of the Republic of Djibouti. Spring was found to be both a birthing and a mating season. Beiras fed in the first and last daylight hours, mainly on dicotyledons and in patches supporting trees and / or bushes. They spent the warmest hours of the day in the shade of trees, or in rock shelters when the temperature became too hot. Observed groups (N+56) ranged in size from one to five individuals (mean+-SD = 2.70 + 1.49). Most of these groups included a single adult male (62.5%) or no adult male at all (33.9%). The only encounter observed between two adult males resulted in the chasing of one by the other. Furthermore, the mixed-sex groups including a single adult male seemed rather stable, and their members used collective urination-defecation sites. From a behavioral point of view, the beira thus appears not very different from the dik-diks (Madoqua spp.) but differs from them by a greater sociability between adult females, and its type of habitat.



The Impact of Horning by Wildebeest on Woody Vegetation of the Serengeti Ecosystem. by R. D. Estes, T.E. Raghunathan, D. Van Vleck

The Journal of Wildlife Management 72(7):1572-1578; 2008 Abstract

Horning vegetation, an expression of aggression predominately among adult males, may be universal among horned ungulates. We found that horning by wildebeest (Connochaetes taurinus) males had an important impact on the Serengeti ecosystem, Africa, from the 1960's to the 1980's as the wildebeest population increased from 0.25 million to 1.5 million. Between 1979 and 2003 we sampled 2,626 trees and bushes to assess horning impacts. In the 1986 survey, 57% (n=1416) of trees and bushes had suffered moderate to severe horning injury. Severe damage frequency was highest in open grassland (68%), where few trees were exposed to many wildebeests, and lowest (24%) inside savannah woodland where wildebeest rarely go. Horning by 300,000 to 400,000 adult male wildebeest contributed to converting savannah woodland into tree savanna and open grassland. Horning by wildebeest in combination with known impacts such as grazing, manuring, and trampling, may result in ecological impacts to Serengeti ecosystems only exceeded by elephant (Loxodonta africana) and fire. More research is needed to understand the ecological and management implications of horning.



Extensive Population Genetic Structure in the Giraffe

by D. Brown, R. Brenneman, K. Koepfli, J. Pollinger, B. Milá, N. Georgiadis, E. Louis Jr, G. Grether, D.Jacobs and R. Wayne*1 * Corresponding author

Abstract

Background: A central question in the evolutionary diversification of large, widespread, mobile mammals is how substantial differentiation can arise, particularly in the absence of topographic or habitat barriers to dispersal. All extant giraffes (*Giraffa camelopardalis*) are currently considered to represent a single species classified into multiple subspecies. However, geographic variation in traits such as pelage pattern is clearly evident across the range in sub-Saharan Africa and abrupt transition zones between different pelage types are typically not associated with extrinsic barriers to gene flow, suggesting reproductive isolation.

<u>Results</u>: By analyzing mitochondrial DNA sequences and nuclear microsatellite loci, we show that there are at least six genealogically distinct lineages of giraffe in Africa, with little evidence of

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interbreeding between them. Some of these lineages appear to be maintained in the absence of contemporary barriers to gene flow, possibly by differences in reproductive timing or pelage-based as-

sortative mating, suggesting that populations usually recognized as subspecies have a long history of reproductive isolation. Further, five of the six putative lineages also contain genetically discrete populations, yielding at least 11 genetically distinct populations.



<u>Conclusion</u>: Such extreme genetic subdivision within a large vertebrate with high dispersal capabilities is unprecedented and exceeds that of any other

large African mammal. Our results have significant implications for giraffe conservation, and imply separate *in situ* and *ex situ* management, not only of pelage morphs, but also of local populations.

• This article is available from: http://www.biomedcentral. com/1741-7007/5/57

Range and Habitat of the Mountain Nyala (*Tragelaphus buxtoni*): 2008 Update and Review by P. Evangelista

The mountain nyala (*Tragelaphus buxtoni*), a spiral-horned antelope endemic to Ethiopia's southern highlands, was first reported to the scientific community in 1908 by Ivor Buxton. The specimens were collected on the "southeast of Lake Zewei on the Arussi Plateau"; presumably, in an area that is now referred to as the Galama Mountains. The specimens were sent to Richard Lydekker of the South Kensington Museum, who first identified the species as a type of greater kudu (*Tragelaphus strepsiceros*) in an article called "The Spotted Kudu" (Lydekker 1910a). The skins and horns were sent to Rowland Ward in London, who informed Lydekker that the specimen was actually a new species of antelope not yet documented

by western science. Lydekker wrote several descriptive papers on the new species (Lydekker 1910a, 1910b, 1912); however, the mountain nyala received little attention from the scientific community until Leslie Brown's first expedition to Ethiopia in the early 1960s (Brown 1963). In the last decade, the mountain nyala has been the focus of new research. As scientists, wildlife managers and conservationists work to collect new information that will enhance management decisions and policy



