

DEER SPECIALIST GROUP NEWS

NEWSLETTER NO. 15

October 1999

Deer Specialist Group

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Some minor changes were made in a few articles. This was done strictly for grammar and comprehension. Please accept our apologies if any errors were made during this process. Also, most of the articles were provided with a bibliography, but for space reasons, they were removed. You may contact the author or Laura Walker if you need to see references.

Europe and Near East

European Moose Knocking On Germany's Door

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The European moose has greatly recovered from range losses in middle and Eastern Europe. Populations in Latvia rose, for example, from an estimated 600 in 1937 to 13,000 in 1990. In Poland, moose had been confined to a single area of habitat by the end of the 1940s. During that time, the last remaining population (about 20 animals) inhabited the Biebrza river region. From this population, and through the successful release of moose in the Kampinos National Park and migration from Belorussia, a population of some 5,000-6,000 individuals has developed in recent years. This population is distributed over a more or less continuous area, covering half of the country's territory in the northeast and east.

In the 1970s, the first population in western Poland developed. Moose populations were growing and spreading to other areas, especially to the baltic region in the northwest, and, in small numbers farther south along the Polish-German border. In the first half of the 1990s small populations were established in all four counties along the border with Germany.

In Germany, where moose disappeared inside modern borders about 200 years ago, the migration of single individuals from Poland, the neighboring Czech Republic, and even Austria, is known to have occurred several times since 1950. Unfortunately, these animals were either shot or killed by traffic. Reintroductions of moose in the territory of the former East Germany failed in 1934 and 1965.

Moose is a protected species in Germany, but hunting is permitted in the state of Saxony. This was bad for a young, migrating bull, who was sighted in Saxony in September 1998, and shot in November. The president of Saxony's hunters organization expressed his regrets, and appealed to hunters in Saxony not to shoot migrating moose. This case proves again that migration from neighboring Poland is occurring. Three new national parks created during the last days of the German Democratic Republic are located in areas where migrating moose might establish territories. Game managers in these national parks are prepared to welcome migrating moose, so there is good hope for a small German moose population in the future.

Large Herbivore Initiative For Europe (LHI)

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Inspired by the success of the Large Carnivore Initiative for Europe (LCIE) as a cooperative effort of interested parties for the benefit of large carnivores, it was decided to develop a similar initiative for large herbivores (Large Herbivore Initiative or LHI). Just as with LCIE, the role of WWF in the LHI would be to act as a catalyst: providing a network to bring partners together, stimulating and supporting the initiative, but not taking ownership of the project as a whole.

Initial funding was provided by WWF-Netherlands, and in February 1998 the initiative was founded during a Program Planning Workshop in Bialowieza, Poland. Some 50 experts and interested parties from more than 15 countries participated in this workshop. At that time, it was decided to enlarge the geographical scope of the LHI to include Central Asia, Siberia and Mongolia due to the importance of these regions for large numbers of herbivores living in relatively undisturbed ecosystems.

The most important objectives of the Large Herbivore Initiative are to prevent the disappearance and decline of large herbivore species, not just for the species themselves, but for the crucial role they play in their ecosystems. In a complementary fashion, this leads to a desired objective, where restoration of the role of herbivores becomes a means for ecological restoration on a larger scale. More concretely, this means making the protection of threatened species and their habitats a priority, especially in Eastern Europe and further to Central Asia. Priority has already been given to species like the wild camel, Saiga, Mongolian antelope, musk deer and several species of wild sheep and goats.

Toward Western Europe, species and habitat protection remains an important issue (e.g. for the European bison). Ecological restoration will be the biggest challenge. It will involve the reintroduction of wild living herbivores, carnivores and the development of natural areas. The abandonment of agricultural lands, and the cessation of extensive grazing of domestic cattle and horses all over Europe, poses a great threat to the biodiversity which still exists in semi-natural systems. On the other hand, it lends great opportunities for ecological restoration and the recreation of wilderness in Europe.

Bukhara Deer Within Its Broken Area - Problems For Species Survival

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The endangered subspecies of red deer – bukhara deer (*Cervus elaphus bactrianus*) IUCN Red Data Book - is unique in several ways, differing morphologically both from other European subspecies of red deer, and from the Asian and American subspecies (*wapitoides*). This subspecies possesses specific physiological adaptations to the arid conditions of Central Asia, most notably to the very limited supply and quality of food resources. Our investigations had shown its specificity in behavior and communication, which appeared to be consistent across different ecological conditions and densities. One of the most vivid examples of this specificity is a stable creation of true *leks*, which is characteristic only for this subspecies of red deer. According to the most recent genetic analyses carried out by our colleagues from Great Britain, it is shown – together with Kashmir and Yarkand deer – to be a monophyletic and ancient *clade*, close to the common ancestry of elaphoids and *wapitoides*. These tests were conducted

on samples of hair collected in different riparian forests of Amudaria.

As the only true deer species in the arid zone of central Asia, it has always been strictly associated with the riparian forests of river valleys. As the most favorable areas for agriculture in the surrounding desert, these valleys suffer greatly from anthropogenic influences.

Being both sedentary and rare, the number of animals and the distribution of bukhara deer reduced greatly in the 70s and 80s. Recently, it has come to be under threat of extinction, as a result of a great decrease in numbers in certain populations, and from the elimination of others.

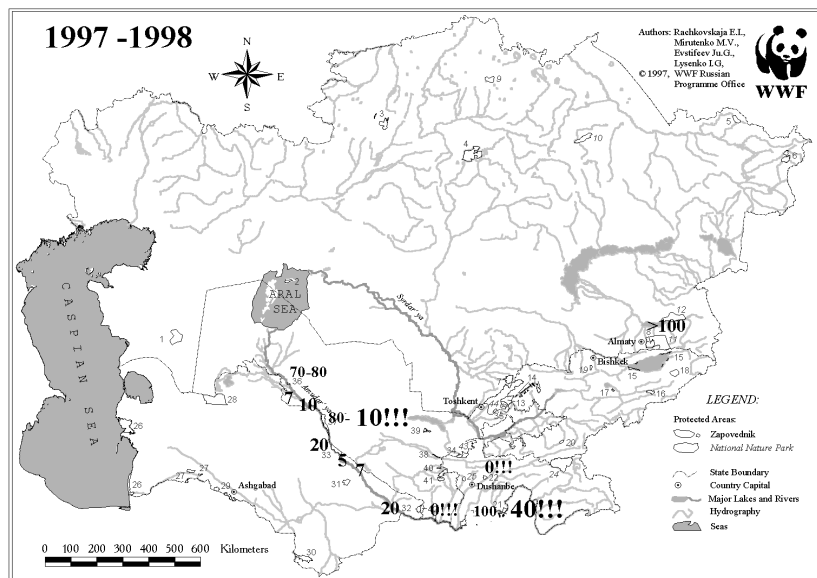
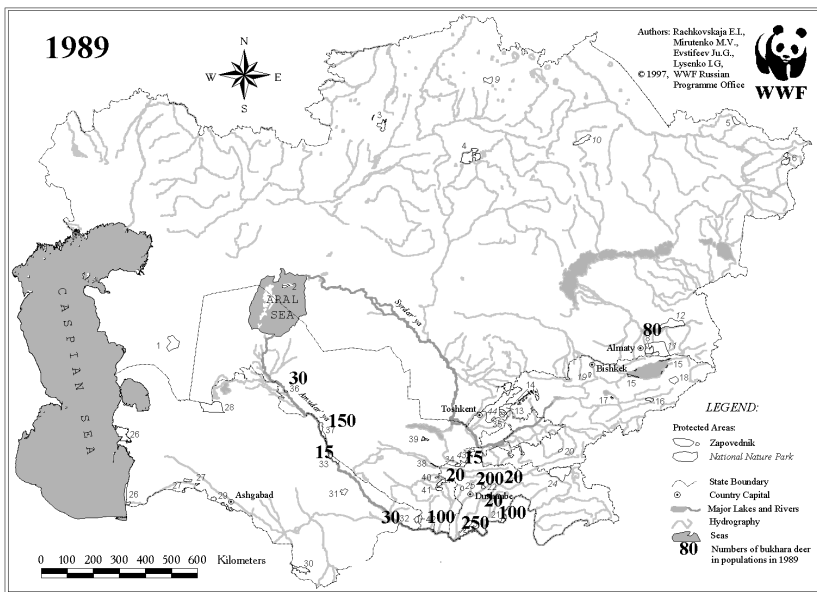
There had been about 900 bukhara deer in the FSU by the end of the 80s. The main populations of this rare deer at that time were:

