DEER SPECIALIST GROUP NEWS

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INSIDE

Dear DSG members,

The IUCN and SSC have recently redefined their policies refer to the SSC Strategic Plan (2001-2010), and the DSG need to contribute actively to conservation biodiversity through the promotion of viable and welfare deer populations in the world. I have been recently re appointed by Dr. Holly Dublin to lead the DSG for the next period (2005-2008). We are walking in a new triennium focusing our efforts to stimulate research and conservation management policies for the endangered and unknown species named in the Red List as Data Deficient.

In this period we will be focusing in reinforce our membership that needs to be qualified and interdisciplinary to assess in decisions and policies affecting deer populations influenced by sound interdisciplinary scientific information that share the expertise and interact to assess in the several instances required as for the Global Mammal Assessment, Red List, CITES and other cases in the ground to solve conflictive situations common in conservation deer biology.

We are welcoming the new Vice Chair Dr. José Maurício Barbanti Duarte, well known for many of our membership a conservation leader in neotropical deer species. In the North America region Dr. Sonia Gallina is the new North American coordinator. Sonia is specialized in North American species as the white tailed deer. The New Red List authorities are Dr. Patricia Black de Decima specialist in gray brocket deer and taruka and Dr. Mariano Gimenez Dixon are in charge of analyzing, reviewing and assessing the membership to prepare and update the submitions to the Red List Team. We are willing to have a more active role in this mater and this will need the collaboration of all the involve parts.

In this issue we are including articles from India submitted by Bibhab Kumar Talukdar updating the ***Swamp Deer*** *status, and from South America three interesting research in the smallest deer* ***Pudu*** *conducted by Eduardo Ramilo, the report of Cysticercus tenuicollis errático in* ***white tail deer*** *by Marco Enciso and collaborators and an interesting report of darting* ***pampas deer*** *in Pantanal by Piovezan and collaborators. Thanks to all the authors and referees that help us to increase the quality and communication skills. We are inviting to prepare and submit articles for the next Newsletter.*

Dr. Susana González

Chair

ARTICLES

SOUTH AMERICA

First report of darting to capture the pampas deer (*Ozotoceros bezoarticus*)

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Resumen

Existen pocos reportes de capturas de ciervos en Sudamérica. La mayoría de las capturas han sido usando redes de armado rápido. Nosotros estamos evaluando la captura con dardos con un método alternativo de captura de venado de campo. Hemos desarrollado una estrategia basada en aproximaciones con movimientos lentos y en circulo que nos permitieron acercarnos a los animales (<15m) y disparar el dardo. Entre Enero 2003 y Mayo 2006 hemos capturado nueve venados de campo en la región Sur del Pantanal usando una pistola "DistinjectÒ dartgun" o "Zarabatana" (blowpipe) y dardos conteniendo una mezcla de Zolazepan y Tiletamine (ZoletilÒ - 10mg/kg). Todos los animales que fueron inoculados con los dardos se recuperaron, no registramos ninguna lesión o mortalidad. El método de dardos probó ser viable y seguro para la captura del venado de campo. La eficiencia de este método se basa en la experiencia que tenga el "capturador" en el acercamiento para disparar el dardo.

Introduction

In the Neotropical and other underdeveloped regions there is a lack of information to guide conservation efforts and wildlife management. Wildlife research and management commonly require animal capture and handling (DelGiudice *et al.*, 2005). In such situations, the main challenge is to develop techniques that minimize mortality risk and injuries. There are few reports of deer capture in South America. Only seven studies have reported captures of the pampas deer (Leeuwenberg *et al*., 1997; Mathias *et al*., 1999; Rodrigues & Monteiro-Filho, 2000; Gonzalez & Duarte, 2003; Pereira *et al.*, 2005 and 2006; Tiemann *et al.*, 2005), except for Leeuwenberg *et al*. (1997) all of them were conducted by the same research group. The drive net, "fast setting net" and fixed nets have been the most used methods to catch the species in South America (Gonzalez & Duarte, 2003, Piovezan, Person. obs.). Until the present, there are no available reports of darting as a viable method of capturing free-ranging pampas deer.

Our objective was to evaluate the viability of the darting method to capture pampas deer in the Pantanal wetland.