formulation, there is increasing awareness that we really know very little about this charismatic species. Scientific study of the mountain nyala has been limited by the remote range and elusiveness of the species, Ethiopia's changing political environment, and an unwillingness to collaborate by researchers and wildlife managers. As a result, much of the available data on the mountain nyala has been based on speculation and inadequate scientific investigation. In turn, the consequences have greatly hindered our ability to implement effective management and conservation strategies that will insure

the long-term persistence of the species. In this report, I attempt to clarify some of the misconceptions surrounding the mountain nyala by examining published scientific literature, internal reports from Ethiopian agencies, and interviews with stakeholders at all levels. I also take this opportunity to highlight my own research; some previously published and others in final preparation. Although much of this work is founded on years of field observations, I've employed new technologies, such as geographic information systems (GIS), remote sensing, and spatial models, that have proven to be critical tools for addressing a suite of today's environmental issues. However, effective conservation of the mountain nyala and other wildlife species cannot simply be solved by technology. Scientists need to return to sound scientific methodologies, form collaborative partnerships, and publically present their research to support decision making and guide new investigations. My intention with this report is to simply provide the IUCN Antelope Specialist Group with a summary of (1) information regarding the mountain nyala's range and habitat requirements, and (2) preliminary results of recent research that is being prepared for peer-reviewed scientific publication. I fully appreciate the work of the IUCN's Antelope Specialist Group, and hope my work can contribute to its' mission in finding "pragmatic solutions to our most pressing environment and development challenges.

• This article can be found at http://www.nrel.colostate.edu/ outgoing/25im4yvU/IUCNReport_2008.pdf



Recent Reports

Non-random sampling method improves precision of population size estimates of a desert antelope by P. Mésochina, and S. Ostrowski

Abstract

Desert antelopes are difficult to census because of their sparse distribution over large areas. During summer however, they restrict their range use to areas with shading opportunities. We compared precision of mark – re-sighting estimates of Arabian oryx (*Oryx leucoryx*) population size coupled either with random linear transect sampling or summer intensive search of shading sites. Population estimates calculated from investigations of shading sites were of greater precision than those based on transect counts (mean coefficient of variation of estimates were 10% and 25%, respectively). Sampling of shading sites is a promising technique to estimate more precisely populations of arid-zone antelopes where a substantial number of individuals are already marked.

Introduction

Antelopes of Arabian and Saharan deserts have suffered a dramatic decline of their populations during the last 50 years, mostly due to human persecution (Mallon and Kingswood, 2001). Their over hunting was eased because they are visible from long distance given their relative large size and clear-colored reflective coat (Stanley Price, 1989), and they leave conspicuous footprints in the sandy areas where they range (Dragesco-Joffé, 1993). The Arabian oryx



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(*Oryx leucoryx*) was extirpated from the wild in 1972 (Henderson, 1974), the scimitar-horned oryx (*Oryx dammah*) in 1987, and the addax (*Addax nasomaculatus*) was considered regionally extinct in North Africa in 1970 (Mallon and Kingswood, 2001).



Once at the cusp of extinction, Arabian oryx has been successfully propagated in captivity, and was first returned to the wild in Oman in 1982 (Stanley Price, 1989). In Saudi Arabia, Arabian oryx has been reintroduced between 1990 and 1994 into the fence-protected area of Mahazat as-Sayd (2 244 km²; 28°15'N, 41°40'E), and since 1995 into the unfenced sand dune reserve of 'Uruq Bani Ma'arid (12 500 km²; 19°07'N, 45°30'E) (Ostrowski et al., 1998). In 2003, the reintroduced oryx populations exceeded 700 and 200 animals in Mahazat as-Sayd and 'Uruq Bani Ma'arid, respectively (Bedin and Ostrowski, 2003; Mésochina et al., 2003a).

With the aim of proposing a management policy for the oryx population of Mahazat as-Sayd, Treydte et al. (2001) developed a computer model of its persistence under different management strategies and highlighted the need for regular and precise estimates of population size. Seddon et al. (2003) compared distance sampling (Buckland et al., 2001) and mark-resighting (MR) methods (Seber, 1982) along 14 north-south transect lines set every three minutes of longitude to estimate the population size of oryx in Mahazat as-Sayd. They showed that the precision of distance sampling estimates was poor (coefficient of variation [CV=100 × (standard error / mean)] ranging between 30-50%) because of low encounter rates. MR estimates derived from transect counts yielded more precise estimates of population size, with a mean CV of 25%.