1. A natural population in the riparian forests of Tigrovaja balka zapovednik (a strict nature reserve; Tadjikistan), which fluctuated around 300-400 animals;
2. An artificial population in mountainous zapovednik Ramit (Tadjikistan), comprised of approximately 150-200 deer;
3. A natural population in the riparian forests of Vakhsh and Piandj (upper flow of Amudaria, Tadjikistan) comprised of approximately 100 deer;
4. A natural population in the Aral-Pajgambar zapovednik, (upper flow of Amudaria; Uzbekistan) comprised of approximately 100 deer;
5. A natural population in Kizilkumskii zapovednik (middle Amudaria, Uzbekistan) comprised of approximately 150 deer.

About 40 recommendations were made for its restoration and possibilities for increasing the deer number up to 4000 or more in *Programme for Bukhara Deer Conservation and Restoration* (Flint et.al., 1989).

The situation for bukhara deer in the Central Asian region of the FSU has changed significantly within the modern political and economical context, and has become truly critical within the last few years.

A special census was carried out in 1995-1997* and 1998*** which showed the following (see accompanying map):



Tadjikistan

Eight deer were noted in Ramit in 1996, and there are purported to have been around 100 deer in Tigrovaja balka in 1996 (Abdusaliamov, Dadabaev - oral information). Estimates in 1998 gave the number at not more than 40 animals.

No information is available concerning deer either in the rest of the riparian forests, or in the various mountainous areas, where artificial populations had been created in the 1970s and 1980s. According to the information available, there is very little chance that any of these deer groups still exist.

Uzbekistan

The main natural population of bukharu deer still existed in Kisilkumskii zapovednik until 1997 (about 70 deer according to the census in October – B. Djakin, oral communication); and there is also a restored population in Badai-Tugai nature reserve – about 80 living in the wild and 16 in captive pens (May 1995). Additional census during the rutting season in 1998 confirmed the number of deer in Badai-Tugai, although the sex ratio is unfavorable to support population development: about 50 males from the total amount of 80 animals. Contrary to that, a maximum of 7-10 deer remain in Kisilkumskii, the results of a very strong over-flood and poaching

this summer. The only hope is that some deer managed to immigrate to other riparian forests, and will return later.

As reported by a group from the Ministry of Forestry of Uzbekistan in October November 1997, there are no deer on Aral-Paigambar Island, and hardly any of the ecosystem itself remains (B. Djakin, oral communication).

Turkmenistan

Groups of 7 (tugai Borli), 10 (tugai Djigerbent and Karagiir), up to 20 (tugai Gorelde, a part of Amudaria nature reserve), 5 (tugai Kabakli, a part of Amudaria nature reserve), 5-7 (tugai Nargis), and about 20 (tugai Tcharshanga, southern borders of Turkmenistan) deer were noted in separate riparian forests in 1996. The group within the Gorelde riparian forest increased in 1998, perhaps due to the immigration of some deer from Kisilkumskii nature reserve.

Kazakhstan

A single artificial population of bukharu deer in Kazakhstan was created by the translocation of 12 deer from Tadjikistan to Karatchangil (special fenced game area of the President of Kazakhstan; riparian forests on Ili water reserve). This population had increased to 80 animals by 1989. Contrary to the situation in the rest of the states, it continued to develop, and is expected to reach 200 deer (Pavlov, Baidavletov, oral communication).

So, the total number of bukharu deer can be estimated to have been 400-450 by 1997, and 300-350 by the end of 1998.

In this region, all of the significant natural populations of bukharu deer are concentrated in riparian forests of Amudaria, both on the left and right banks. The main problem facing these populations and local groups of bukharu deer are the regulated floods, which take place regularly in conjunction with the artificial regulation of water. The level of water rises up to 1.5 meters in the forest, and this can continue for several months, as it did in the summer of 1998. Such extended floods can – and did – have tragic results. So, although there are 7 local areas of for-

ests with a carrying capacity of about 250 deer in which populations can be restored, the necessity and importance of creating additional populations is apparent. It is absolutely necessary to have sustainable populations of bukhara deer in the other areas – independent of that in Amudaria – to insure the safety of the species.

Some possibilities for bukhara deer restoration** were analyzed in collaboration with the Ministry of Forestry of Uzbekistan. As a first step to this work, in collaboration with CNRS (France) and with their support, a pen was built in the Zeravshan nature reserve. A group of animals was brought there from the Badai -Tugai and Kizilkumskii nature reserves in 1996-1997. The purpose of this exercise was to have a reserve group of animals in a safe area – away from Amudaria basin – for the future

creation of a restored population. This population would presumably be restored within the original historical range in the riparian forests of the Zeravshan river valley.

In the frame of an INTAS grant, there had been an expedition in the winter of 1999, which proved promising for the possibility of bukhara deer restoration in the riparian forests of Syrdaria (Kazakhstan).

One way to create additional herds is to use modern artificial reproduction techniques (embryo – transplantation, etc.) with different forms of park deer as donors. We began this work in the frame of an INTAS grant together with the French Museum of Natural History, and the Centre for Animal Reproduction at the Academy of Sciences of Kazakhstan.

At present, no more than 300-350 bukhara deer still exist in the world. If we do not carry out some urgent measures on behalf of their conservation and restoration, there is a serious threat that this unique animal will ultimately become extinct in the wild.

* Expeditions in Uzbekistan were financially supported by CNRS, France, on PICS 266; expedition in Turkmenistan by MackArthur foundation - personal grant of O.Pereladova in March 1995 -August 1996.

** All work on deer translocation from Badai-Tugai to Zeravshan were financially supported by CNRS, France, on PICS 266 with special additional help from the Ministry of Foreign Affairs of France through the Embassy of France in Uzbekistan.

*** INTAS grant with French and Kazakh partners, mainly aimed on artificial reproduction of BD

Insular Asia

The Fate of the Philippine Brown Deer on the Ogasawara Islands, Japan

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The Philippine brown deer (*Cervus mariannus*) has been assigned as a data-deficient species in the IUCN Red List (IUCN, 1996). In this list, the deer was described to occur not only on the Philippine Islands but also on the Ogasawara Islands (or the Bonin Islands) which consist of over 30 islets and which are located about 1,000 km south of Tokyo in the Pacific. Whitehead (1933) stated that the deer was indigenous to the Ogasawara islands. We have been concerned about the fate of this deer since the IUCN list was published. Recently, we have confirmed that no deer survive there at present. However, it is clear that the deer inhabited several of the Ogasawara islands in the past.

