

IUCN/SSC

ASIAN WILD CATTLE SPECIALIST GROUP newsletter



Number 2

Spring 1989



INTERNATIONAL UNION
FOR CONSERVATION OF NATURE
AND NATURAL RESOURCES
SPECIES SURVIVAL COMMISSION



WWF World Wide Fund
For Nature

Produced with the assistance of
World Wide Fund for Nature

FROM THE EDITORS

In this issue, we draw your attention to our feature article on the little known bovid, the tamaraw of the Philippines. It chronicles the decline and fall of the tamaraw and the efforts of the conservationists in the Philippines and the Government itself in coming to its rescue. It has all the markings of becoming a success story, if the tamaraw can increase its range and numbers under careful protection. As such, the project would benefit much by visits of some experts who could give some useful guidelines and information on management of the tamaraw both *in situ* as well as *ex situ*.

As Dr Petocz writes, the ultimate goal of the project is motivated by a combination of conservation and economics. The project plans to sell captive, tame tamaraws to zoos abroad in order to expand the captive breeding programme to a wider area. This will no doubt delight the zoos in the west where technology for breeding endangered species is available and is being developed further to make such programmes successful. Any captive breeding programme must aim at accumulating a reservoir of material which is then available for either exchange or sale purposes or for reintroduction into the wild. If the zoos abroad can establish a large enough captive population of tamaraw for breeding and exchange, then it would reduce substantially the pressure to capture any more new tamaraw in the wild. The decline of the tamaraw in the Philippines was brought about through a wanton neglect of its habitat and a callous disregard to its vulnerability to over hunting. The future threat to the tamaraw is likely to come from the competition for land, especially in the lowland areas from ranchers determined to raise cattle.

The captive breeding programme is in fact an insurance policy, a kind of last ditch effort to save

the species from becoming extinct. It is clear that had no timely action been taken by the Filipino authorities, the tamaraw would certainly have become extinct in the wild. Legal protection alone can never save the species, once its habitat is lost. So, while there are efforts to maintain the tamaraw in captivity, as a breeding stock in the zoo, there must also be a serious parallel effort to rehabilitate and protect possible re-introduction sites now while there is still time. Accordingly, as Warland (1975) recommended (in a paper entitled: A cautionary note on breeding endangered species in captivity. In: *Breeding Endangered Species in Captivity*, ed. R.D. Martin, Academic Press, London), "captive breeding itself is only one part of a larger operation of capture, breeding and return to the wild, and so it is therefore incomplete without the third element". We therefore stress the need to rehabilitate the tamaraw's natural habitat both ecologically as well as politically.

Vo Quy and Charles Santiapillai

FEATURE ARTICLE

STATUS OF THE TAMARAW

(*Bubalus mindorensis*)

by Dr Ronald Petocz

With the formation of the new IUCN/SSC Asian Wild Cattle Specialist Group, it is appropriate to give some exposure to what appears to be a little known, but major conservation initiative in the Philippines to protect and propagate the endangered tamaraw (*Bubalus mindorensis*). This effort which began in 1979 with funding from the Philippine government has so far received little international recognition. Despite many setbacks, a conservation success story is beginning to unfold in the Philippines from which much can be learned and perhaps applied in the fight to save the Kouprey (*Bos sauveli*) in Indochina. The

programme here has furthermore reached a stage where expertise and information from the new SSC group should be shared with Filipino colleagues to help perfect and implement artificial propagation of tamaraw, an important aspect which is now being addressed in this phase of their programme.

