

ENDANGERED SPECIES

Technical Bulletin Reprint

Wildland Management Center
School of Natural Resources
The University of Michigan

Studbooks — Phase One in Captive Management

by Dr. Alan H. Shoemaker

Sometime in the sixth millenium B.C., man domesticated wild cattle, *Bos taurus*, selecting certain individuals for desirable traits like strength and tractability. Much later, traits for increased milk or meat production, tolerance to heat, and increased growth rate would be enhanced, again by selecting certain individuals over others. In the meantime, this species vanished from the wild in 1627 A.D.

The domestic dog, *Canis familiaris*, came into being at an early age, again passing through a program of selection away from its wild ancestor, the Wolf, *Canis lupus*. The horse, *Equus caballus*, was also selected from wild ancestors.

In captivity, wild animals are not intentionally bred toward an ultimate goal of domestication or "improvement" upon nature's evolutionary scheme, but this strategic propagation does have one thing in common with domestic forms — both are managed through the use of accurate record keeping systems. Wild animals maintained in captivity are not considered domesticated, although behaviorially many are perhaps better suited to a life after several generations in captivity than a similar specimen taken recently from the wild. True domestication requires hundreds of years for completion. The last animal to be developed was the domestic rabbit, a species selected by French monks from the European hare, *Lepus capensis*, during the 1500's.

Horses have enjoyed a close relationship with man since biblical times and it seems only natural for the precursor of domestic forms, the Przewalski or Asian wild horses, *Equus*

caballus przewalskii, to be one of the first wild animals managed with studbooks. Unfortunately, early specimens, captured in Mongolia in 1899-1901, were not well managed. In 1927, a domestic pony in the Halle Zoo was bred with one of these wild horses. Its heirs were subsequently distributed throughout many collections and today this species' gene pool is based upon this domestic form as well as 11 wild individuals.

In order to rectify this mistake and insure that it would never happen again, an international studbook was established in 1959 by Erna Mohr. Since 1961, it has been maintained by Jiri Volf, Assistant Director of the Prague Zoo. The most recent edition,

published in 1985, provides pedigree data on 522 animals alive on 1/1/84, a 10% increase over the preceding year.

Another large ungulate, the European bison or Wisent, *Bison bonasus*, has been managed with the assistance of a studbook since 1924 in order to trace its pedigree. By 1921 and 1930, the two recognized subspecies from northern Europe and the Caucasus, respectively, were extinct in nature; today's wild populations were developed from a captive herd of 56 animals held in captivity at that time. The first complete pedigree was published in 1932 and it has appeared fairly regularly since then.

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Although widely used by the livestock industry, studbook keeping was an alien management tool to zoos until recently.

Photo by Alan H. Shoemaker

Studbooks continued

In the case of the Wisent, a problem appeared in the captive population which caused a dramatic increase in the number of stillbirths and infant mortalities. Only through the use of the studbook was the culprit identified. It turned out that a young male Wisent was captured in the Caucasus and introduced to captive herds derived from Poland and Byelorussia. This young bull carried at least seven lethal genes and to insure preservation of the species, many of his offspring had to be destroyed.

By the mid-1960's, it was becoming increasingly obvious to many members of the international zoo community that a number of species were on the verge of extinction. Many species, such as the tiger, *Panthera tigris*, were common in zoos but required continual replacement from the wild in order to meet exhibition demands. Such a cavalier attitude had to change.

Under the guidance of IUCN and IUDZG, prototype studbooks for 14 high profile species were begun by 1968, patterned largely after pedigrees kept for domestic animals. In this fashion, a studbook for the Siberian tiger, *P. t. altaica*, was initiated by the Prague Zoo. Since 1973, it has been maintained by Siegfried Seifert, Director of the Leipzig Zoo. From an initial nucleus of approximately 18 animals, there are now far more of these rare felids in zoos of Europe and North America than remain in the wilds of Northern Asia.

It may seem odd that management tools as vital to animal welfare as record keeping and studbooks would be so alien to the zoo community given the widespread use of these practices by the livestock industry. Zoological parks, on the other hand, traditionally obtained replacement animals from the wild and even as late as the late 1960's, some zoos continued to depend on direct importations for stocking many of their new exhibits. Today there has been a complete reversal in this line of thinking.

In recent years a more insidious problem has been recognized in some "zoo" animals. Inbreeding began to appear, at times caused by a scarcity of suitable mates, but more often from a lack of appreciation of its deleterious effects. Frequently it expressed itself in the form of increased mortality in young, skeletal deformities, and early death. It should have been obvious that brother-sister or sibling matings were going to create problems at some point. Detailed experiments begun in 1898 by the Ashaniya-Nova Zoo on the domestication of the Eland, *Tragelaphus oryx*, demonstrated that young from closely related sires and dams, all descended from only two original pairs of wild eland, experienced genetically linked problems. Offspring were born with a rickets-like disease and skeletal deformities, problems which were only temporarily reduced by the introduction of a new unrelated male.