Several Japanese documents describing the deer are available. Isomura (1888), probably the oldest description, reported that the deer were very common on the major islets and were controlled actively by capturing because the deer caused serious damages to the fields. Then, Yamagata (1906) reported that the number of deer had decreased by pest control but few populations still survived on at least two of the islets. Momiyama (1929) mentioned that the deer were reported to have been introduced in 1853 by Commodore Perry and that the populations had become established on the islets. He found, however, that the populations were extinct at the time of his visit, though few individuals had survived several years before his visit. Kuroda (1930) also confirmed extinction of the deer and showed pictures of the skulls of the deer, which was regarded as *C. unicolor boninensis* classified by Lydekker (1905). Judging from the description on the size, antler configuration, and color pattern of pelt, it seems to have been *C. mariannus*. The population of this deer with unknown origin had been extinct around 1925.

Hasuo (1970) reported that a pair of the deer of *C. mariannus* was introduced again from Guam after the second world war. The pair was released on

Chi-Chi Jima Islet (the biggest islet) and succeeded in establishing a population there, numbering 4 individuals at the time of his visit. He also provided pictures of a live deer which was tame and probably an introduced female.

Gary J. Wiles (Division of Aquatic and Wildlife Resources, Guam, pers. comm.) confirmed that the deer of *C. mariannus* were introduced from Guam. He stated that the deer were introduced by the American military in the 1960s during the time of mandate. Thus, the Philippine brown deer was not indigenous to the Ogasawara Islands, but two introduced populations of the deer (one is *C. mariannus* but another species is not valid) with different origins and times were established.

We interviewed old residents of Chi-Chi Jima Islet about the fate of the second population. They told us that the original pair of the deer established a small-sized population, but that the number did not increase. In 1973 only three individuals were observed. People tried to capture the deer because they also damaged the fields. One female was captured and kept in captivity until she died around 1975, one male was found dead, and the final individual, probably female, had disappeared by 1980.

Loktak Lake Dying a Slow Death

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Dear Colleagues:

The report below is taken from the Hindu Newspaper, 20 July 1999 and will be of interest to those working with the Manipur brow-antlered deer.

By our Correspondent: Imphal, July 19.

Loktak Lake, with an area of 289 sq. km. – the biggest natural lake in eastern and north-east India -- is dying. This is something on which Ministers, Opposition and ruling party members in the Manipur Assembly unanimously agreed upon on Friday. The Minister of Irrigation and Flood Control, Mr. M. Nilachandra, the Environment Minister, Mr. Gangumei Kamei and the Loktak Development Authority Minister, Mr. Muthammad Hessauddin are of the view that because of man – made problems the lake is dying fast.

Mr. N. Mangi, an Opposition CPI MLA, said over 2,000 fisher-folk have made permanent homes on the lake in floating huts. He said, apart from domestic trash, the fisher-folk also dump human excreta into the lake.

The Irrigation Minister, Mr. M. Nilachandra, said the construction of the Ithai Dam for the generation of power in the Loktak Hydroelectric Project had aggravated the problem.

About 30 small rivers in the state are also dumping all kinds of debris into the Loktak lake. Out of the 289 sq. km of the lake, at least 206 sq. km is covered by bio-mass according to scientists, he said.

Before the construction of the Ithai Dam, most of the rivers did not empty themselves into the lake, but flowed towards Myanmar. As a result, the bulk of the rubbish was avoided. Earlier, fish used to eat up the rubbish. However, the fish population has now come down, killed by the toxic conditions of the water. The Ithai Dam has curbed the movement of fish from the sea into the lake.

Mr. Muhammad Hessauddin said a joint Indo-Canadian project has been constructed at Ningithou Chong, and equipment has been brought in to provide latrines and urinals to the fisher-folk. Mr. Gangumei Kamei said the Ithai Dam which retains water at 768.5 meters above sea level, is the primary reason for the slow death of the lake. No environmental clearance was obtained for the Loktak project, the Environment Minister said.

Status of Swamp Deer in Kaziranga National Park

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The Kaziranga National Park of Assam has been termed as one of the key protected areas for deer conservation, as it harbors four species of deer, including the threatened Swamp Deer (*Cervus duvauceli ranjitsinhi*). The other three species are: hog deer (*Axis porcinus*), barking deer (*Muntiacus muntjac*), and Sambar (*Cervus unicolor*).

Swamp deer population figures in KNP from 1966 to 1993, were documented earlier (Talukdar, 1996), and showed a decline in Swamp deer population since 1991. In fact, this was due to the devastating effects of a high flood in KNP during 1988, which caused a crash in the deer population from around

756 in 1984 to around 559 in 1991 census. A census of Swamp deer was conducted again, however, in KNP in April 1998, using the "Direct Visual Count" method. A total of 526 Swamp deer were recorded, showing an increase of around a hundred swamp deer in comparison to 1993 census.

In Table-1, the census figure for Sambar, barking deer and hog deer have been summarized, which also show declines in population for all three species mentioned in the table, between the 1984 and 1991 censuses, and also during 1993 census. It may be mentioned here that in 1988 the KNP was badly affected by a high flood, and thousands of hog deer were either drowned, or killed by people, or hit by speeding vehicles (mainly trucks and buses on National Highway 37 which passes by the edge of the southern boundary of KNP). As a result of the devastating flood in 1988, the populations of all four deer species crashed. In the case of Sambar, around 158 Sambar were counted in the 1984 census – prior to the flood – while during 1991 census only 55 Sambars were counted. This indicates a decline of around 65% in the Sambar population. In the case of hog deer, the population decline was around 71% during the same period. The effects of the flood on Swamp deer reduced the population from 756 (counted in 1984) to 635 (counted in 1991). This shows a decline of around 16%. The heavy flood of 1988 transformed some of the wetlands into grassland due to heavy silt deposition.

While the population decline of deer since the flood was in the process of recovering, nature's fury struck again in 1998, exactly 10 years after the earlier flood. This time, three waves of flooding put the animals of KNP – including deer – under great strain, and a large number of deer were killed. The official figures on casualties of deer in KNP as a result of the 1998 flood are shown in Table-2.

During the flood period, 42 gog deer, 2 Swamp deer, and around 10 Sambars were rescued. The figures shown here are based on the number of carcasses recovered after the flood. There may

have been more casualties due to drowning, however, as some of the carcasses might have fallen into the Brahmaputra river, and it is very difficult to locate or count animal carcasses in such a big river. The preliminary research done by the author after the post flood scenario in KNP sheds a skeptical light on the future conservation of deer after the flood. Although there is no poaching threat on deer under normal circumstances, the flood remains the major threats to deer in KNP. It is assumed that the deer population in KNP has been further affected by the flood of 1998, and a long term deer conservation and management plan in KNP is needed. A proposal has been forwarded to the State Government to construct more high land inside the KNP so that during

high floods, the animals – including deer – could take shelter. Long-term public awareness programs have been initiated by the Aaranyak Nature Club to seek the cooperation of the local people to give shelter to deer and other animals during times of crisis, especially during the flood season.

Efforts have been initiated to regulate the traffic on National Highway 37 during the flood season to ensure safe migration of deer and other animals from low-lying KNP areas to the adjoining hilly areas. This effort will also reduce the number of animals being killed or injured by speeding vehicles.

However, it is realized that it will take quite some time for all of the deer species to recover from their declining populations as a result of these floods.

Sika Deer Project News

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News About an Ongoing Project

I am currently involved in a genetics study of the sika deer in Asia. This cooperative project involves scientists in Japan, Taiwan, Russia, China, Vietnam, and Great Britain, and DNA labs in Japan, Taiwan, and Scotland. Recently I have visited countries over most of the geographic distribution to gather tissue samples, and to assess the status of the species. The sika deer has been raised in captivity for antlers for the Chinese medicine market for many years, but uncontrolled hunting and habitat loss either has, or is, driving them to extinction in the wild.