History and background

In 1900, the endemic tamaraw population of Mindoro Island was estimated at some 10,000 animals. Twenty years later, two protected areas were established for the tamaraw by the American colonial administration: the F.B. Harrison and Calavite reserves at the northwest and southwest tips of the island. For years, these reserves were to have inconsequential effects for conservation of the species, as there was but limited protection for the animals in the field. As population numbers continued to drop dramatically, Commonwealth Act Number 73 was enacted in 1936 which prohibited all further hunting of tamaraw. But by 1949, habitat destruction and poaching had reduced tamaraw numbers to an estimated 1000 animals. The government then proposed a further survey in the Iglit Forest Reserve which produced the alarming news announced in 1953 that the tamaraw population had dipped to an estimated 244 animals. In 1961, Filipino biologists Rabor, Manuel and Alvarez reported that the tamaraw were indeed nearing extinction. This prompted the government to establish another reserve for the tamaraw in a 9000 hectare area around Mt. Iglit, called the Iglit Game Refuge. In 1962, Alcasid reported the critical status of tamaraw to IUCN, which was subsequently classified an endangered species in 1965. In 1970, the Mt. Iglit reserve was expanded by Republic Act 6148 to the present Iglit-Baco reserve which now covers approximately 75,000 hectares. In the 1970s, the American Aviator Charles Lindberg assisted Filipino conservationists to promote conservation of both the tamaraw and the Monkey-eating Eagle (now called the Philippine Eagle, *Pithecophaga jefferyi*), but by 1975, the remaining tamaraw population had dropped to an estimated all time low of 120 animals. Executive order number 544 established the Presidential Committee for the

Conservation of the Tamaraw (PCCT) which received an independent budget and initiated a task force to make an all out effort to save the threatened species.

The Mta. Iglit-Baco reserve was upgraded to national park status and currently spans the central northwest-southeast divide of Mindoro island, encompassing an area of some 75,445 hectares within an altitudinal spectrum of 400-2488 m. Mt. Baco dominates the terrain which includes some areas of mixed dipterocarp forest and mossy forest above 1500 m.a.s.l. However, most of the vegetation in the reserve is fire-maintained secondary savanna with *Imperata cylindrica* and *Saccharum spontaneum* in dense stands. In 1982, the park was declared an ASEAN Heritage Site.

The region is inhabited by Mangyan hilltribes who repeatedly burn large parts of the park lands annually for *kaingin* (shifting cultivation). Pasture leases within and adjacent to the park likewise burn the area to provide grazing lands for their numerous herds of cattle. Because of this extensive annual burning, very little of the cleared lands can ever return to a natural condition. Ranching and uncontrolled hunting activities have contributed substantially to the decline of the tamaraw. In 1982, after intensifying tamaraw protection measures, the PCCT reported that the entire wild tamaraw population stood at about 250 animals, more than double the estimate of 1975.

Conservation Activities

After the launching of the PCCT and the Tamaraw Conservation Programme in July 1979, a 280 ha fenced enclosure was built to initiate a captive breeding centre at Canturoy, Rizal in Occidental Mindoro. At the present time, 13 animals are now held in captivity. In its initial stages, the PCCT project suffered from mismanagement and lack of professionalism. In fact the choice of the enclosure site by the Bureau of Forest Development and Ministry of Natural Resources was the first of many mistakes. The enclosure is composed of both flat and hilly terrain with sufficient vegetation cover but is bounded on two sides by existing cattle ranches, and by the

Busuanga River and Lapuz Creek to the northwest. It is furthermore traversed by some six creeks. Access is difficult during the rainy season as the swollen Busuanga River must be crossed to reach the enclosure. The flash floods in the many creeks crossing the enclosure have also elevated maintenance costs and caused innumerable other problems.

Since 1905, management of the Tamaraw Conservation Project has been taken over by the Conservation and Resource Management Foundation Incorporated (CRMF), under the leadership of Dr. Francisco Panol. The CRMF now receives an annual government budget of some 5.5 million pesos (about US\$ 260,000 at the current rate of exchange) to implement the programme which has two major objectives: 1) to promote and prevent extinction of the tamaraw, and 2) to develop the tamaraw and its habitat as economic resources. The project employs some 50 field staff which includes mostly non-technical personnel and 10 additional office support staff in Manila. For the present time, most efforts are focussed on the first objective which include maintenance and development of the captive gene pool and capture of additional animals, censusing of the wild population, research on mortality patterns in the wild, monitoring and protection of the wild population at Mt. Iglit, and management improvements at Mt. Calavite.

The project is also engaged in an anti-logging campaign and is actively working to protect Mt. Iglit and Mt. Calavite against illegal logging. A public awareness campaign is on-going which includes tamaraw posters, displays, and drawing contests for school children. An additional study on Mangyan livelihood development is also underway and has been initiated with population censuses.

In 1987, the CRMF population estimate of tamaraw amounted to 369 animals with the following distribution.