Study site

We captured pampas deer in the proximities of the Nhumirin ranch, a research station of the Brazilian Agricultural Research Corporation (Embrapa Pantanal), located in the central region of the Pantanal Wetland, Brazil (18º 59' 15'' S; 56º 37' 03''). This region is characterized by low flooding levels, lasting 3 to 4 months (Soriano *et al.*, 1997), and a mosaic of vegetation physiognomies determined by the smooth topography and the annual inundation pulse. The grasslands and shrubs savannas dominate the lower terrains, the savanna (Cerrado) and semi-deciduous forest vegetations are common in higher areas (Ratter *et al.*, 1988).

Capture

The aim of our capture effort was to fit deer with an assembly of a modified GarminÒ handheld GPS unit plus an ATSÒ glue-on radio, adapted from Mourão & Medri (2002). This "GPS-radio-collar" device is under development, as part of one major research project carried out by Embrapa Pantanal (PRONAPA, 2004, project #

02.02.5.25). The objectives of the study are to survey the pampas deer circadian activity, habitat use and health.

We searched for the animals randomly in the study area, and approached them by foot with one or two handlers, always keeping visual contact with the animal. The approaching strategy consisted of slow and circular movements around the animal (or grouped animals) until reaching distances up to 15m. Only deer that were laterally positioned in relation to the shooter, and were close enough were chosen as targets (Figure 1). We darted those animals that met these criteria, with 5ml darts using DistinjectÒ dart-gun (model 35) or a blowpipe. We used the association 1:1 zolazepan-tiletamine (ZoletilÒ) intramuscular, with a dosage of 10mg/kg. After shooting, we maintained visual contact with the deer and waited at least 10 minutes before accessing the animals.

Once laid down on the ground, we weighted and checked its reflexes. Subsequently, after the complete chemical immobilization, we blindfolded and ear plugged the animals to reduce external stimuli and administered 0.5 mg of atropine sulfate intravenously. During the handling, deer was kept ventrally down to prevent rumen fermentation and received salt water solution on its eyes to prevent corneal drying. Puncture wounds were treated with antibacterial veterinary spray. In attention to the cooperative research between Embrapa and Fundação Oswaldo Cruz (FIOCRUZ), we also collected blood samples and ectoparasites for further studies. We observed all animals for at least 4 hours after capture to ensure that the animals became completely awake before leaving them in the field. The whole capture process was performed by two or three handlers.

*Figure 1 – Researcher during approach attempt to dart the pampas deer (*Ozotoceros bezoarticus*) in the Pantanal.*

All handling procedures followed the recommendations of the Guidelines for Capture, Handling and Care of Mammals as approved by the American Society Mammalogists (Animal Care and Use Committee, 1998). The project had permission of IBAMA (license number # 26/ 2005, Process nº 02014.001890/2005-66), according to the Brazilian law.

Results

Between May 2003 and May 2006, we captured nine deer (7 bucks and 2 does) (Table 1). The equipment attached to the animals contained an auto-release system that made recapture for recovery of the device unnecessary. The animals were monitored from 1 to 94 days after the capture. We did not observe any mortality during capture procedures and neither during the monitoring period. We did not record any injuries (serious or minor) to the animals. The unique exception was the buck (OB8) which lost one antler less than 24 hours after its capture. The mean deer mass was 29.6 Kg (n=8), and the handling time (the time elapsed from the first access until the last moment we handled each animal) was 55 minutes on average (n=9).

Darted deer never fled more than 100 meters away and never got so far that could not be observed by the shooter. After being shot, deer generally tried to return to their previous activities. Two darted animals were not completely immobilized and avoided our new approach for

*Table 1 – Pampas deer (*Ozotoceros bezoarticus*) captured in the Pantanal from 2003 to 2006, using the dart-gun or blowpipe.*

Identification	Capture date	Sex	Body weight (Kg)	Handling time (minutes)	Post-capture monitoring (days)
OB1*	Sept/2003	Male	27	40	2
OB2	May/2004	Female	Ñ-	39	1
OB3*	May/2004	Male	28	53	7
OB4	Dec/2005	Male	32.5	65	3
OB5	Febr/2006	Male	33.5	50	8
OB6	Mar/2006	Male	30	53	7
OB7	Mar/2006	Male	35.5	60	94
OB8	May/2006	Male	28	57	10
OB9	May/2006	Female	22.5	78	62

* = *animals captured using*

Discussion

Comparisons between capture methods have been conducted with the *Odocoileus virginianus*, the most studied deer in the Americas, and darting has presented the lowest mortality and injury rates (Haulton *et al.*, 2001). Darting also requires fewer handlers than other methodologies (Ishmael & Rongstad, 1984). DeNicola & Swihart (1997) evaluated blood cortisol levels in *O. virginianus* (as a stress index) and found that darted animals exhibited concentrations up to five times lower than deer captured by physical-restraint techniques. We didn't record any injury or mortality in our study, which represents an important aspect of the method concerning the security of the pampas deer capture. Even though we tested darting on only nine animals, our results agree with other researches' that consider this procedure safe and less stressful than other methods involving physical restraint before chemical immobilization of the animals (DeNicola & Swihart, 1997).

