

CAPTIVE BREEDING OF MAMMALS

Marco Masseti

Dipartimento di Biologia Animale e Genetica, Laboratori di Antropologia, Università di Firenze, Firenze, Italy

Keywords: captive breeding, domestic mammals, threatened wild mammals, zoological gardens, arks, museums.

Contents

1. Introduction
 2. Captive breeding of mammals. The domestic species.
 3. Selective breeding
 4. Captive breeding of non-domestic species as a conservation strategy.
 5. Captive breeding of threatened species
 6. Captive breeding of threatened micromammals
 7. Captive breeding and reintroduction of carnivores
 8. Case studies
 - 8.1 The Arabian Oryx Programme
 - 8.2 The Case Of The Fallow Deer
 9. Perspectives
- Bibliography
Biographical Sketch

1. Introduction

Mammals are currently among the main victims of human depredations on the environment. A huge amount of species and subspecies have disappeared to date, revealing human exploitation of natural resources as a long lasting process beginning in prehistorical periods and lasting until historical times. In the late Pleistocene, for example, the modern mammalian fauna assemblages of the Western Palaeartic Region were already defined. They would have yet comprised the totality of the species still surviving today, if some extinctions had not mainly affected large terrestrial mammals between 15.000 and 10.000 years BP, such as the mammoth (*Mammuthus primigenius* Blumenbach, 1803), the cave bear (*Ursus spelaeus* Rosenmuller & Heinroth, 1794), the woolly rhinoceros (*Coelodonta antiquitatis* Blumenbach, 1803), the giant deer (*Megaloceros giganteus* Berckhemer, 1910), and others. All these extinctions were without replacement by ecologically similar species: for large mammals - i.e. species exceeding about 40 kg mean adult body weight - it has been estimated that Europe lost approximately 7 out of 24 genera (i.e. 29%). Currently among the possible causes for these extinctions, there are only two serious contenting hypotheses: man and climate. The climatic hypothesis, however, does not explain why similar losses did not take place at previous cold stage/interglacial transitions. Human predation is thus the most probable cause of late Pleistocene extinctions at times of major climatic-environmental changes. These extinctions occurred, in fact, at the climax of the Upper Palaeolithic hunting technologies of the 'anatomically modern humans'. However, approximately 9000 years ago the human hunter-gatherers began to alter their way of life. Instead of

hunting wild animals for food they began to keep flocks and herds of livestock animals to be killed when required. This phenomenon notably took place in those parts of south-western Asia, the so called Near East, that was relatively densely populated. It was the beginning of the food-production period, a revolutionary change that laid the foundations of a new kind of civilisation, built upon settlement, agriculture and the keeping of livestock for food.

2. Captive Breeding Of Mammals. The Domestic Species

Mammals have been bred in captivity since man first domesticated wild animals. Since that time, with few exceptions, most of the effort put unto breeding mammals in captivity has been directed at the breeding of domestic mammals for food, wool, and leather. Sheep, *Ovis orientalis* Gmelin, 1774, and goats, *Capra aegagrus* Erxleben, 1777, were probably the first livestock animals that have been domesticated, followed by cattle, *Bos primigenius* Bojanus, 1827, and pigs, *Sus scrofa* L., 1758. A domestic animal is one that has been bred in captivity for purposes of economic profit to a human community that maintains complete mastery over its breeding, organization of territory, and food supply. Not all adult mammals can flourish or will breed under such drastic alterations to their natural way of life, although all young mammals can be tamed when nurtured under the right conditions. In the process of domestication, human behaviour might have differed as the circumstances suggested, moving from the basis either of the economic needs or of the biological patterns of the different species exploited. As already noted, several species of large herbivores were already of great economic importance in prehistory. Their biological patterns must have had some influence on related human behaviour. Not all of the tamed and/or semi-domestic ungulates might have been exploited in the same way, some of them being destined to breed in conditions of captivity and others in a free-ranging state, while others still could have returned to the wild after their introduction in new areas and were subsequently hunted by man as fully established wild game. As early as 1976, Jarman summarised the prehistoric relationships between man and ungulates in six main patterns, basing his classification on human economic behaviour rather than on morphological and zoological criteria as follows: random predation, controlled predation, herd following, loose herding, close herding, and factory farming. Regarding human behaviour toward tamed and/or domesticated ungulates, however, Jarman's first pattern of exploitation - random predation - was not fully appropriate, because it totally devoids aspects of "husbandry", in the sense of an effective long-term economic strategy which favours the continued existence of both partners in the relationship. There is instead sufficient archaeological evidence for the other types of "husbandry", such as factory farming, loose and close herding, and even controlled predation. According to several authors, however, domestication is more than the controlled breeding of animals in captivity. Domestic animals are controlled by man to such an extent that the choice of mates is determined. Artificial selection is therefore not only possible, but inevitable, so that domestic animals are human artefacts.