Mt. Calavite (Matingcaram)-45
Halcon-Eagle Pass-65

Santa Cruz-Pinagturilan-20
Iglit-Baco-Blue Mountain-145
Aruyan-Mapad Valley-41
Victoria-Bansud-Bongabong-Mansalay-40
Captive gene pool-13

The CRMF report points out that the estimate is conservative and was limited due to inaccessibility to areas under insurgency control, alteration of tamaraw movement by military and insurgent operations, and the possible influence of logging operations at Halcon-Victoria on tamaraw movements.

Current composition of captive animals is as follows:-

- 2 adult females
- 3 young females (2 calved inside the enclosure)
- 1 calf (calved inside the enclosure; sex not yet determined)
- 1 young male (calved inside the enclosure)
- 5 adult bulls

Because of the size of the enclosure, neither the mating behaviour nor the four births was witnessed by the staff. An additional calf was reported to have died in 1983 when it was evidently abandoned by the mother. The project has now built a 0.75 hectare enclosure within the larger area and has succeeded in taming a young female tamaraw with its confines. They now intend to pair the tame animal with a young male which has been targeted for capture. The project now also contemplates accelerating the captive breeding programme through embryo transfer using surrogate carabao mothers, but research in this regard is proceeding slowly and cautiously.

The ultimate goal of the project is motivated by economics as well as conservation. The project intends to sell captive, tame tamaraws to zoos throughout the world to expand the captive breeding programme to the international arena. It is intended that a substantial portion of the profits will be re-invested in protection and management implementation for the wild tamaraw population in the ASEAN Heritage Site (Mts. Iglit-Baco National Park), and to develop and open up the park

to more visitors. The selling price: US\$ 100,000 per head, and reportedly some zoo buyers have already been lined up.

The accelerated captive breeding programme has only recently been initiated and would benefit substantially from an information exchange and visit of international expertise. Likewise, the initiation of a captive breeding programme for the kouprey would stand a chance to profit and learn by the experience as well as the mistakes of this endeavour in the Philippines. Dr Panol, the programme director, has already expressed a willingness and enthusiasm to cooperate and integrate the activities of the CRMF with the new IUCN/SSC Asian Wild Cattle Specialist Group and has extended an open invitation to professional visitors, particularly to our colleagues in Indochina. There is certainly every reason to welcome the Filipino conservationists of CRMF to this international forum and render assistance and encouragement for their praiseworthy efforts to save the tamaraw in what will hopefully turn out to be a conservation success story for the country. The contact address and the programme office is:

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THE WILD BUFFALO

by Raju Kane

Among the most ignored of all species under the purview of the Indian Wildlife (Preservation) Act is one of the most majestic of the wild Indian herbivores - the Wild Buffalo. Often confused with its cousin the Gaur (Indian Bison) the 1000 odd surviving wild buffaloes are the only truly wild relatives of over 25 million domestic buffaloes in South Asia. Once extant all over the riverine jungles of North-east and Central India, the buffalo is today restricted to a few patches of riverine forests in Madhya Pradesh's Bastar District and Assam.

.....Unlike the Gaur, which during its evolution was adapted to riverine as well as hilly areas, the buffalo is restricted to riverine forests and accompanying swamps. Perhaps this is the reason why the buffalo has never been recorded south of the river Godavari, while the Gaur is found extensively in peninsular India. Like most animals inhabiting the tropical forests, the buffalo grazes in the mornings or evenings, preferring to wallow in the grass or marshes during the hot hours of the day.

The breeding season is by the end of the monsoons, and the calves are born by March or April. The animals live in a herd with one bull being predominant. While no authentic records of exactly how many buffaloes existed in India by the turn of the century are available, naturalists seem to agree that at least about ten of the fifteen thousand animals once roamed the riverine jungles of Orissa, Bihar, West Bengal, Assam and Madhya Pradesh, apart from the few isolated herds in Maharashtra.

The animal's affinity to water and its inability to adapt to any other habitat was the basic reason behind the spectacularly tragic decline in its numbers. As human populations grew and man went deeper and deeper into the forests in search of that important resource - water, the buffalo was threatened. The decline was accelerated by a host of 'development projects' which were taken up since Independence, particularly by the Damodar Valley Project, the Balimela Project, the Seleru Project, the Hirakundi Project, the Kariyar Project among others which wiped out entire populations and also irreversibly altered the

ecological balance. The extensive road network which was built and which facilitated the destruction of the previously inaccessible forests was another factor responsible for the species becoming endangered.