The authors predicted that a greater precision could be obtained using MR method if a greater proportion of the population could be detected during surveys. Coupling MR method with an intensive haphazard search count, whereby an attempt was made to record as many oryx as possible, Seddon et al. (2003) improved the CV of the estimate of oryx population size up to 12.4%.

In the present study we evaluated the precision of oryx population estimates provided by MR method coupled with summer intensive search of shading sites, a method that we believed could further increase the proportion of population detected.

Material and Methods

In Mahazat as-Sayd, an area with relatively high density of oryxes (*c* 40 oryxes/ 100 km²; Mésochina et al., 2003a), we conducted two transect counts per year between 2001 and 2003, in winter and spring, following the methodology used by Seddon et al. (2003), and one intensive search count per year over two consecutive days in 2003 and 2004. The latter method was only used in summer, when oryx retreat from the heat of daytime under the shade of trees (Seddon and Ismail, 2002; Ostrowski et al., 2003). Both techniques had a comparable investment in term of personnel involved and duration of survey. Transect counts involved between six and eight teams (two to three people) over a day and intensive search counts involved three teams over two days.

For intensive search counts, we divided the protected area into six sectors, based on topography and limited by readily observable features. We did not define set routes or time limits to census a given sector. Surveys started at 6 a.m. and lasted up to 6.30 p.m. Because our aim was to locate as many animals as possible, we focused search on checking sites where oryx were likely to rest during daytime (Seddon and Ismail, 2002). We called this method the non-random intensive search (NRIS). At each sighting of oryx, we recorded: time, GPS coordinates, group size and composition, presence and identity of each marked animals and behavior at first sighting.

In 'Uruq Bani Ma'arid, a protected area with low oryx density (*c* 2 oryx/ 100 km²; Mésochina et al., 2003b), it was not possible to carry out transect sampling because of the area configuration (limestone plateau incised with vegetated wadis and partially covered with parallel sand dunes difficult to cross in the West, or only covered with sand dunes in the East). We therefore only carried out annual NRIS counts in 2001-2004 using the methodology used in Mahazat as-Sayd. Most of the shade used by oryx is provided by trees, so we restricted our surveys to the treed western part of the reserve of approximately 2 500 km² (Wacher, 1998; Bedin and Ostrowski, 2003).

During the study period, there were between 70-100 and 50-100 oryx marked with numbered neck-collars in Mahazat as-Sayd and 'Uruq Bani Ma'arid, respectively. Oryx had been marked during opportunistic capture operations since 1990. We darted adult oryx all year long except during summer, when climatic stress and the consequent death risk are the highest. We chose collars as the marking method because they have lower rates of loss than ear tags, and are easier to read in the field.

Based on the occurrence of marked animals in the population (MR method), we calculated an estimate of the population size (*N*) (Seber, 1982) both for transect and NRIS counts, as follows: $N = [(n_1 + 1) (n_2 + 1)/(m_2 + 1)] - 1$, where: n_1 is the number of marked animals in the population, n_2 is the number of animals seen closely enough to discern marks and m_2 is the number of marked animals seen during the survey. We calculated the variance for each estimate as follows: $(var (N)) = [(n_1 + 1) (n_2 + 1) (n_1 - m_2) (n_2 - m_2)] / [(m_2 + 1)^2 (m_2 + 2)]$ (Seber, 1982).

To compare the precision of MR method coupled either with transect or NRIS count in Mahazat as-Sayd protected area, we calculated the percentage of the assessed population detected, and the CV of the estimated population size for each survey (Table 1). We also estimated the length of the driven transect (*L*) necessary to obtain the level of precision of population size density estimates recorded during NRIS counts ($cv_t(D)$), using the actual cv(D) derived from the survey data and the driven length actually covered (*Lo*) during transect surveys, as $L=L_0 \{cv(D)\}^2 / \{cv_t(D)\}^2$ (Buckland et al., 2001).

Since we did not conduct linear transect sampling in 'Uruq Bani Ma'arid, we only present the percentage of the assessed population detected in the reserve, and the CV of the estimated population size derived from NRIS counts (Table 1).

Results

The distance covered in Mahazat as-Sayd during NRIS counts was 1 063 km and 1 185 km in 2003 and 2004, respectively (Table 1), approximately 2.5 times longer than distances driven during transect sampling (mean: 452 km; range: 417-472 km; *N*=7). We observed on average 52% (range: 43-61%) of the estimated population during NRIS counts whereas we detected only 21% (range: 16-34%) of the estimated population during transect counts. MR population estimates calculated from NRIS counts were of greater precision (mean CV=10%; range: 9-12%) than those recorded during transect counts (mean CV=25%; range 20-28%). It would have been necessary to drive a mean distance of nearly 3 000 km during transect counts to reach the level of precision of NRIS counts.

In 'Uruq Bani Ma'arid we detected between 55 and 79% of the estimated free ranging population and obtained a CV of MR estimates ranging between 4 and 9% (Table 1).