Currently, China has some 600,000 in captivity, and less than 600 (and declining) in three isolated populations in the wild. They are extinct in the wild in Vietnam (southern end of the distribution was originally near Ha Tinh) and Taiwan. Both countries have native sika deer in captivity, Vietnam about 3,000 in various locations, including 2 national parks, and Taiwan about 400 in 2 locations. They are also extinct in South Korea, and apparently no original stock is in captivity. Their status in North Korea is not known. Substantial wild populations still occur in Far East Russia (northern end of the distribution is in Sikhote-Alin Nature Reserve) and Japan (in Hokkaido they are causing serious crop damage and car collisions).

The evolution of sika deer is of interest because it ties into geological glacial-climatic events and land bridges that have resulted in genetic spatial structuring. Sika deer are most closely related to the wapiti lineage of the red deer, and is a more southern, lowland, warmer climate species, and likely evolved when the two species were geo-

Table-1 : Census Figure of Sambars, Hog Deers and Barking Deers in KNP.

Deer/Year	1966	1972	1978	1984	1991	1993
Sambar	120	105	215	158	55	34
Barking deer	29	76	95	33	—	—
Hog Deer	1311	4551	6855	9872	2811	2048

Table-2 : Deer Killed during 1998 Flood
 (Source : DFO, Eastern Assam Wildlife Division)

Animals	1st flood from 25.6.98 – 3.8.98			2nd flood from 13.08.98 - 30.8.98			3rd flood from 3Sep-30 Sep98			Total
	[A]	[B]	[C]	[A]	[B]	[C]	[A]	[B]	[C]	
Swamp Deer	03	—	03	—	—	—	06	—	06	09
Hog Deer	27	17	44	09	04	13	437	12	449	506
Sambar	01	—	01	01	—	01	13	—	13	15

New Deer Species Found in Northern Myanmar

Excerpted from Discovery News Brief (<http://www.discovery.com>) by Kate O'Rourke

In the remote mountains of northern Myanmar, researchers have discovered a new species of deer, measuring just 20 inches at the shoulder and weighing no more than 25 pounds.

Alan Rabinowitz of the Wildlife Conservation Society of New York first observed the so-called leaf deer on a biological survey in 1997. Local hunters call the creature a leaf deer because hunters can carry it in one large leaf.

Through DNA analysis, researchers report in the recent issue of *Animal Conservation*, the deer can be classified as a new species of muntjac, or small Asian deer. In addition, researchers say that certain physical traits (small single-spiked antler, and the fact that both males and females have equal-sized canine teeth) make it the most primitive deer known today.

graphically isolated during a cold climatic period. More recently, the two species have come into secondary contact in Far East Russia where they are thought to not interbreed (a proposition we are testing), which is surprising given that wherever sika deer have been introduced to red deer range in Europe (and both species to New Zealand), hybridization is a common occurrence. We are looking at sika deer invasion of the Japanese Islands and Taiwan during two glacial periods that exposed land bridges, one about 1 00,000 years ago and a second about 10,000 years ago. Sika deer reached these islands during both periods.

Conservation issues abound. First, it is important to establish the original genetic structuring of sika deer because they are extinct in the wild in some countries, and declining in others. Deer in captivity are purposely being interbred to achieve greater antler productivity through hybridization. Soon, captive stocks will be hopelessly mixed. Recovery programs depend on maintaining origins of stocks, and management to retain genetic diversity within these populations, many of which are very small. Simple prudence requires that we assume that local stocks are uniquely adapted to their environments, and that outbreeding should be avoided in stocks to be used for recovery programs. These measures must be taken now to enable recovery programs in the future when economic development allows. For example, sika deer went to extinction in Taiwan when it was a poor country, but since economic development a recovery program has been in progress.

Ecology, Habitat and Resource Utilization of Hog Deer

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Abstract: Habitat Utilization by Hog Deer (*Axis porcinus*) in Relation to Other Sympatric Species at Jaldapara Wildlife Sanctuary, West Bengal, India (M.Sc. Dissertation)

Project Duration: 6 months (Nov 1998 – April 1999)

This study on habitat utilization by hog deer (*Axis porcinus*) in relation to other sympatric species (chital and rhino) was carried out from December 1998 to April 1999 in Jaldapara Wildlife Sanctuary, West Bengal. The spatial and seasonal differences in habitat utilization of grasslands by hog deer, chital, and rhino were investigated. The study was restricted to various types of grasslands existing within the sanctuary, which were broadly stratified into five major types: pure grassland (natural), pure grassland (plantation), savanna grassland (natural), savanna grassland (plantation) and riverine grassland.

Different habitats were traversed on riding elephants on selected paths to collect data on animal abundance/hr based on sightings in different habitat types. A total of nine transects were laid in different habitats to quantify availability of habitat parameters and their selection. Both direct and indirect methods were used to compare habitat use by hog deer and other sympatric species. Dung abundance was quantified using belt transects, at each 100m interval on the transects. Data on availability of different habitat variables was quantified according to Riney (1982) in 2 x 2 m. quadrats by using Braun and Brauquet

scale. Later the method of Neu et. al. (1974) was adopted to identify preferred habitats and its variable which governed the habitat utilization pattern of hog deer.

The results showed that hog deer selected areas with extensive grass cover with structural mosaics of cover and mostly early phenophase as opposed to habitats with low cover values. High abundance of hog deer were found in areas with higher proportion of *Imperata cylindrica*. They were found to prefer natural grasslands and avoid savanna grassland and plantation areas. These plantation areas are raised for the management of the mega-herbivore rhino (*Rhinoceros unicornis*) which occurs in sympatry with hog deer at Jaldapara. Fire or burning of grasslands in combination with rain seemed to influence the overall selection of habitat by hog deer. Cutting of thatch by local people also influenced the habitat use by hog deer. Areas preferred by hog deer were found to have high level of disturbance in terms of cutting, burning and cattle grazing thus showing the stress on their habitat. Most of the areas avoided by hog deer were found to be highly degraded with high weed density and woodland encroachment. Among different sympatric species interaction with chital (*Axis axis*) and rhino seemed to be very low, as the areas preferred by hog deer were avoided by them. Most surprisingly, rhino – an obligate species of grassland – were found to avoid natural grassland and prefer plantation areas. Thus apart from the effect of these sympatric species directly, habitat use by hog deer seemed to have been more influenced by the management steps taken to provide protection to rhino.

Ecology and Resource Utilization of Hog Deer (*Axis porcinus*) in Relation to Other Sympatric Species Under Various Stochastic Processes at a Landscape Level

Project Duration: 5 years (2000 - 2005)

Summary – Hog deer is a specialist and obligate species of grasslands on the Indo-gangetic plains. Currently, these grasslands are under various

threats like fire, cutting, flooding and woodland encroachment, putting the survival of this species under a threat. This study is designed to generate information for devising better management and conservation strategies for hog deer in India, where little information is available regarding the status and ecology of the species. This project will be carried out for a period of 5 years in two phases. In the first phase a status survey of hog deer (*Axis porcinus*) will be carried out along its past range of distribution from Punjab to the north-east. This phase will be completed within 18 months of the initiation of the project. The next phase will include detailed research on the ecological aspects of the species at either Dudhwa National Park (Uttar Pradesh) or Jaldapara Wildlife Sanctuary (West Bengal). The study sites may be changed on the basis of the status survey done during the first phase. The second phase of the project will be completed within 42 months of the initiation of this phase. Thus, the specific objectives of this study are:

To assess the present distribution range of hog deer (*Axis porcinus*) and its status in India.