According to the naturalist H. K. Divekar, former Executive Committee member of the Bombay Natural History Society (BNHS) who has studied the wild buffalo for over 15 years, less than 1000 wild buffaloes survive in the country, less than 100 of which can be classified of pure stock. "The problem is that most forests in the North-east where the buffalo is found are surrounded by villages with huge herds of domestic buffaloes, which are left to graze in the forests. A few of them get separated from the herds and become feral. In time these feral buffaloes inter-breed with wild buffaloes" he said.

"Even the wild buffaloes found in Sri Lanka, Burma and other parts of South Asia cannot be said to be of truly wild stock. It is only the buffaloes in the Bastaar region of Madhya Pradesh which have not inter-bred with the feral or domestic animals and thus constitute a vital gene-pool, which needs to be preserved at all costs".

In Bastaar however, the buffalo is under grave danger of being wiped out. According to the latest survey carried out in the Indravati National Park and the Bhairamgarh, Pamed and Uddanti Sanctuaries in Madhya Pradesh by Divekar and Bharat Bhushan, Conservation officer, BNHS, about 100 animals survive. The forest department has no statistics on the number of animals and whatever they have is unreliable. Only five isolated populations survive in the Bastaar and Raipur districts of the state and these are under heavy poaching pressure.

The understaffed wildlife protection personnel are unable to initiate park or sanctuary measures and police duties. The forest department is unable to effectively prevent disturbances to wildlife as well as forest felling. In fact in the Bhairamgarh Sanctuary, an area of 138.9 km², the survey team found only the superintendent present, no other staff being posted there.

Apart from poaching - especially by tribals indulging in the Paradh system of ritual hunting - and inefficient management, the other major problems identified by the survey were forest fires which destroy huge tracts of forests and encroachment by tribal people.

Divekar says, "Most of the forest in the Bastaar highlands, close to the cities has been destroyed. This has forced tribal populations to move to the hinterland thereby further threatening the buffalo." Among the recommendations made by Divekar and Bharat Bhushan are training of management personnel in wildlife aspects and appointment of tribals at the guard level in the Indravati National Park and the three sanctuaries, steps to ease the human and cattle pressures at water-bodies, fire protection and constant monitoring of green meadows, prevention of ritual hunting and extensive nature education programmes for the locals. "Unless immediate steps are taken on a war footing, the wild buffalo would be one more victim of man's senseless destruction of the planet and its resources", Divekar warns.

(Source: Indian Post, Bombay. 11 December 1988)

MANAGEMENT

REMOVING THE BUFFALO POPULATION FOR IMPROVING BANTENG NUMBERS IN BALURAN NATIONAL PARK, EAST JAVA, INDONESIA

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BOVID SOCIAL SYSTEMS: Grazers, Browsers & Body Size

by Norman Owen-Smith
University of Witwatersrand
South Africa

The main objective of the Baluran National Park (250 km²) in East Java is to protect the population of Banteng (*Bos javanicus*). According to the recent inventory it appears that the approximately 150 banteng are in competition with the 1,200 head of buffalo (*Bubalus bubalis*).

On the premise that such competition might upset the equilibrium of the two species and affect the natural ecosystem of the park, it was decided to launch a programme for the removal of a large proportion of the buffalo with the hope that such a move would reduce the pressure and enhance the conservation status of the banteng. The project was under way in 1985-1986.

The President of the Republic of Indonesia has been concerned about the plight of the banteng in Baluran and in 1985 presented the excess buffalo that were captured in the park to the people who inhabit the peripheral areas of the park for their use in farms and as draught animals. In all a total of 276 animals were distributed among the people in the neighbourhood. However, this did not reduce the pressure in the park for the banteng as a subsequent inventory made at the end of 1987 indicated that the number of buffalo in the park had reached once again 1,200 head, while the banteng numbers were still very low.