Similar defects in the Przewalski's horse were also noted by Jan and Inge Bouman in the mid-1970's. Inbred horses tended to live shorter lives, demonstrate high levels of infant mortality, and females produced fewer foals. Congenital defects also surfaced: stunting, infertility, an increased number of abortions, and hip defects. Captive animal management needed an overhaul.

Today, studbooks are maintained for over 90 species of wild animals, and encompass projects of regional as well as international scope. In this way, individual animals are identified, and their movements and planned matings traced throughout their entire lifetime. All young born in captivity to studbook-kept species, including abortions and young that do not survive, are registered, thus insuring that complete records on the background of rare animals are maintained. Some studbooks are now computerized for easier and more in-depth analysis; others, including several complex ones, are maintained entirely by hand.

International studbooks are coordinated through The Zoological Society of London. A complex project such as that for the tiger may further employ several regional representatives to assist the studbook keeper in obtain-

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A forum for information
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Initially studbooks were used to insure the purity of wild species or subspecies. Another repeat of the Przewalski's horse episode was to be avoided at all costs. In this way, tigers that are born to Siberian x Bengal parents are excluded from registration in the studbook and are beginning to disappear from zoological parks. Similar trends can be observed in other species which possess more than one subspecies: Orang utan *Pongo pygmaeus*; Leopard, *Panthera pardus*; and Asian wild ass, *Equus hemionus*, to name but a few.

Studbooks continued

ing current population information. In other instances, a species such as the Aruba Island rattlesnake, *Crotalus unicolor*, which is only maintained in North America, is managed in a regional studbook. At the present time, approximately 45 studbooks are maintained in North America, and 49 more are sponsored by European institutions. An additional four are housed in other parts of the world.

Traditionally, studbooks involved mammals because this group represented the most visible and easily bred portion of any zoological park's collection of endangered wildlife. Today over 65 mammalian species are actively managed in this fashion and dozens more are expected to be initiated within the next several years.

Today this trend is changing. Although studbooks for only 19 species of birds and 6 species of reptiles and amphibians are presently in existence, these numbers are expected to increase several times in the near future. These groups are suffering from the same pressures in the wild that mammals do, and now that techniques for their captive propagation are becoming better understood, they too can benefit from coordinated efforts by cooperating institutions otherwise separated by great distance. In the future, if any "wild" remains, these groups may also generate surplus young for restocking areas of former natural abundance, a primary goal of all captive propagation efforts.



Today, studbooks are maintained for over 90 species of wild animals.

Photo by Mike Greer, Chicago Zoological Society

Dr. Schoemaker is a zoologist from Riverbanks Zoological Park in Columbia, South Carolina. He is also an International Studbook Keeper for rare leopards.

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FUTURE MEETINGS

October 20-23. Wildlife Conservation International, a division of the New York Zoological Society, and the Rockefeller University is organizing a conference, "Conservation 2100" to be held at the Rockefeller University. The focus will be current ecological trends, the strategy of scientific research, wildlife and ecosystem management, and the political, cultural, and economic contexts in which conservation measures must be carried out. Standard Registration is \$100; student registration is \$75. For more information write: Conservation 2100, Wildlife Conservation International, New York Zoological Society, Bronx, NY 10460. Telephone: (212) 220-6879.

November 7-9. The annual meeting of the Gopher Tortoise Council, a scientific and conservation organization dedicated to the perpetuation of biological diversity in xeric habitats of the Southeastern U.S., will be held at Wekiaw Springs State Park, north of Orlando, FL. For more information contact: Ellen Nicol, Rte. 1, Box 1367, Anthony, FL 32617.

November 18-19. The Smithsonian Institution is hosting an international workshop on current marine and terrestrial research on Aldabra Atoll: an overview of scientific priorities, policy directions, and role in the international community. The purpose of the workshop is to summarize the present state of knowledge of the marine and terrestrial environments of the atoll, and to clarify research priorities for the future. It is hoped to identify the gaps in knowledge and to establish guidelines for an aggressive conservation program covering the marine turtles, terrestrial tortoises, bird populations, flora, and the management of introduced species. For further information contact: Dr. Brian Kensley, Smithsonian Institution, National Museum of Natural History, NHB 163, Washington, D.C. 20560.

GARDEN CLUB OF AMERICA SCHOLARSHIPS IN TROPICAL BOTANY

The Garden Club of America is offering two \$5,000 awards to assist with field work in the area of tropical botany. These awards will be made on a competitive basis to graduate students who will be carrying out field work in the tropics as part of their doctoral dissertation research. The awards will be made on a one-time basis, and applications are due by December 31, 1986. The winners will be announced by March 1, 1987. There is no application form, however, students must include a CV, including graduate and undergraduate transcripts; evidence of a foreign language capability; a letter stating his/her plans for the future; and a letter of recommendation from the advisor, which should include an evaluation of the student's progress to date. U.S. citizenship is not a requirement, however, students must be enrolled in a U.S. university to be eligible for this scholarship. Please mail applications to Ms. Jane MacKnight, Garden Club of America Scholarships in Tropical Botany, World Wildlife Fund, 1255 23rd Street, N.W., Washington, D.C. 20037.

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