To study the habitat ecology of hog deer and its relation with other sympatric species.

To generate Habitat Suitability Index (HSI) models for hog deer under various anthropogenic and stochastic forces for planning better conservation and management strategies for the species.

Phase I – The main objective of this phase of the project is to determine the present range of hog deer (*Axis porcinus*) and evaluate its status in India. In this phase of the project a survey of hog deer will be done all along its past range and potential habitats from Punjab to Assam. Data on its present distribution will first be compiled from various secondary sources, and then cross-checked by actual field visits to those areas. Data on its present distribution will be collected from both direct and indirect methods, and then mapped with the help of GIS and GPS technologies. Data will also be collected on habitat conditions and threats to the species in terms of poaching from primary and secondary sources. Data on habitat conditions will

be collected from the incidences of fire, cutting, weed invasion and woodland succession, cover height and forage condition. The information on hog deer abundance, habitat conditions and extent of threat to the species in each area will be ranked to generate a matrix identifying the potential habitats at a landscape level. Subsequently, information on present range of distribution, sightings and abundance will be used to evaluate the status of hog deer in India.

Phase II – In this phase the ecology of hog deer will be studied in either of the sites mentioned above with special emphasis on its interaction with other sympatric species. This study will also investigate how various disturbance factors like grass cutting by local people, cattle grazing and fires influence the ecology of the species. Information from all the above aspects will be used to generate Habitat Suitability Index (HSI) models for hog deer to help design better management strategies for the species. Prior to the initiation of the field work, image processing will be done by using GIS, remote sensing and *Survey of India* toposheets to broadly identify different habitats in the study area. Subsequently, a spatial database of the vegetation and habitat types in the study areas will be generated.

For monitoring the home range, movement pattern, habitat ecology and activity pattern of hog deer radio telemetry will be used. Information on social organisation and grouping patterns will be collected from direct sightings of hog deer. Whenever an individual is sighted, data regarding its sex, age, group size, activity, habitat type and distance to water will be collected. To study the population dynamics Capture-Mark-Resighting (CMR) method will be used in combination with line transects run from elephant back to estimate the density. To compare habitat use with other sympatric species, direct sighting and indirect methods will be used. Pellet group counts and density will be used as an indicator of the presence of the species in each habitat type. Road transects will also be used to supplement further information. Cattle dung density, sightings in each habitat type, numbers of people entering the park to

cut grass and the biomass of cut grass will all be used as indices to quantify disturbance. Information on fire prone areas will be quantified by collecting data on dry grass and distance to water; flood prone zones will be quantified by collecting data from loose sand bed and forest cover along the river; grazing and cutting areas will be quantified from areas dominated with thatch, dung density, cattle abundance and distance to nearest village. During this project, field experiments will be undertaken to test whether grass cutting and fires can be used as tools to manage hog deer and grasslands. To quantify habitat degradation, incidences of fire, weed density, woodland encroachment by recruitment class, seedling density and sapling density will be used. Data on all these aspects together will be used to develop Habitat Suitability Index (HSI) models for hog deer. The HSI model will be integrated with the spatial database in the GIS domain. Separate spatial layers will be created for each variable. These layers will then be overlaid, and analyzed to further develop the HSI models.

At the end of this phase the project will provide information about:

The present status and range of hog deer

The habitat requirements and ecology of hog deer

How and to what extent hog deer may be competing with other sympatric species

Whether various sources of disturbances can be used as management tools for the hog deer and grasslands of the terai region.

STATUS OF SWAMP DEER IN HASTINAPUR WILDLIFE SANCTUARY, UTTAR PRADESH, INDIA

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The swamp deer or Barasingha (*Cervus duvaucelli*), with four distinct subspecies, once inhabited swampy areas in India, Pakistan, Nepal and Thailand. It is now extinct in Pakistan and Thailand. The remaining populations surviving in India and Nepal are highly threatened. Considering the hunting records of the century and studies conducted by a few conservationists, it is clear that both the distribution range and the number of swamp deer have declined considerably.

The major factors responsible for the decline of swamp deer in India are the loss of habitat and poaching. The common belief among wildlife conservationists is that the last stronghold of *C. d. duvaucelli* in Uttar Pradesh is Dudhwa National Park and its adjoining Kishanpur and Katerniaghat wildlife sanctuaries. However, there are areas along the Ganga that support good populations of swamp deer but are badly neglected by wildlife managers. One such area is the Hastinapur Wildlife Sanctuary where swamp deer exist but little is known about this population. The survey conducted by me during June 1995 in Hastinapur Wildlife Sanctuary was mainly aimed at investigating the status, distribution, and conservation problems of *C. d. duvaucelli*.

Hastinapur Wildlife Sanctuary encompasses an area of 2073 sq km on both banks of the Ganga river in five districts of Uttar Pradesh, namely Muzaffarnagar, Bijnor, Meerut, Ghaziabad, and Moradabad. The swamp deer is distributed throughout the swampy areas of the sanctuary. The population, however, is highly fragmented due to the interspersed cultivated areas enveloping the swamps. During the survey I identified three areas which support a considerable number of swamp deer

(fig. 1). The largest population inhabits the west bank of the Ganga barrage, in Muzaffarnagar district, and extends from village Deval to Sukkar Tal (DSS) covering an area of about 70 km² and it is probably the largest swamp area within the Sanctuary limits. According to a conservative estimate the population of swamp deer in this area is about 300 individuals. The population may be more since certain areas which were inaccessible due to the water inundation were not visited. Another area falls under Meerut district and is along the Central Gangetic Canal near Pir Nagar-Pratap Nagar village (PPS). It is about 25-30 km² in area and supports a population of about 50 individuals. The third area (JS) near Garh Mukteshwar, falls under Ghaziabad district and is about 10 km² in area. It supports a population of 30-40 individuals. Apart from these, small populations of less than 10 individuals are found at a few more places where considerable swampy areas exist. For instance, few individuals still survive in Naowala Forest Block at the eastern bank of the Ganga in Moradabad district.

Conservation and management problems

One of the major problems of the Hastinapur Wildlife Sanctuary is that most of the land belongs to individual cultivators or government agencies other than the U.P. Forest Department. According to a rough estimate, of the total sanctuary area only about 15% of the land belongs to the Forest Department, about 50% is agricultural land, and the remaining 35% belongs to agencies like U.P. Land and Revenue Department, U.P. Irrigation Department, and others. Thus, the U.P. Forest Department has virtually no control over a large area which in turn poses a problem of demarcating the management units and implementing the protection laws effectively.

Another major problem the swamp deer face is habitat loss and degradation. For example, a large and continuous swamp between Hastinapur and Garh Mukteshwar (distance 45 km) along the west bank of the Ganga is today severely fragmented and where conversion of swamps for cultivation is going

on. At one place, local people showed me a patch where 10 hectares of prime swamp land had been converted into arable farmland merely within the last four months. Considering the rate at which these swamps are converted for cultivation, it seems that in the coming few years existing swamps will completely disappear and the population of swamp deer may also become locally extinct.

The extraction of grass from the sanctuary has been banned, but the practice is still going on for commercial purposes. Grass cutting by the villagers for domestic use may not affect the habitat in a serious way but large scale extraction by the contractors is a matter of concern. For instance, the area along the Ganga barrage which supports the largest population of swamp deer within the sanctuary is under the control of the Irrigation Department, though it is a part of the sanctuary. The grasses are auctioned every year by the U.P. Irrigation Department. Hundreds of people are employed by the contractors for grass harvesting. This practice not only creates human disturbance for the swamp deer but also enhances the chances of poachers coming in. Other areas which are under the control of the Forest Department are also frequented by organized gangs of commercial grass cutters. For instance, several carts hired by unauthorized contractors were observed carrying grass loads from the sanctuary near Garh Mukteshwar.