The Ministry of Forestry reported the matter to the President and it was suggested that a further 800 head of buffalo ought to be removed from Baluran National Park. The President agreed with this proposal and instructed the various Ministries such as the Ministry of Forestry, Ministry of Agriculture and the Provincial Government (East Java) to join hands in resolving the problem. The removal of 800 buffalo will be carried out within the next four years, commencing from the dry season (August-October) in 1989. The budget of 280 million rupiah (= US\$ 165,000) for this operation comes from BanPres (Bantuan Presiden) - President Aid.

The defining features of Bovid sociality are these: (i) sizes of groups formed by females, in terms of the number of reproductive females associated together, and total group membership; (ii) persistence of associations between particular individuals; (iii) association of breeding and immature males with these units; (iv) spatial relations between the ranges covered by these groups; (v) relations between male home ranges and female home ranges; (vi) male grouping patterns in terms of their size and membership; (vii) relations between spatial areas occupied by different males, taking into account their age and dominance status, and seasonal variations in relation to the reproductive cycle; (viii) referant for the organization of male dominance relations - spatial (territorial), female (harem), individual (rank hierarchy); (ix) philopatric or dispersal tendencies of pre-reproductive males and females. Social patterns may be related casually to the underlying factors, or to ultimate evolutionary mechanisms.

Among bovids the size of groups formed by females and immatures tend to increase with increasing body size. Browsers tend to form smaller groups than grazers of similar size. In some species individual associations are transient, with attachment being primarily to a shared home range. In other groups tend to be consistent in their individual membership. Distinctions need to be made between groups, including those individuals that are spatially associated at a particular time, and social units, including those individuals that are frequently associated together over a period of time. Over the course of the seasonal cycle, social units may split into sub-groups, or amalgamate temporarily with other social units.

Persistent pair bonds between males and females occur in certain small antelope, but in most species males are only transiently attached to female units. Among grazers dominant breeding males almost invariably occupy territories. Inferior males may coinhabit the territories in some species. Among browsers of the tragelaphine tribe breeding males range widely, and individual dominance relations govern mate access. Small browsers generally display territorial exclusion, whether as a male-female pair or solitarily.

Generally males disperse from their natal areas, while females tend to remain associated with their maternal group or home area, but this pattern is reversed among the Reduncini.

Socio-ecologically, these patterns can be related to (i) habitat cover, which in conjunction with body size influences predator evasion tactics; (ii) the biomass density of food resources, and seasonal variations therein, as determined by plant part selectivity; (iii) the spatial dispersion and predictability of feeding stations, influencing sedentary or nomadic tendencies. These factors determine the feeding costs and survival benefits of group associations by females.

The size, cohesion and mobility of female groups, together with the seasonality of reproduction, promotes particular association patterns of breeding males with females. The local density of breeding males, through its effect on interaction frequencies and hence risks of escalated contests, leads to particular spacing patterns among prime males. A special feature of the Tragelaphini is the marked sexual dimorphism. This is associated with delayed sexual maturity, and male mortality rates greatly exceeding those of females, resulting in a strongly female-biased sex ratio. Coupled with the generally lower population density of browsers relative to grazers of similar size, this promotes a roving rank-dominance among males, without the high time and energy costs otherwise associated with non-territorial systems.

RESEARCH NEWS

GENETICS SURVEY OF WILD CATTLE, OXEN AND BUFFALO

Bruce Read
Alan R. Templeton
Scott Davis

(The following is a shortened version of the original paper. For full details please write to: Dr Bruce Read, St. Louis Zoological Park, Forest Park, Saint Louis, Missouri 63110, USA).

The goal of this study was to make genetic comparisons among 10 species in four genera of the family Bovidae that have similar external phenotypic characteristics. These genetic comparisons were to be used to determine the evolutionary relationship of these species. The results of this survey will provide managers with information on genetic relatedness which will be useful when transferring reproductive technology from one species to another and which will provide genetic markers in this group that could be used for detecting possible cases of hybridization. We have fully achieved this goal and feel the project is a complete success.

Species and specimens examined:

In order to achieve our goal, we wanted to screen 6 to 10 individuals of each of the cattle species for genetic variation as detected by protein electrophoresis and Southern blotting of ribosomal DNA (rDNA). In addition to the 10 cattle species, we also performed these genetic screens on individuals of four other species closely related to the cattle species. The purpose of screening these additional species is to provide the "outgroup" data that are necessary to construct an evolutionary tree of the cattle species of primary interest.