Discussion

In Mahazat as-Sayd, we improved the precision of MR estimates of Arabian oryx population by carrying out an intensive search of shading sites (mean CV=10%) rather than linear transect sampling (mean CV=25%). NRIS also yielded a high precision (CV<9%) in the estimates of oryx population size in 'Uruq Bani Ma'arid protected area. Sampling of shading sites therefore appears to be a promising technique for assessing precisely the populations of aridzone antelopes over a large range of animal densities (i.e. 2 to 40 oryx / 100 km2).

The estimation of population size using MR methodology is based on several critical assumptions that NRIS should respect to be used: (1) Animals do not lose or gain markers; (2) There is no difference in mortality between marked and unmarked animals; (3) There are no recruitments or losses in the population; (4) Marked and unmarked animals are equally easy to detect; (5) Animals are distributed randomly and redistribute themselves at random after capture (Giles, 1978). We only considered assumptions (4) and (5), because they are directly related to census technique. The occurrence of numbered neck-collar did not bias oryx detectability (assumption 4), first because we focused our search on shading sites rather than directly oryx. Second, oryx are large antelopes with reflective coat, and are therefore readily detectable whether they bear neck-collar or not. We concluded that marked and unmarked animals were equally easy to detect, even for animals observed outside shade (35% of detections were made out of shade; unpublished data). Assumption (5) may be translated as 'each animal is equally likely to be marked, and marked animals mix randomly with unmarked animals'. Since we opportunistically marked any adult animal at random (but only shading oryx during

summer), we considered that each adult oryx was equally likely to be marked. We did not observe that the shading behavior of oryx changed following marking and consequently considered that NRIS allowed a random population sampling. This outcome was predictable since in desert environment, such large



animals unable to burrow are to escape from direct solar radiation to survive in summer (Ostrowski et al., 2003). We observed this compulsory use of shade by oryx during NRIS surveys in Mahazat as-Sayd, where all animals detected between 9 a.m. and 4 p.m. were in shade (unpublished data). We therefore did not find any methodological incompatibility between MR assumptions and NRIS census technique.

However, MR assumptions are strict, and consequently usually violated (Greenwood, 1996). We therefore recommend using multiple NRIS recapture occasions to derive a more sophisticated estimator of population size (i.e. with less restrictive assumptions; e.g. Greenwood, 1996).

MR methodology becomes flawed when many unmarked individuals are counted more than once. The probability of recording the same unmarked animal several times during NRIS survey is reduced because oryx considerably reduce their range size during summer (Stanley Price, 1989; Wacher, 1998), and are reluctant to move from the shade where they rest during daytime. Based on animal locations, time of observation, herd size and composition, recognizable individuals, we assessed the risk of multiple sightings of an animal during a single NRIS survey in Mahazat as-Sayd. We found that only five out of 185 detections were possible double counts. However, the NRIS technique could have been improved had we carried out the survey over a single day, preferentially between 9 a.m. and 4 p.m. The risk of recounting the same unmarked specimens would then have been further reduced.

Exploiting the oryx summer shading behavior notably increases the proportion of population detected and improves precision, because search effort can be concentrated on areas offering shading opportunities. We believe however that availability and distribution of shading sites are likely to impact on the expected precision of NRIS surveys. In 'Uruq Bani Ma'arid, an area where shade is scarce and clumped (Wacher, 1998; Bedin and Ostrowski, 2003), we detected a relatively larger proportion of the estimated oryx population size than in Mahazat as-Sayd (Table 1)

where shade sites are numerous and more scattered (Seddon and Ismail, 2002). The advantage of NRIS may therefore be limited in the specific case of a fenced area with numerous and patchily distributed shade opportunities. This may explain why an intensive haphazard search approach provided also precise MR estimates in Mahazat as-Sayd in winter, when oryx were more mobile and less dependant on shade (Seddon et al., 2003). However, in the case of a population ranging over large unfenced-areas, with scarce and clumped shading zones, concentrating survey effort on shading areas is expected to improve significantly the survey efficiency. By this, we divided by five the area to be surveyed in 'Uruq Bani Ma'arid. We therefore recommend the use of NRIS counts during summer. However, preliminary surveys are required to locate all putative shade sites, as the accurate knowledge of available shading locations is instrumental to achieving efficient NRIS surveys. Summer shading requirement may also be taken into account when designing protected areas to improve protection of aridzone antelopes (Seddon et al., 2003). Poaching remains the major threat to the survival of these populations in the Middle East and North Africa (Gorman, 1999; Mallon and Kingswood, 2001; Bedin and Ostrowski, 2003). Though shading behavior appears to increase antelope survival during summer, it also makes them particularly vulnerable to poachers aware of their summer shading

requirements. During NRIS surveys we were able to locate up to 80% of the estimated oryx population within a relatively short period. Such ease of detection could prove devastating for the population when surveillance teams are not present in the area. The use of mobile ranger units to operate directly in protected areas where antelopes find shade may help to reduce the potential impact of poaching.