One severe problem which needs immediate attention is the electrocution of wild animals by farmers. To guard their crops from the wild animals, the farmers put live electric wires around their crop fields. This is not only a cost-effective way of dealing with the depredation problem but also fetches some money by selling the meat of electrocuted animals in the local market. The problem of erecting live wires is severe between Garh Mukteshwar and Hastinapur. It is however not so serious a problem along the Ganga barrage where a viable population of swamp deer exist. During the survey it was reported that as many as eight swamp deer were electrocuted few months ago in a single night near Garh Mukteshwar alone. It is

Announcements

not only the swamp deer, but other species such as hog deer and Nilgai, which also fall victim to electrocution. A few human casualties have also occurred around the Garh Mukteshwar area. During crop season night movements are almost impossible even for the local villagers due to the electric wires. There is a total lack of coordination between forest officials and the State Electricity Department officials. Since these wires are erected on personal land around the crop fields, forest officials face difficulty in dealing with such cases legally. There seems to be no action from the officials of the Electricity Department to punish those who illegally put live wires on the ground, endangering not only wildlife but also the human public.

Once perennial, now the swamps, get dry during the summer as the water is drained to the crops by the farmers. This in turn provides an opportunity to the grazer to set fires for an early flush of new shoots during the summer. According to one estimate, every year about 10% of the existing swamp areas get burnt. Repeated fires can change the ecology of these grasslands as it encourages the establishment of fire resistant species. The fires completely destroy the populations of micro fauna, insects, and other ground dwelling vertebrates thus reducing the biodiversity of the grasslands. The mortality of large mammals such as swamp deer or hog deer also cannot be ruled out. Following the fires, visibility in the area is greatly enhanced and a new flush of grasses attracts animals for grazing which in turn becomes an easy target for poachers.

The presence of a viable population of swamp deer and the nature and extent of conservation problems in Hastinapur Wildlife Sanctuary calls for more management input, without which the survival of the swamp deer will be in jeopardy.

Population Survey Techniques Workshop for South American Deer

A workshop on population survey techniques is being held from November 1st to the 15th, on the Nhumirim and Rio Negro ranches in the Pantanal region of Brazil. The purpose is to train South American field biologists in the survey and census techniques that will help implement the first phases of the DSG Action Plan. The instructors for the course will be: Dr. William McShea (Smithsonian Institution, USA), Dr. Susana Gonzalez (DSG Latin America Coordinator, Montevideo, Uruguay), Walfrido Moraes Tomas (EMBRAPA - Recursos Geneticos) and Dr. Guilermo Mirando Mourao (EMBRAPA - Pantanal). The coordinator and primary contact for the course is Mr. Tomas. He can be reached at (061) 348-4646 or tomasw@cenargen.embrapa.br

New Book: Ecology and Management of the North America Moose

A new book is available entitled *Ecology and Management of the North America Moose* (Smithsonian Institution Press, 1998). The hardbound book is 733 pages, including an extensive index and references. For more information about this publication, please contact the Smithsonian Institution Press directly. Their address is: P.O. Box 960, Herndon, VA 20172-0960. The telephone numbers are: (800) 782-4612 or (703) 661-1599. The fax number is: (703) 661-1501.

Sika Deer Monograph

Dale McCullough obtained a small grant from the Safari Club International to translate into English – and to publish in both Russian and English – a monograph about the status and biology of the sika deer in Far East Russia. The reference is L. Makovkin, 1998, *The Sika Deer of Lazovsky Reserve and Surrounding Areas of the Russian Far East*. It is a 126 page hard cover book. A couple of copies of the Russian version are available now, and the English translation is complete and should be available by next summer. People wanting to obtain a copy should send a self-addressed mailing label and a check or money order for US\$5.00 to cover shipping and handling (sorry, no purchase orders, credit cards, or foreign currency) to Dale R. McCullough, ES-ESPM, 151 Hilgard Hall, Univ. California, Berkeley, CA 94720-3110.

Pampas Deer Survey in Paraná State, Brazil

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Pampas deer's original distribution was between 5° and 41° S, in open areas such as natural grasslands, pampas and cerrado. In fact, it is considered an endangered species primarily due to the loss of natural habitat and poaching.

In the past few decades, natural Brazilian grasslands and cerrado have been transformed by human activity. In Paraná State (southern Brazil) these areas are converted to large crops, to cattle, and to other agricultural crops, especially soy beans.

The main objective of this project has been identifying, in a period of one year, the occurrences of residual pampas deer populations in this state, and correlating them with the vegetation cover.

To develop a species conservation program, it is necessary to know the areas in which the animals occur, and the population situation. This work is the first step to obtaining basic knowledge about the pampas deer's actual situation in Paraná State.

The initial information gathered in this study will be useful in designing guidelines to develop a conservation management program for species conservation in southern Brazil.

Demographic and Genetic Dynamics of Pampas Deer Populations in Uruguay

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Conservation of endangered species in Uruguay is a challenge because it is necessary to deal with the lack of protected areas status. In spite of the fact that pampas deer has been declared a "Natural Monument", the declaration does nothing to take care of habitat protection. There are two wild populations of pampas deer, both located on private cattle ranches. To establish a conservation program for them, it is necessary to integrate the landowners' interests with the management goals.

The population located in the north of the country, in El Tapado, is in the department of Salto between 31° 48' 55" S; 56° 33' 30" W to 31° 44' 65" S; 56° 45' 20" W. This population is distributed among several private ranches.

The other population is located in the eastern part of the country, in the department of Rocha (33°50'01"S; 54° 01' 34"W) also on private ranch land.

With the purpose of obtaining information to create guidelines for a conservation program in Uruguay, a comparative demographic and genetic study is being developed for the two isolated pampas deer populations that remain in the country.

Demographic data

To obtain the demographic data, car censuses were con-

ducted at least once in each season for both populations.

The data recorded during one year of survey is illustrated in Fig. 1 and 2. In the case of El Tapado, counts were conducted only in the 1000 ha "La Invernada" enclosure, for one season. In this population we detected a decline trend since winter (June) for the males and juveniles. Also we have recorded male and female dispersal in the El Tapado population, but for a complete survey we consider it necessary to put radio collars on some individuals.

Total counts recorded in 1998 and February 1999 in "La Invernada" enclosure from El Tapado differentiated by sex and age.

The counts at Los Ajos were recorded in five enclosures of approximately 1800 ha used by the pampas deer. In Los Ajos' case, it is difficult to establish a trend because the observed variation is related to the differential use

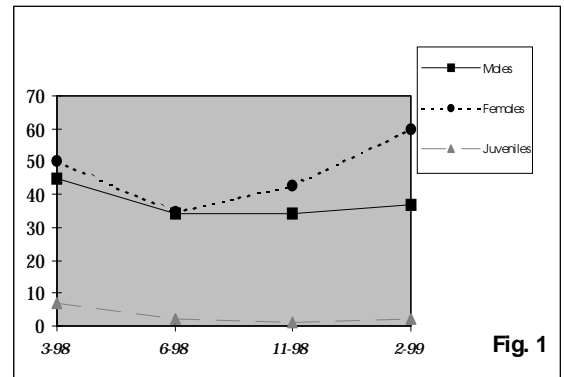


Fig. 1
 Total counts recorded in 1998 and February 1999 in "La Invernada" enclosure from El Tapado differentiated by sex and age.