The species used in this study were: *Ovis aries*, *Ovibos moschatus*, *Gazella spekei*, *Boselaphus*

tragocamelus, Syncerus caffer, Bubalus bubalis, Anoa quarlesi, Bison bison, Bison bonasus, Bos gaurus, Bos javanicus, Bos grunniens, Bos taurus and Bos indicus.

We were not able to obtain 6 individuals from all species, but in other cases, we were able to obtain much larger sample sizes. Altogether we ran our genetic screens on a total of 94 individuals. A total of 14 different institutions cooperated in this project by sending blood samples that were collected from animals when they were caught or immobilized for other reasons.

Results of Genetic Screen

Total cellular DNA was isolated from each individual, divided into aliquots and cut with 16 different restriction enzymes. The DNA was then run on agarose gels and subjected to a standard Southern blotting procedure using a cloned mouse rDNA probe. A total of 28 variable restriction endonuclease sites were detected with nine of the enzymes.

All individuals were also scored for variation at 14 protein-coding loci: glucose phosphate isomerase (GPI), superoxide dismutase (SOD), malic enzyme (ME), 6-phosphogluconate dehydrogenase (PGD), phosphoglucomutase (PGM) 1 and 2, malate dehydrogenase (MDH), aspartate amino transferase (AAT), hemoglobin A and B (Hb), acid phosphatase (ACP) 1 and 2, and lactate dehydrogenase (LDH) 1 and 2. Variability was found at 9 of these loci. The number assigned to each allele is relatively mobile, with yak chosen as an arbitrary standard and assigned a value of 100. Some species were polymorphic; i.e. they had more than one common allele.

Data analysis and conclusions

The data were analysed using the computer program PAUP (Phylogenetic Analysis Using Parsimony), which was provided by David Swifford. This program finds the pathway that interrelates the genetic states of all the present species by the fewest evolutionary steps. This pathway of relationships can be transformed into an evolu-

tionary tree if the ancestral genetic state can be inferred.

The study draws out the affinity between the African buffalo, Water buffalo and the Anoa, as these come out as a separate cluster; while another grouping consists of the American bison, Wisent, yak, domestic cow, gaur and the banteng.

BOOKS

Two hundred years of BRITISH FARM LIVESTOCK

by S. Hall & J. Clutton-Brock

Foreword by: HRH The Prince of Wales.

British Museum of Natural History. Publishing 3
March 1989

272 pp. Hardback 19.95 pounds sterling.

The end of the eighteenth century saw the human population of the British Isles increasing at a great rate and this resulted in a desperate need for improvement in the methods of food production. Inspired by pioneers such as Robert Bakewell (1725-1795) farmers began to select their animals for improved performance. Their stock was the ancient breeds that had evolved over centuries to become perfectly adapted to particular regions of the country. Hereford and Devon cattle, Leicester sheep, Berkshire pigs, and many others, received the attentions of the improvers but the breeds retained their distinctive, regional characteristics.

Today, with the emphasis of modern farming on the widespread use of a few highly specialized and productive breeds, there has been a reduction in diversity and most of the old breeds are in decline. Their loss seriously threatens our enjoyment of the countryside, and could lead to an irretrievable depletion of genetic material. By concentrating on a handful of breeds which suit present farming conditions we are failing to consider the possibility

of changing requirements in the future for which the variety of our breeds is an important investment. Our livestock industry must be able to adapt to new requirements and at the same time the old breeds must be integrated into today's farming, a process encouraged by the Rare Breeds Survival Trust.

The aim of this work has been to give a fully illustrated description of the development of more than 100 breeds of British cattle, sheep, pigs, goats, and horses over the past two centuries. The book contains over two hundred pictures, both photographs and contemporary paintings by nineteenth century and modern artists. It is produced under the aegis of the Rare Breeds Survival Trust, for the 1989 Celebration Year of British Food and Farming, and is a tribute to our fascinating and diverse livestock heritage whose preservation and development should be the concern of us all. This book will delight livestock owners, agriculturalists, biologists, conservationists, and everyone interested in farm animals and their history.

Send orders to: Publications Sales, Natural History Museum, Cromwell Road, London SW7 5BD, England, UK.