Two darted deer did not get immobilized in this study. This fact may be explained by inadequate drug dosage, dart failure, and/or poor dart placement on the animal's body. Excessive reliance on the darter's ability is a drawback of the method, since it may expose the animals to risks if the dart hits vital organs (Palmer *et al.*, 1980), and it may cause failure of dart injection. Caulkett & Haigh (2004) strongly recommend delivering darts at a distance of 30 meters from the deer or closer, to ensure accuracy and to reduce tissue trauma. Moreover, the small flight distance presented by the pampas deer in Pantanal combined with our parsimonious approaching strategy increased the accuracy and minimized the shooting related risks.

We cannot assure that buck OB8 was not affected by our procedures, however antler loosing events were also observed in several males in the study area, during the same period (May). This month coincides with the beginning of the velvet antlers covering season in the Pantanal (Tomas, 1995), which occurs immediately after antler loosing. For security, we recommend to avoid capturing *O. bezoarticus* in this period of the year.

Another common trait used to evaluate capture methods is the recovery rate of darted deer (Kilpatrick *et al.*, 1997). This rate may vary with environmental characteristics and deer behavioral responses. Kilpatrick *et al.*, (1997) recovered 86% of darted white tailed deer in hardwood forests using transmitter-equipped darts at Mumford Cove, Connecticut, and Ishmael and Rongstad (1984) and Schwartz *et al.*, (1997) reported 50% and 43% of recovering rate, respectively, for the same species using standard darts. In our study area, all darted deer were recovered, showing that the method used to capture pampas deer is pertinent especially in areas of open grasslands as the Pantanal.

Other methods using traps and bait don't seem to be cost efficient in the study site because of the relatively low densities of the pampas deer when compared with white tailed

Other methods using traps and bait don't seem to be cost efficient in the study site because of the relatively low densities of the pampas deer when compared with white tailed deer in North America, and the high availability of food resources and salt (offered to cattle by the ranchers).

Darting has proven to be a safe and viable method to capture pampas deer. However, the effectiveness of this method will depend on personal experience and on behavioral responses of some animals, which can differ between regions and populations.

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VII CONGRESSO INTERNACIONAL SOBRE MANEJO DE FAUNA SILVESTRE NA AMAZÔNIA E AMÉRICA LATINA
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Ocurrencia de *Cysticercus tenuicollis* errático en Venado cola blanca (*Odocoileus virginianus*) en cautiverio

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Abstract

The metacestode *Cysticercus tenuicollis*, the larvae stage of *Taenia hydatigena*, was recovered from the pleural sac of a white-tailed deer (*Odocoileus virginianus*) maintained in captivity in Peru. Two cystic structures with 4 cm of diameter were observed in the toracic cavity. This erratic localization of *C. tenuicollis* is recorded for the first time in the white-tailed deer.

El estudio de los parásitos de animales silvestres tiene una gran relevancia sanitaria, no sólo por las afecciones que pueden causar a sus hospederos, sino por la posible transmisión a otros hospederos, tales como animales domésticos e inclusive al ser humano. Es ese sentido, el estudio de la helmintofauna de los cérvidos reviste importancia debido a los pocos estudios y reportes existentes (Maia, 2001).

Uno de los cérvidos con mayor distribución en América es el venado cola blanca (*Odocoileus virginianus*). No existe estimación precisa de sus poblaciones, pero se dice que sobrepasan los 15 millones, esto los convierte en portadores y vectores de diferentes enfermedades (Smith, 1991, Dewey, 2005). En el presente reporte se describe un caso de ocurrencia de *Cysticercus tenuicollis*, forma larvaria del céstodo *Taenia hydatigena*, en un venado cola blanca en condiciones de cautiverio.