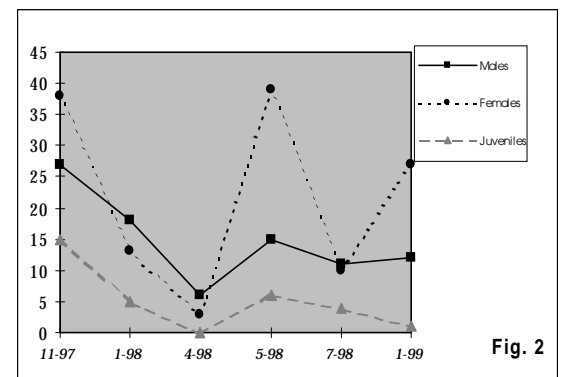


Fig. 2
 Total counts recorded from November 1997 to January 1999 in Los Ajos differentiated by sex and age.

of the enclosures by the deer. In this ranch, agropecuaria activity: cattle load and the rice crops influence the differential use of the land by the deer.

Habitat use

Besides the number of pampas deer in each enclosure, we also recorded the number of individuals of other species, like *Rhea americana* and cattle. Moreover we are also recorded the vegetation type and crops.

A study to determine the diet is being carried out on the Los Ajos population. Plant species are being collected on a seasonal basis, and used to create a micro-histological reference collection and herbarium. Four transects were established, and sample plots from each are being extracted to analyze the percentage of each plant species' cover.

Feces are being collected to be analyzed for microhistological diet determination, as well as other analyses related to the use of habitat resources.

By the second year of this study, these data analyses will provide information about the habitat use, and also correlations with the demographic trends.

Genetic data

In order to deduce genetic units for conservation (Moritz 1995) and to better understand the effect of habitat fragmentation on gene flow and genetic variation, we conducted a molecular genetic study of the Pampas deer based on samples from throughout their geographic range (González *et al.*, 1998). To determine levels of genetic differentiation among isolated populations, we examined DNA sequence from the mitochondrial control region of 54 individuals from six localities (Emas, Pantanal, El Tapado, Los Ajos, San Luis and Bahía Samborombón). The control region is a hypervariable, non-coding segment of the mitochondrial genome that is often used in studies of genetic population structure (Avise 1992). These data represent the first molecular systematic study of Pampas deer, and although sample sizes are limited, our results suggest that mitochondrial control region sequence variability in this species is remarkably high, reflecting large his-

toric population sizes. Pampas deer populations are significantly differentiated with respect to control region sequences.

By the end of the second year, we hope to obtain the demographic population trends, as well as to characterize the main plant species in the pampas deer's diet. With this information we would establish guidelines with the landowners for the management and conservation of the pampas deer in private lands.

This study is being funded by Comisión Sectorial de Investigación Científica (CSIC) de la Universidad de la República del Uruguay and PEDECIBA. We want to thank Dr. Horacio Cardoso for critical discussion of this study, Mr. Clemente Olivera for driving to the field sites and the landowners Mr. Carlos Arrarte, Mr. José Pedro Castro and Mr. Guillermo Constantín.

Feeding Behavior of the Pampas Deer: A Grazer or a Browser?

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The genus *Ozotocerus* is considered the lesser known of the South America deer (Redford, 1987). The pampas deer's (*Ozotoceros bezoarticus*, L. 1758) diet was studied in the Argentine pampas (Jackson and Giulietti, 1988; Merino, 1993), but no studies were conducted in Brazil. The pampas deer feeds mainly on grass, but eats also dicotyledonean herbs (Jackson and Giulietti, 1988; Merino 1993). Despite the fact that pampas deer are selectors, ingesting mainly buds and new leaves (Jackson and Giulietti, 1988), studies about ungulate

diet consider it a grazer, due to the large amount of grass it consumes (Bodmer, 1990; Putman, 1988).

This study aims to determine the diet and feeding behaviour of the pampas deer in an area of Brazilian cerrado, comparing the proportion of different items consumed to their availability in the environment. The goal is to examine whether the diet of the Brazilian pampas deer supports the assertion that this species is a grazer.

This study was conducted in Emas National Park (ENP), the largest federal conservation unit in the Cerrado biome (131,868 ha) situated in the west of the Goiás state, central Brazil (18° 15' 50" S; 52° 53' 33" W). The Cerrado is savanna-like vegetation, covering approximately 1.5 million km² in the Central Brazilian Plateau. This comprises a mosaic of distinct physiognomies ranging from open grasslands to dense xeromorphic savanna, dry forests and gallery forests. All Cerrado physiognomic vegetation types are represented in ENP, but open grasslands and grassland with scattered trees correspond to 60% of the park area (Redford, 1987).

To estimate food availability, we collected monthly vegetation samples, in randomly selected parcels and transects. From each parcel we quantify the new leaves, buds and young plants of three categories of plants: grass, herbs and shrubs; from the transects we quantify the flowers. We observed feeding pampas deer to determine the food preferences. For each record of consumption (ingestion) we noted the type (herb, grass or shrub) and the part of the plant eaten (leaf, flower, fruit).

Grass was the most abundant category in the availability sampling, followed by herbs and shrubs. Flowers were responsible for a small proportion of the total available throughout the study period. On the other hand, herbs were the main category eaten, followed by flowers, shrubs (including palms) and grass. Despite the variety of items eaten, deer mostly fed on the soft, juicy and apparently most digestible parts of a plant, such new leaves, buds and flowers.

The pampas deer prefer flowers and new dicotyledonean leaves and avoid grass leaves ($\chi^2 = 27195.93$; $df = 3$; $p < 0.005$). Flowers, which correspond to one third of the items ingested but represent less than 0.5% of the food resources biomass available, are more available between September and February (Rodrigues, 1996), but even in periods of low availability are intensively consumed. Although grass was the item most consumed by pampas deer in Argentina (Jackson and Giulietti, 1988; Merino, 1993), it was rarely eaten at Emas in spite of its high availability. The pampas deer in ENP present a behavior characteristic of browsers in the grazer-browser continuum proposed by Bodmer (1990), primarily eating herbs and searching for the most nutritious parts to ingest.

Acknowledgments:

We thank Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis - IBAMA, for the authorization to conduct research in ENP and for their support. We give thanks to the World Wildlife Fund - WWF/Brazil and to Fundação O Boticário de Proteção à Natureza - FBNP for the financial support of the project.

Differentiated Management of Wildlife: Indians and Deer

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Conservation of deer populations in indigenous reservations should not be underestimated for dealing with hunted populations. In Brazil the land area of indigenous reserves is three times the size of federal Conservation Units. Many Indians, however, have lost size in their territory, or suffered degradation or deforestation of their natural hunting grounds.

Since the early 1990s, a diagnosis on the sustainability of game management was done in the indigenous Xavante reserve Rio das Mortes, in the state of Mato Grosso, Brazil. The analysis was

supported by WWF Brazil and the New York Wildlife Conservation Society. In this area of 329,000 ha, composed 90% of cerrado habitats, and 10% of transition-zone of the Amazonian biome, live four species of deer: marsh deer, Pampas deer (*Ozotoceros bezoarticus*), red brocket deer (*Mazama americana*) and gray brocket deer (*Mazama gouazoubira*). All species are hunted by the Xavante Indians. During the last decades the hunting intensity was extremely high and local populations were close to extinction, especially Marsh and Pampas deer.