Capture and marking of free-ranging animals is a time-consuming and expensive operation but NRIS might be applied uncoupled from the MR method, while still providing pertinent information to monitor arid-zone antelope populations. A post-hoc evaluation of NRIS estimates revealed that this method allows to detect a relatively large proportion of the estimated population (i.e. over 50%). One can therefore speculate that it is applicable to unmarked populations of arid-zone antelopes to derive meaningful evaluations of population structure, or abundance indexes to monitor trends over time (e.g. number of animals per kilometer covered; Greenwood, 1996). NRIS may also be interesting for monitoring desert antelopes like the scimitar-horned oryx or the addax, two species which rely also on shade during summer (Dragesco-Joffé, 1993) and are also candidate to reintroductions in large protected areas (Mallon and Kingswood, 2001).

Population	Year	Technique	Distance covered (km)	Number of oryx detected	Population size estimate N (CV ^a)	Percentage of population seen
Mahazat as-	· 2000 ^b	T^{c}	459	122	372 (19.6)	33.6
Sayd	2001	T^{c}	461	110	680 (25.5)	16.5
	2002	T^{c}	455	164	1 087 (27.9)	16.1
	2003	T^{c}	417	125	658 (25.1)	19.0
	2003	NRIS	1 063	450	738 (8.5)	61.0
	2004	NRIS	1 185	423	803 (9.4)	52.7
'Uruq Bani	2001	NRIS	-	157	199 (4.4)	78.9
Ma'arid	2002	NRIS	-	133	183 (5.4)	72.7
	2003	NRIS	-	111	203 (8.6)	54.7
	2004	NRIS	-	_	129 (8.7)	_

Table 1: Estimates for reintroduced Arabian oryx population size in Mahazat as-Sayd and 'Uruq Bani Ma'arid protected areas, Saudi Arabia, between 2000 and 2004, using mark-resighting technique coupled either with transect (T) or non-random intensive search (NRIS) surveys. ^aCoefficient of Variation = $100 \times$ Standard Error / Mean

^bData calculated from Seddon et al. (2003)

^cYearly average

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Oryx rock carving

GNUSLETTER VOL

Staus of the Bongo (*Tragelaphus eurycerus eurycerus*) Population at Kakum Conservation Area in Southern Ghana by Y. Boafo, W. Oduro

YEARS OF EXECUTION OF RESEARCH: 2001 and 2002 COUNTRY: GHANA

RESERACH AREA: Kakum Conservation Area SPECIES NAME: Bongo (*Tragelaphus eurycerus eurycerus*) *Keywords:* bongo, status, transects, camera-traps, Kakum Conservation Area, Ghana

DATE OF SUBMISSION: 11th September 2008

Abstract

Bongo (Tragelaphus eurycerus eurycerus) and forest elephant (Loxodonta africana cyclotis) use the same patches of secondary forest because they possibly compete for the same food source, but little is known about bongos in the wild. Three consecutive bongo dung surveys were carried out on randomly distributed transects between 2001 and 2002. Kakum Conservation Area was stratified into three for the first two surveys. Four Camera- traps were also used to survey the population. Farmers and Wildlife field staff perceptions about the status of the species were also evaluated through questionnaire administration. The indices of dung abundance per km were 0.17 in 2001 wet season, and 0.11 and 0 in 2002 dry and wet seasons respectively. Bongo numbers could not be estimated directly from the surveys but the best informed guess is 0.1 individuals/km² in the high density zone of the Kakum Conservation Area. Fifty- nine percent of Wildlife staff was of the opinion that bongo population is increasing whereas conflicts of opinion exist among the farmers. Legislation and law enforcement need to be strengthened and public education directed at the urban and rural communities to enhance the conservation status of the bongo population at the Kakum Conservation Area

1. Introduction

The IUCN Antelope Specialist Group considers bongos in the Upper Guinean forest to be near threatened, but in the face of hunting, the status of the species is largely unknown. In Ghana, for instance, surveys of 67 forest estates in 2001 only indicated the presence and absence of the species (M. Abedi- Lartey, pers comm). Dickinson (1996), East (1990) and Azika (pers comm.) provided scanty information about the species in the Kakum Conservation Area. Against the backdrop of the hunting of bongos, this study was initiated to assess the status of the bongo population in the Kakum Conservation Area where they use the same patches of secondary forest as elephants which have a recorded density estimate of 0.6 elephants per km² (Eggert *et al.*, 2003).