Un individuo macho adulto y aparentemente normal de *Odocoileus virginianus* de la colección del Parque Zoológico Huachipa, Lima - Perú, fue sacrificado por sobrepoblación. En la necropsia se observaron dos estructuras quísticas a nivel torácico, una cercana al ápice del corazón, y otra a nivel de la bifurcación de la tráquea, ambas se encontraban fuertemente adheridas a la pleura visceral, y no causaban daño orgánico aparente. Luego de la observación *in situ* fueron separadas y fijadas en formol al 10% para su identificación.

Estas estructuras vesiculares de aproximadamente 4 cm. de diámetro, se encontraban recubiertas de un tejido fino que contenía un líquido translúcido; en el interior se observaba una invaginación cefálica que contenía un escólex. De acuerdo a sus características morfológicas, éstas vesículas fueron identificadas como *Cysticercus tenuicollis*, metacéstode de *Taenia hydatigena*, que se desarrolla en rumiantes domésticos y silvestres (Sánchez Acedo, 1999).

La infección en los rumiantes ocurre cuando éstos ingieren los huevos o los proglótidos de *T. hydatigena*, que son expulsados en las heces de carnívoros domésticos y silvestres. Éstos huevos eclosionan en el intestino delgado y liberan las oncósferas, que llegan al hígado por vía hemática. Los embriones rompen los vasos portales y migran por el parénquima hepático hasta llegar a la cavidad peritoneal. Es en el peritoneo donde los cisticercos se terminan de desarrollar y comúnmente se fijan al mesenterio y a la superficie serosa de los órganos abdominales (Soulsby, 1987; Sánchez Acedo, 1999); sin embargo también pueden encontrarse localizaciones erráticas en el pulmón, pleura, cerebro y ovario (Sánchez Acedo, 1999).

Los principales hospederos de *C. tenuicollis* son los ovinos y los cérvidos. Dentro de este género, la literatura menciona la presencia de *C. tenuicollis* en venados cola blanca en estado silvestre y en cautiverio en Estados Unidos (Prestwood *et al.*, 1976; Forrester y Rausch, 1990) y Australia (Mason, 1994); en todos los casos la ocurrencia del metacéstode es limitada a una pequeña cantidad de animales, y la localización del cisticerco es en la cavidad abdominal. Por otro lado, se cuenta con el reporte de Maia (2001), quien menciona la ocurrencia errática de *C. tenuicollis*, fijado a la pleura visceral en un venado rojo (*Cervus elaphus*). En tal sentido, la importancia del hallazgo de *C. tenuicollis* en venado cola blanca radica no sólo en el registro de ocurrencia en el Perú, sino en la localización atípica de la forma parasitaria.

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Graves lesiones y muerte de un pudú (*Pudu puda*) luego de una pelea entre machos.

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Abstract

A male pudu deer (*Pudu puda*) with a serious injury in one eye, was found in Nahuel Huapi National Park. After its death, it was found that the injury had been caused by the antler of another male, which nailed into the bottom of the eye cavity. Territoriality and aggression is known for pudus in captivity. The consequences of this fight between two males suggests a marked potential for inter-male aggression in the wild, similar to that observed in captive conditions, and presumably associated to resource defense.

El pudú (*Pudu puda*) habita los bosques templados, andino nor-patagónicos o valdivianos, de Argentina y Chile. En Argentina, el pudú se distribuye a lo largo de una angosta franja de bosque húmedo y denso desde el sudoeste de la Provincia del Neuquén (39º lat. sur aproximadamente), llegando hacia el sur hasta el sector centro-oeste de la Provincia del Chubut (44º lat. sur) (Ramilo, 2001). El macho adulto apenas llega a los 45 cm. de altura a la cruz y el peso (en cautiverio) es de 13 a 15 kg. Las astas son simples, como estiletes, de cerca de 10 cm. de largo. Las hembras son muy similares en tamaño y peso, sin astas. Hershkovitz, 1982, da una completa descripción de la especie.

Está considerado como "vulnerable" por la IUCN (1998), y en Argentina (SAyDS, Resolución 1030/04) y Chile (Glade 1988). No obstante, existe escasa información sobre su abundancia y distribución como para determinar adecuadamente su status actual.