During a three-year study period, a mean of 25 individuals of marsh deer were harvested per year and almost 50 Pampas deer; the yearly kill of the red and gray brocket was respectively 6 and 4 individuals. Due to the size of the area and the extreme shy behavior of the deer, no estimation of the population was feasible. General direct counting is counter-productive for indigenous hunters. According to the Indians, the hunting success was declining. As census data would be complicated and biased, other parameters were sought to determine the status of the vulnerable species, such as age-structure, sex-ratio and the proportion of juveniles in the hunting bag.

Although there is absolutely no selective hunting, either for Pampas or Marsh deer, the age structure for both species was not normally distributed. The population lacked the oldest age classes, indicating a diminishing flux of sub-adults to the reproductive age groups. This imbalance in the age structure was explained to the Indians in a simplified manner, and compared with a stress period suffered by the Indians around 20 - 30 years ago. Consequently, the problem came to be well understood by the indigenous community.

The sex-ratio – especially for Pampas deer – was extreme in 1991, going to 1:4.7 in the clearly over-hunted area close to the village. Also in 1993 Pampas deer had 2.2 females to one male. For the most part, the hunting zones in 1993 were the same as those of 1991, suggesting that the hunting ban for 18 months had improved the Pampas deer

population. The proportions for the marsh deer were much less extreme and only showed a proportion of 2.3 females for each male in 1991.

The percentage of juvenile Pampas deer of less than 18 months old was 67% and 54% in 1991 and 1992, while that of the Marsh deer was 50% in 1992. This indicates an increased reproduction in those years, a consequence of the extreme hunting pressure in the near past.

The impact of hunting on the deer populations was explained to all hunters. Nevertheless, they did not accept western limits to diminish hunting, such as the hunting period, selective hunting on one of the sexes or a hunting ban for certain species. Culturally, these limitations would not fit into their customs. Finally the hunters indicated three large refuges, one known as a favorite habitat for Marsh deer and one other with large open and half-open habitats favorite for Pampas deer.

The indication of the refuges by the Indians themselves, combined with their old traditional knowledge on these species, increases the chances for serious management for the threatened deer species without the need for fiscalization by governmental agencies.

This study shows that, with relatively simple data on hunted populations, one is able to detect problems with certain populations, and the local Indians are able to indicate the best reproduction areas for the species in terms of their refuges. Biological explanation shown from the view of the community and incorporating traditional and secret internal knowledge, can be the guarantee that a management plan will be implanted and respected by the indigenous Indian populations.

Gray Brocket Deer (*Mazama gouazoubira*) in the Brazilian Savanne

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A study of Gray Brocket deer (*Mazama gouazoubira*) between 1989 and 1990 in the Ecological Reserva of IBGE in the Cerrado of central Brazil, showed that this species is abundant in all habitat types in the Brazilian savanna, and some alternate habitats. This species seems to be a generalist in their selected habitat, more so than the two other deer species which occur in this region, the Pampas deer (*Ozotoceros bezoarticus*) and the red brocket deer (*Mazama americana*). (L. Resende & F. Leeuwenberg, 1992).

Between September and December 1990 an adult female deer was radio-tagged. Monthly home ranges varied between 28.4 – 41.9 hectares, a total of 96.9 hectares during 4 months. 24 hour triangulation showed that the major activities occur from 5:00 AM to 10:00 AM, and from 5:00 PM and 10:00 PM (N=88). (Cabral, 1991). The daily range varied between 0.3 km² and 0.1 km². (Cabral, 1991; L. Resende & F. Leeuwenberg, 1992). All habitat types were utilized, with some preference in the late dry season for areas with anthropogenic influence, and always close to the gallery forest. Cabral (1991) distinguished the habitat use by one individual as follows; 59% cerrado, 30% abandoned small farms, 7% marshy grasslands, and 4% gallery forest. By the observation of fawns (N=5) during 30 months, it was possible to suggest that the main reproduction period occurs during the late wet season, January to May (L. Resende & F. Leeuwenberg, 1992).

The study also suggests that the Gray Brocket deer is the least threatened deer species in Brazil, as this species adapts easily to anthropogenic influences, and is hardly hunted by Indians or local inhabitants. The density varied between 0.67 and 0.81 individuals per 100 ha. (F. Leeuwenberg & L. Resende, 1994).

Population and Habitat Viability Analysis of Taruka, *Hippocamelus antisensis*, in the South- ern Andes of Peru

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This study analyzes the probabilities of survival for a population of tarukas *Hippocamelus antisensis* in the Aymara-Lupaca Reserved Zone (ALRZ), located in the southern Andes of Peru. Data gathered in the field and the computer-based simulation program *Vortex* were used to evaluate taruka's survival probabilities.

A total of 900 km² of the northern part of the ALRZ were evaluated. The altitudinal range of the taruka groups (and tracks) was from 4,000 to 4,850 meters above sea level. The habitat was analyzed using multivariate statistical techniques with 2062 vegetation plots to help determine different habitat types. Taruka seemed to favor areas with rocky outcrops and higher amount of forbs. Seven of the eight habitat types included vegetation plots that were located in both areas used and not used by taruka. These results might indicate that taruka was not using the entire available habitat, and that it might be displaced by livestock.

Tarukas were found to be separated into five units that included from 6 to 25 individuals and were using a total of 63.8 km². Movements between these units could be seasonal, thus, unperceived during this dry-season study. A total of 63 taruka individuals were identified as adults, juveniles, and fawns using direct observation and identification of tracks. The average group size of taruka in this study (3.8 ± 0.57 individuals; range: 1 to 11) was lower than in studies in nearby areas (6.4 ± 0.36 and 6.8 ± 1.58 individuals). The explanation might be due to larger human and livestock populations. The fawn/female ratio between June and November (0.31) was similar to other taruka studies on similar dates.

The population viability analysis showed that this taruka population exhibited high sensitivity to changes in first-year mortality, immigration, and fragmentation of the population. Taruka population size and survival probabilities, however, did not exhibit sensitivity to changes in the carrying capacity of the area or to changes in environmental variation.

Although the results of this study are open to alternative interpretation, the conservation and management of taruka in the Aymara-Lupaca Reserved Zone should be oriented towards the findings of the viability analysis. Population and habitat viability analysis appears to be a cost-effective tool in identifying the factors that affect the survival of vulnerable species.

Project Corzuelas (Brocket deer) (*Mazama spp*)

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Since 1991, the PROJECT CORZUELAS has been running in the Horco Molle Experimental Reservation (Universidad Nacional de Tucumán). The general objective of the project is the study of the natural history of *Mazama* spp, its management possibilities, and uses. Up to now, the results have been shown in 12 publications where we developed, in different degrees, the following topics: In *M. gouazoubira*: Diet in Premontane Forest and chaco forest (trophic spectrum, frugivory, seasonal variations, foraging behaviour); evaluation of the regional hunting activity and human use; predation; vigilance, agonistic, territorial, outlet and social behavior; interspecific relations; reproduction and breeding care; activity rhythms and habitat use. Recently an evaluation of the status of *M. americana* has been started in the Northwest of Argentina. The project trains personnel with grade and post - graduate courses (more than 80 assistant to the present). It also trains investigators in an internships program. Finally the Project Corzuelas carried out educational campaigns that include an average of 24.000 peoples a year.

New Project in Ibera Wetlands

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A major study on the Ibera marshlands in northern Argentina is underway with the participation of several European and Latin American universities. The studies relate to the investigation of climate, flora and fauna of this peculiar ecosystem, the second largest wetland of South America. Since the Ibera marshlands are the stronghold of the marsh deer in Argentina, a long term investigation is being carried out by Dr. Marcelo D. Beccaceci, a member of the IUCN-Veterinary Specialist Group.