3. Selective Breeding

As already noted, one of the main effects of captive breeding on animals is the hindrance of natural selection. Selection creates a difference in reproductive rate within

a population, so that animals having certain characteristics tend to have more offspring than animals without those characteristics. The genes of the selected animals therefore tend to become more abundant in the population, and those of the less favoured animals less abundant. Artificial selection by man differs from natural selection in being usually more intense, since the question to survival is not left to chance. Moreover different kinds of characteristics are favoured. Artificial selection may also sometimes act in the opposite direction to natural selection. Domestication did not cause natural selection to cease. Weak animals still die before becoming old enough to breed. Selection by man merely supplements natural selection, which tends to become less important. Man tends to emphasise characteristics that were of no value in the wild state. Other notably protective characteristics decline in value after domestication. Artificial selection therefore differs in direction as well as in intensity. Whatever the cause, evolution became faster after domestication, so that the animals changed more, and did so in a shorter period of time than under natural selection. A young mammal if removed from its mother and its natural environment to be reared in captivity will, if it survives, adapt to its new way of life. This adaptation will include changes in its morphology and in its behaviour. Some of these changes are obvious, some are barely perceptible, but if the animal breeds in captivity they will be more marked in the next generation. The mammalian body is a much more plastic and changeable structure than might be thought, and even the skull and skeleton of a tame animal may exhibit distinct differences from that of its wild counterpart. Future generations of the tamed animal, whether these lived in the prehistoric period or at the present day, will be subjected not primarily to natural selection but to artificial selection by man for characters that may be favoured for economic, cultural, or aesthetic reasons rather than for survival of the species. Over a long period of selective breeding dramatic alterations may occur in the appearance of the animal although these will be always constrained by genetic barriers. It is for this reason that the effects of taming and domestication produce the same general physical changes in widely different groups of mammals. Many of these changes originate from the retention of juvenile characters into adult life rather than from genetic alteration and they therefore exhibit the same form in mammals as different as the pig and the dog. Examples of such changes are the deposition of fat under the skin, the shortening of the jaws, and the curled tail. Therefore, it is possible to observe that a “breed” is a group of animals that has been selected by man to possess a uniform appearance that is inheritable and distinguishes it from other groups of animals within the same species. It is a product of artificial choice of characters that are not necessarily strategies for survival but are favoured by man for economic, aesthetic, or ritual reasons, or because they increase the social status of the owner of the animals. Selective breeding was probably practised by the earliest Neolithic farmers for animals that were distinctive and submissive, as well as small, hardy, and easy to feed.

-
-
-

TO ACCESS ALL THE 10 PAGES OF THIS CHAPTER,
[Click here](#)

Bibliography

Clutton-Brock (1981). *Domesticated animals from early times*. Heinemann/British Museum (Natural History), London: 208 pp. [A story of the domestication of mammals.]

Dixon A. and Jones D. (1987). *Conservation and Biology of Desert Antelopes*. Christopher Helm. London: 238 pp. [The paper deals with the decline of desert antelopes.]

Ginsberg J.R. and Macdonald D.W. (1990). *Foxes, wolves, jackals, and dogs*. An action plan for the conservation of canids. IUCN/SSC Canid Specialist Group-IUCN/SSC Wolf Specialist Group, IUCN, Gland (Switzerland):116 pp. [The IUCN/SSC Canid Specialis Group action plan for conservation of canids.]

Gippoliti S. and Amori G. (1998). *Rodent Conservation, Zoos, and the Importance of the “Common Species”*. Zoo Biology, 17: 363-365. [The paper deals with the conservation of rodents.]

IUCN. INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (1996). *Red List of Threatened Animals*. World Conservation Union, Gland (Switzerland). [Red Book of the endangered species.]

Jarman M.R. (1976). *Early animal husbandry*. Phil. Trans. R. Soc. London, B. 275: 85-97. [The management of animals in prehistory.]

Masetti M. (1996). *The Postglacial diffusion of the genus Dama Frisch, 1775, in the Mediterranean Region*. Suppl. Ric. Biol. Selvaggina, 25: 7-29. [The story of the fallow deer in the late Quaternary.]

Ryder M.L. (1983). *Sheep and man*. Duckworth, London: 846 pp. [The importance of sheep in the story and the economy of man.]

Stuart (1991). *Mammalian extinctions in the Late Pleistocene of Northern Eurasia and North America*. Biol. Rev., 66: 453-562.

Soulé M. (1987). *Viable populations for conservation*. Cambridge University Press, Cambridge (UK).

Volf J. (1961). *International Studbook of the Przewalski's horse*. Prague Zoo, Prague.

Biographical Sketch

Marco Masetti works as researcher and teacher at the Dipartimento di Biologia Animale e Genetica, Laboratori di Antropologia, of the University of Florence (Italy). His studies are mainly focussed on the reconstruction of the former ecosystems and the relations between man and the other animals in the Mediterranean region and in the Near East, since prehistorical times, with particular reference to mammals.