Encuentro del ejemplar

A principios del mes de junio del año 2000, personal del Parque Nacional Nahuel Huapi encontró un ejemplar de pudú sobre el camino vehicular que conduce al Cerro Tronador, dentro del Parque Nacional. Al ver que presentaba una lesión grave en un ojo fue capturado y trasladado a San Carlos de Bariloche para su atención veterinaria. En el Hospital Veterinario de Bariloche, conducido por el Med. Vet. Pablo Hulfskamp, se le revisó la lesión en el ojo derecho, que presentaba un cuerpo extraño que sobresalía del globo ocular dañado. Se le tomó una radiografía, y luego se extrajo del ojo un trozo de asta de otro pudú de 4,5 cm. de largo que se encontraba firme y profundamente clavada, lo que provocó la pérdida total del ojo. Luego de la higiene de la herida y la administración de antibióticos, el animal fue mantenido en cautiverio. Murió a los cuatro días, sin haber mostrado signos de recuperación de su condición general.

Evaluación de la lesión

Luego de disecada la cabeza, pudo observarse la lesión provocada por el asta en el hueso del fondo de la cavidad orbitaria derecha. El asta atravesó totalmente el hueso (porción orbitaria del hueso frontal), dejando un orificio ligeramente ovalado de 5 mm de diámetro (Fig. 1), y penetrando 2,5 cm dentro de la cavidad craneal. El

Figura 1. Orificio de 5 mm de diámetro dejado por el asta en la cavidad orbitaria derecha

trozo de asta tenía la punta quebrada y en el otro extremo, se partió muy cerca de la roseta.

El asta penetró por el borde lateral del ojo derecho, pasando por el lado interior de la apófisis supraorbitaria del frontal, muy próxima a ésta (Fig. 2). Se incrustó en el fondo de la órbita con una dirección postero-medial, y levemente ventral.

El borde superior del trozo de asta quedó hacia abajo, por lo que la corneada tiene que haber sido producto de una embestida violenta realizada con la cabeza gacha (la cara en línea con el suelo) y las astas dirigidas directamente a su oponente. Este último debió encontrarse con la cabeza en posición normal en el momento en que era embestido. No presentaba otra lesión en la cara, por lo que se presume que fue corneado con el asta derecha, en tanto la izquierda no habría hecho contacto con otra parte del cuerpo.

El vigor de la embestida del "agresor" puede deducirse por la perforación del hueso y la profunda penetración del asta en la cavidad craneana (2,5 cm.). El trozo de asta presenta una profunda muesca en su sector central, aparentemente provocada por la presión realizada contra el borde superior del orificio en la cavidad orbitaria cuando el animal que realizó la corneada enderezó su cabeza generándose un efecto palanca con el asta trabada en el hueso. Esta presión finalmente provocó que el asta se partiera a la altura de la roseta.

Discusión

Presumiblemente la embestida no haya estado dirigida a provocar una lesión tan seria ni la muerte del otro animal, pero es evidente que existió la intención de utilizar las astas para provocar un daño suficiente como para disuadir al oponente a que se retire rápidamente del área.

Si bien la evolución de las astas en los ciervos está más relacionada con los efectos sociales que con la defensa individual, o con provocar lesiones, dolor, etc. a un oponente (Bubenik and Bubenik, 1987), ciertas especies no sociales, y ecológicamente consideradas como "*defensoras de recursos*", mantienen un

Figura 2. Posición en que quedó el asta al partirse, y en la que se encontraba al ser rescatado el animal.

comportamiento más agresivo hacia sus congéneres y cierta capacidad para provocar daño. Entre machos de pudú se producen vigorosos enfrentamientos cabeza a cabeza, topetazos, empujones y saltos dirigidos hacia el oponente con la ayuda de sus fuertes caderas (Geist, 1998).

Macnamara y Eldridge (1987) describen un tipo de enfrentamiento (*antler pointing*) entre machos de pudú en cautiverio, donde uno de los individuos se dirige con las astas apuntando directamente hacia otro, que se retira o permanece inmóvil hasta que el oponente se aproxima. También se menciona que los pudúes son sumamente territoriales en cautiverio y pueden matar a un individuo que es introducido dentro de un grupo ya establecido (Eldridge, et al. 1987). Contrariamente, el grado de territorialidad del pudú en libertad no ha sido adecuadamente establecido (Geist, 1998).

En este caso, la lucha se desarrolló en libertad y con evidencias de una marcada agresividad, similar a lo observado en cautiverio. Teniendo en cuenta que la pelea se produjo cerca del inicio del invierno quedaría descartada alguna relación con la actividad reproductiva, pudiendo vinculársela más bien con la obtención o el mantenimiento de un territorio productivo donde no permiten el ingreso o presencia de individuos de la misma especie.