2. Materials and Methods

2.1 Study Area

The Kakum Conservation Area (KCA) comprises Kakum National Park and the adjacent Assin-Attandaso Resource Reserve and covers an area of 366 km² (Figure 1). KCA has been logged in the past. Logging ceased in 1989 when the forest block was declared a wildlife reserve. This has resulted in the creation of patches of secondary forest. The forest condition is described in Hawthorne and Musah (1993).

The rainfall pattern is bimodal with peaks in May-July and October-November. KCA is largely isolated with no buffer between the study site and the surrounding cultivated crop fields.

2.2 Dung surveys

A reconnaissance survey was carried out along the rivers where bongos were reported by KCA fieldstaff to visit frequently. Based on the index of bongo signs the study area was divided into high (HD), medium (MD) and low densities (LD) for the July 2001 and February 2002 dung surveys (Figure 1). Twenty transects were randomly distributed in the proportion of 8:7:5 in the HD: MD: LD respectively. The study area was divided into square grids each measuring 1.84 by 1.84 km. In the high density stratum, for example, eight grid cells were randomly selected and transect spanning the full length cut in the middle of each cell. The survey was repeated in October 2002 but differed from the previous arrangement in that the study area was not stratified and twentyfive transects, each 1 km in length, were randomly distributed and walked.

The line transect method was used for the dung surveys (Buckland *et al.* 1993) and dung density estimated using the DISTANCE program (Laake *et al.* 1993). The stage of decay of dungs was categorised using that for elephants (Barnes and Jensen, 1987). Distance along transects was measured with a Keson Roadrunner. A conversion factor was worked out between the Roadrunner and the Hip chain, which is a more accurate measurer of distance in forested areas. The relationship is:

Hip chain readings = $0.92 \times \text{Roadrunner readings}$ (EBM. 2000).

All illegal activities seen during the survey were also noted. The survey team of four comprised a compass man, line cutter, an experienced wildlife field staff and an old hunter in KCA.

Bongo numbers (E) were estimated from the dung survey using; E= Yr/D (McClanahan 1986) where Y is dung density, r is dung decay rate and D is defecation rate of 4.4 droppings/day (Hoppe-Dominik pers comm.). To estimate r, five fresh bongo dungs seen in the forest between 12th February 2002 and 23rd April 2003 were monitored biweekly till they disappeared. The date of deposition was estimated visually by examining the dung when first sighted.

2.3 Camera-traps

Bongos were also surveyed using four camera- traps set up on fresh bongo trails in the high density zone of area 64.33 km². The camera-traps were in the forest for six months but monitored biweekly. The description and set up of the camera- traps follows that of Karanth (1995).

2.4 Sociological survey

Bongos raid crops, but to establish whether they might be concentrating their activities on the farms outside KCA, questionnaires were administered to the farmers. To select

respondents, the perimeter of KCA was divided into one km sections and 10 were randomly selected. Six farmers, whose farms were along the one km band, were randomly selected. Thus a total of sixty farmers were selected to fill the questionnaires. They were administered with the help of 10 locally-based and trained raid assessment monitors employed by Conservation International Elephant Biology Management Project. A different questionnaire was also administered to forty-two KCA field staff. All respondents could correctly identify bongos through photographs. Respondents were asked, for instance, the last time they saw bongos and the number per group per sighting? Fieldstaff were asked whether they think bongo population was increasing, decreasing or stable.

3. Results

3.1 Estimates of bongo numbers from dung counts and camera-traps

A total of six bongo dungs were seen in 2001 wet season, four in 2002 dry season and no dung was seen in the 2002 wet season. The indices of bongo dung abundance per km ranged from 0 to 0.17. The data were analysed on seasonal basis since there was no justification to maintain the stratification.

The decay duration of the five fresh bongo droppings monitored ranged from a minimum of 41 to a maximum of 71 days (Table 2). The decay duration varied widely because the droppings were observed both at the peak of the dry and wet seasons. A rough decay rate, that is, the inverse of the median survival day was estimated (Barnes, pers comm.). The median survival was 46 days and the inverse is 0.02/day. The number of dung piles was far below the minimum of 60 required by the DISTANCE program to estimate dung density with reasonable accuracy and therefore it was not estimated.

The camera-traps were left in the forest for a total of 540 camera-day where one camera operating for 24 is defined as one camera-day. Fourteen 24 exposure 200 ASA or 400 ASA films were used (i.e. 336 exposures were taken), but no bongo was photographed.



Therefore, no estimate was made using the capture-recapture method.

3.2 Illegal activities

The index of illegal activities (excluding poachers cuttings and footprints) per km was 0.97 in 2001 wet compared to 0.89 in 2002 dry seasons and the difference was not significant (G- test G= 0.01, df=1, NS). Snares dominated the illegal activities recorded in both seasons.