LETTERS

In the first issue (October 1988) we referred to an article on the Kouprey entitled, "Fighting for the forest ox" by Elizabeth Kernf that appeared in the *New Scientist* (30 June 1988, p. 51). Following this, there was an interesting letter written by Dr Caroline Grigson of the Royal College of Surgeons of England, London WC2, England, UK in which she provides some arguments for considering that the kouprey may not in fact be a species at all. We reproduce it fully here: -

Complex cattle

As one who has studied the craniology and relationships of cattle for many years I was delighted and relieved to learn that the forest ox, the kouprey, has survived the wars in Indochina. The kouprey is, however, not quite as unique as Elizabeth Kernf implies ("Fighting for the forest ox", 30 June, p. 51).

The suggestion that the kouprey might in the future be crossed with domestic cattle is curious. There are, or perhaps were, many domestic cattle in the area that have characters of both domestic humped ox and the kouprey, some being closer to one and some to the other. These are the "Boeufs des Stiengs" and some of their skulls are preserved in the comparative anatomy collection of the natural history museum in Paris. The Stieng are the local people of the area.

Although many taxonomists would agree that all cattle should be included in the genus *Bos*, it is not true to say that Harold Coolidge referred to the kouprey as *Bos sauveli*. He was so convinced of its separate identity that he named it as *Novibos sauveli*. The original description by A. Urbain names it as *Bibos sauveli*, thus underlining its anatomical similarity and close relationship to the wild ox of the area, the banteng (*Bos javanicus*). Like the Boeufs des Stiengs, the kouprey has characters that connect it to more than one species: many of those relate to cattle of the bibovine type, that is to the banteng; others relate it to the bovine type, that is to *Bos nomadicus* (the extinct wild ox of India) and its descendant, the domestic humped ox or zebu of India and Southeast Asia.

Colin Groves believes that the kouprey forms the last surviving population of the species, or species complex, that gave rise to the zebu, lying at the eastern end of a cline from *Bos primigenius* in Europe to *Bos nomadicus* in India.

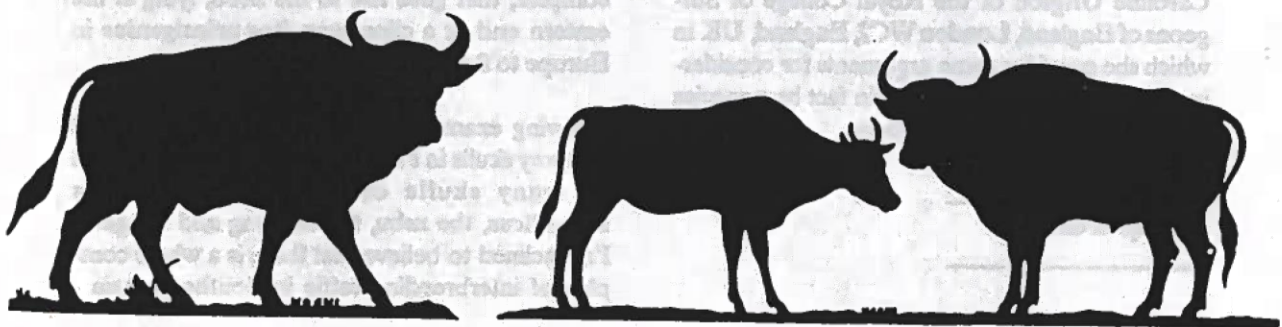
Having examined the Boeufs des Stiengs and kouprey skulls in Paris and from Harvard, as well as many skulls of *Bos primigenius*, *Bos nomadicus*, the zebu, the banteng and the gaur, I'm inclined to believe that there is a whole complex of interbreeding cattle in Southeast Asia -

banteng, zebu, Boeufs des Stiengs - of which the kouprey is one. There are good grounds therefore for considering that the kouprey may not in fact be a species at all.

This in no way detracts from its zoological importance but it does mean that the animal should be considered, studied and above all preserved, not as a unique species, but as a population within a larger complex of cattle taxa.

Caroline Grigson.

Cover photo: a young female tamaraw "Blaisa" wallows in artificial pond inside experimental breeding enclosure at Canturoy, Rizal, Occidental Mindoro. Photo: kind courtesy of Dr Ron Petocz.



of breeding requirements. The kouprey is a...
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The aim of this work has been to give a fully...
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Please send your articles to:

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