Junto a otras características ecológicas de la especie -en particular el comportamiento olfativo/ marcación observado en cautiverio, o la formación de grupos pequeños, y la reducida área de acción que son capaces de utilizar a lo largo del año (Eldridge, et al. 1987; Ramilo, 2005)-, este comportamiento agresivo podría estar indicando una marcada territorialidad del pudú en condiciones de libertad, similar a la observada en cautiverio.

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ASIA

Review of Current State of Swamp Deer at Kaziranga National Park in new millennium

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Kaziranga National Park of Assam, India is known worldwide for its success in the conservation history of one horned Indian rhinoceros. It also provides a natural habitat for a number of rare, threatened and charismatic species like the swamp deer (***Cervus duvauceli ranjitsinghi)***. A symbol of dedication for the conservation of animals and their habitat, Kaziranga, represents the single largest protected area within the North-east India to provide long term viable conservation. Kaziranga National Park is an outstanding example of significant ongoing ecological and biological processes in the evolution and development of natural ecosystems consisting of several communities of plants and animals. Kaziranga is the most important and significant natural habitat for *in-situ* conservation of biological diversity, including those containing threatened species with rhino as the flagship species.

The fact towards its successful management of herbivores including the swamp deer lies with the fact that the national park holds the largest undivided and representative area of the Brahmaputra Valley flood plain grassland and forest with associated large herbivores, avifauna and wet land values. Talukdar (1996, 1999) mentioned about the status of the swamp deer in the national park for the earlier century. In this paper, current state of the swamp deer has been estimated along with the threats and opportunities towards conservation of the species in this new millennium.

It has been observed that the swamp deer prefer the open areas around the wetlands in Kaziranga and are most visible in the morning and evening. The day time is spent lying down in forests in the sunny areas during the winter and during summer they may be found resting in shade or wallowing in the periphery of the wetlands. The rutting season of the swamp deer shows a marked variation from area to area. In Kaziranga the rut begins from the early part of May and lasting till about October-November. Hinds participate actively at the age of about two years and a single fawn is born when the hind is approximately three years of age.

Apart from human beings, the main predator of swamp deer is the tiger. Floods also take a toll of the young fawns. The largest number of swamp deer in eastern India is presently concentrated in Kaziranga. During the 1991 census 559 individuals were counted. Though the population of swamp deer had steadily increased from 1966 to 1984, there was a decline in the population as compared to the figures of previous census (Vasu, 2002). It is generally assumed that the distribution of swamp deer inside the park is limited to a few areas, although during the count they were found to be present in all the blocks. The