3.3 Peoples perception of bongos at KCA

Forty-three farmers out of 60 and 32 out of 42 wildlife staff filled and returned their questionnaires. Fifteen farmers (35%) had not seen bongos on their farms since 1990 whilst fourteen (33%) had seen them in the last 5 years (i.e. 1997-2002). Two farmers alleged they had at a time seen 15 bongos in a group but could not indicate when. An old hunter in KCA who had killed seven bongos in the Afiaso sector during his 15 years hunting expedition did not believe their assertion. Eleven (34%) out of 32 staff said they had seen bongo signs on their patrols since year 2000. Three (9%) reported of always encountering bongo signs in their patrols. Nineteen (59%) thought that the bongo population was increasing.

4. Discussion and Conclusions

Estimates of bongo numbers could not be obtained from the dung and the camera- trap surveys.

This is not surprising considering that about 1000 camera days, as predicted through a random model simulation, has a 95% chance of obtaining at least one photograph for animal densities of roughly between 0.02-0.05 individuals/km² (Carbone et al., 2001). This implies that if there were 18 bongos in KCA (i.e 0.05 x 366 km² area of KCA) 1000 camera days would be required to give a 95% chance of getting one photograph of bongo assuming trapping successes are similar in the two experiments. Through the dung surveys and from Carbone et al. (2001) prediction of trapping success in relation to density, a conservative bongo density at the designated high density zone (64.33 km²) may not be more than 0.1 individuals/km². This is subjective but currently is the best estimate for the Kakum Conservation Area. The sample size for the dung decay study was constrained by the available dung at the study site. The camera- traps had to be set on trails. But bongos were not found to strictly follow their trails as those in the forest of Dzanga National Park at Central African Republic (Klaus-Hugi et al., 2000). It could not be proven whether the KCA bongos exhibit any site fidelity even though their activities were relatively common in the Antwikwaa area.

The opinion of farmers that bongos do not visit their farms as before contrasted with the assertion of Wildlife field staff (59% of staff) that bongos are on the increase in KCA. The missing link here is lack of information from hunters around KCA who were unwilling to fill questionnaires. In the dry period, there were relatively high bongo activities in the Antwikwaa beat possibly due to the retention of water by the Afia River compared to others. Bongo affinity for water perhaps led them to water at the Afia River which flows along the park boundary to Atwikwaa from Afiaso. This situation perhaps created the illusion of bongo abundance at the Afiaso area and consequently the alleged increase held by the staff.

It has been proven that KCA bongo population is small and discrete. The zero dung pile recorded in the 2002 wet season survey does not suggest that bongos had gone extinct. Kakum management reported no sightings of bongo from April to September 2002. The smaller a population, the less precise the estimate of abundance (Barnes, 2002). KCA bongo is hunted. A species face to face with a hunting culture is in grave danger if valuable, insular or big (Caughley, 1994), and Kakum bongos fit all these three words.

To enhance the survival of the few bongos in the short term, it is suggested that patrol teams should adequately cover the Antwikwaa and Briscoe 2 beats. Park staffs have always maintained that GNUSLETTER

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poachers are less active in the wet season because casual poachers would be tending their crop fields. This opinion was not supported by the study. There is therefore, the need to equally intensify patrol operations in the wet season as done in the dry season.

Fig 1. Kakum Conservation Area showing distribution of transects



	Year 2001	<u>Year 2002</u>		
	Wet	Dry	Wet*	
No. of bongo dungs	6	4	0	
No. of transects	20	20	25	
Total transect length (km)	36.03	36.03	25	
No. of bongo dungs/ km	0.17	0.11	0	

Table 1. Abundance of bongo droppings in 2001 and 2002 surveys (*).

*Data was collected by the Elephant Biology and Management project team together with four Liberian Wildlife Officers

Dung serial no.	Duration (days)		
1	46		
2	46		
3	60		
4	71		
5	41		

Table 2. Bongo dung decay duration at Kakum Conservation Area.

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East African Wildlife Society newsletter SWARA (Jan – Mar 2008) article by M. Prettejohn (mike@sangare.co.ke) Excerpt

The conservation status of the that most elusive and striking forest antelope – the Mountain Bongo, *Tragelaphus euryceros isaaci* – is at last becoming clearer. Data from the ongoing Bongo Surveillance Project has accumulated over more than four years in the field have produced fresh insights into Mountain Bongo ecology, while shedding new light on the distribution and genetic diversity of the few remaining wild groups of these rare antelopes. The Surveillance Project's findings may yet prove crucial to the survival of this endangered eastern bongo sub-species – which occurs only in Kenya.