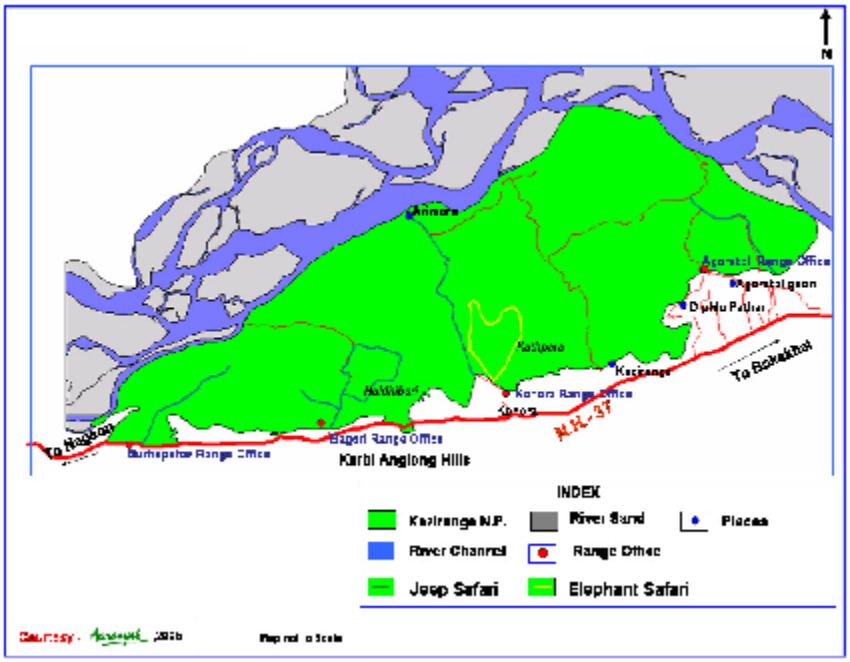

Fig. 1: Forest Map of Kaziranga National Park

Table 1: SWAMP DEER CENSUS IN KAZIRANGA NATIONAL PARK - 2000

SITE Nº	RANGE	STAG	HIND	FAWN	TOTAL	AREA WHERE CONCENTRATED
1	KAZIRANGA (Kohora)	61	117	52	230	Kathpara, Bheselimari, Borbeel, Basantibeel, Tekeliphuta, Laodubi, Naromora & Dimaguri.
2	WESTERN (Baguri)	20	59	31	110	Donga, Garubeel, Gendamari, Bahubeel, Borbeel & Sahabduba.
3	EASTERN (Agaratoli)	35	75	18	128	Solmora, Modarjuri, Kilakili, Boralimora, Debeswari & Joke Sarubheroni.
4	BURAPAHAR	00	00	00	00	
	TOTAL	116	251	101	468	

highest concentration was to be in Baguri and Haldhibari block of the national park (Fig.1).

The first swamp deer estimation exclusively to ascertain its population status was conducted in May 1998 before the devastating annual flood in September 1998. The estimation was done by the Forest Department assisted by researchers from institutions and Non governmental organizations. The whole areas of the national park were divided into eight major compartments. Further each compartment was subdivided into 10 sub blocks to make it easy for one group of enumerators having three persons each to cover one sub blocks. Each block was simultaneously surveyed from 5 AM till 11 AM by a group of about 3 enumerators using direct head counts of the swamp deer from the top of a domestic trained elephant. In total about 240 enumerators were involved in eight blocks. One group of enumerators was covering an average area of about 5.75 sq km. All the enumerator groups were equipped with walkie talkie sets to communicate with the nearest other groups of enumerator in order to reduce double counting. The analysis of the result of population estimation exercise in 1998 revealed that there are 126 stags, 360 Hinds and 40 Fawns. Thus the Stag, Hind and Fawn constituted 24%, 68% and 8% of the total population of the species. The ratio between stag & hind is found to be 1:2.9 and between hind & fawn is 1:0.1 or 1 fawn per 10 hinds. It is pertinent to mention that fawning of swamp deer in Kaziranga may extend up-to early May. As the exercise was done in late March, there is every possibility of not reflecting the total number of fawns expected to be born during the year. The largest herd was sighted in Kathpara area under Kaziranga range consisted of 61 animals. The herd comprised of 21 Stags, 32 Hinds and 8Fawns.

Keeping the need of long term monitoring of the swamp deer population in the Kaziranga National Park, a detailed census for swamp deer was initiated in the year 2000 involving forest staff, researchers and NGOs. The swamp deer population has been found declining in the national park with a total count of 468 in the year 2000 compared to 526 recorded in the year 1998. The decline could be attributed to further loss of swamp deer in subsequent flood in Kaziranga National Park during 1998-1999. The detailed census figure of the swamp deer in Kaziranga carried out in the year 2000 has been summarized in Table1.

The census records indicates that the central range of Kaziranga National Park called at Kaziranga Range harbours the maximum swamp deer population, followed by the Eastern Range also known as Agaratoli range and than the western range also known as Baguri range of the national park. Thus the stag, hind and fawn constituted 24%, 53% and 21% of the total population of the species. The ratio between stag and hind was 1:2.16 while between fawn and hind the ratio was 1:2.48.

It has been realized by the state government of Assam that in order to protect the swamp deer in Kaziranga, long term monitoring of population and

habitat is needed and more highlands within the national park need to be constructed so as to reduce drowning of swamp deer along with other wildlife during the high flood in Kaziranga National Park. During the flood in September 1998, over 130 swamp deer were drowned as per records available with the park authorities. Over 85 percent of the park was inundated by flood water during 2-5 September 1998. During the 1998 flood, it was observed that whatever highlands exist within the park, all the herbivores including the swamp deer takes shelter on those highlands during the high flood that lasts for about 3-4 days. The park managers has geared up the process of preparing more high lands within the national park based on the experience they have gain from the 1998 flood to assist the swamp deer to exploit more safe shelters in some key transition zones of swampy grassland and tree forests during the flood time in order to build up the viable population and reduce the death of swamp deer due to drowning.

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