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Bongo Surveillance April- June 2008

by Mike Prettejohn, from Lyndon Estes

The highlight of this period has been the capture of 2 Bongo pictures on one of our trap cameras above Ragati on the South East of Mt Kenya. Also the fact that these were both young animals proves that there are more and that they are breeding. Although there are still signs of poaching with snares and dogs, this area in which the Bongo are mainly located is so steep and difficult to access, that we hope they remain fairly safe. Their safety can now be aided through the recently set up special force set up through the Mt Kenya Bill Woodley Trust of a new vehicle and 12 armed rangers, fully equipped to spend long periods inside the deep forest. 6 of these men are KWS and 6 trained through the Lewa Trust.

A visit was made to the Bongo at the Mt Kenya Game Ranch, where some 6-8 males are being prepared for release to the wild on the Mountain. Here it was noted with interest that these animals left in a large paddock with thick bush and forest adjacent to the main forest, soon adapted to their wild instincts in becoming completely secretive even with the temptation of their feed bucket. This is a good omen towards their release but as they will have monitoring devices implanted in their horns, they will be able to be tracked and observed.

Dung samples were taken of both the home bred and the recent imports from the US to determine their relationship to those in the wild with a hope of improving their genetics in helping with the inbreeding problem. It was hoped that the DNA work might have been possible to do locally, but it seems that this has to be done as before somewhere such as Cardiff University under Michael Bruford, and with some serious funding.

Further highlights for the period have been the establishing of a substantial web sight, www.mountainbongo.org, a double page article in the Saturday Standard, and a 7 page leader article in the latest issue of Swara Magazine. In this same edition we had a good article on ' The Rape of Eburu'. Here within the last month, 6 Bongo were viewed in the open by our surveillance men who are working under extreme pressure as timber, charcoal and bushmeat continue to be extracted unabated. However we continue to finance and equip these men in the hope that they can preserve this small herd or two.

We completed the first phase of the UNDP grant, and it appears this was satisfactorily approved for them to now forward the second phase, through the Rhino Ark Trust. This will enable us to continue with the surveillance over both the Aberdares and Mt Kenya. Also during the period Mrs Juliette Shears, a volunteer in the UK, successfully negotiated 2 further Grants for School Wildlife Clubs from the Tusk and Rufford Trusts. These funds have been channelled through the Eden Wildlife Trust who in turn have granted continued finance for the surveillance of Eburu and the Mau.

On the Aberdares we continue to get pictures of the Honi Bongo group as well as those in the North at Kanjwiri. Unfortunately here poaching and timber extraction continue at an alarming rate. Below are copied reports from our informers and field teams. A serious set back here has been the loss of 2 trap cameras stolen by poachers. Also stolen was an expensive camera set up by a professional photographer associate, David Gulden. With unconfirmed reports that intruders have been poisoning Colobus monkeys for their skins, perhaps it is these same people that have stolen the cameras? As it is most important to continue the monitoring of this bongo group, a replacement has been set up at S0 12' 19.415" and E36 37' 53.633" where fresh tracks have now been found by our team. While surveying our team gave the following report:-4 poacher tracks with dogs seen at S0 10.975' E36 37.694' while at S0 13.248' E 36 38.614' at 9523 ft 2 dogs were shot by the Askari. Further tracks seen at S0 12.964' E36 37.324 while a cable wire snare was removed at S0 11.171' E36 35.793' Cedar post extraction was seen involving some estimated 5 trees at S0 10,555' E36 36.085 and S0 10.879' E36 37.756' areas between 8.800'- 8000' elevation.

The camera in the South East Aberdares below the 'Elephant and Black Crags' in the Maragwa River area at S0 39.849' E36 45.509' continues to give many pictures of bushbuck and elephant with the odd suni and buffalo but no bongo as yet. Bongo tracks were however observed at S0 39.736' E36 45.680'. One dog was caught on camera, while other poaching activities were seen as follows:- A carcass of slaughtered bushbuck at S0 39.860' E36 45.863' and tracks and bamboo cut marks between 2,500 – 2,750 metres in this same area.

In the East Central forest below Kiandongoro 2 further cameras have been set up at S0 29' 55.26" E36 44' 28.08" on the Magura R. and S0 28' 23.80" E36 44' 29.760" on the Kiambogo R. Here too is much sign of poaching with several buffalo carcasses found. One person has had his picture taken and many buffalo and elephant. A red duiker and number of bushbuck but here too no bongo, although tracks were seen at S0 39.854' E36 45.393' A snare for small game was taken at S0 38.896' E36 45.527' and many signs of intrusion in the area traversed ranging from 2000-3000 metres altitude.

Recent flights have been taken along and within the Aberdare fence, showing many signs of cattle and sheep, probably going in by day, while some are even established full time within. The attached Garmin maps give the details.



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Mountain nyala, Bale National Park, Ethiopia, photos by Martha Fisher

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