CAPTIVE BREEDING *OF ENDANGERED ANIMALS*

Story & pictures by CLAIRE ELLIS

The future for many endangered animals appears to be grim. There is much controversy over the best way to save species that are on the verge of extinction, one of the arguments being that first the environment and natural habitat of the animal must be preserved. If this could be done and poachers kept out, it would obviously be the best solution. However, diseases, natural disasters and other problems can rapidly wipe out small, wild populations. Additionally, the political system of setting up reserves and changing the effects that progress has upon them is a long-term process in most countries. In the meantime while the arguments continue, animals are becoming extinct at an increasing rate.

Captive breeding programs have been advocated as a means of helping to overcome this problem until better solutions can be found. Under these programs populations of rare animals can be bred in captivity and released into the wild at a later date when safe habitats have been established. However, disagreements among conservationists have been raging for some time against this method. Some feel that captive breeding programs are too expensive and that the money would be better spent on protecting habitats, the only chance for the ultimate survival of these animals. Certainly habitat protection is often the cheapest way, and it also ensures that many other species of both flora and fauna are preserved as well. The role that zoos play in conservation efforts has been particularly singled out for attack, zoos being accused of being little more than animal prisons where creatures are treated as freaks. But as zoos progress with the times, these views have become increasingly outdated.

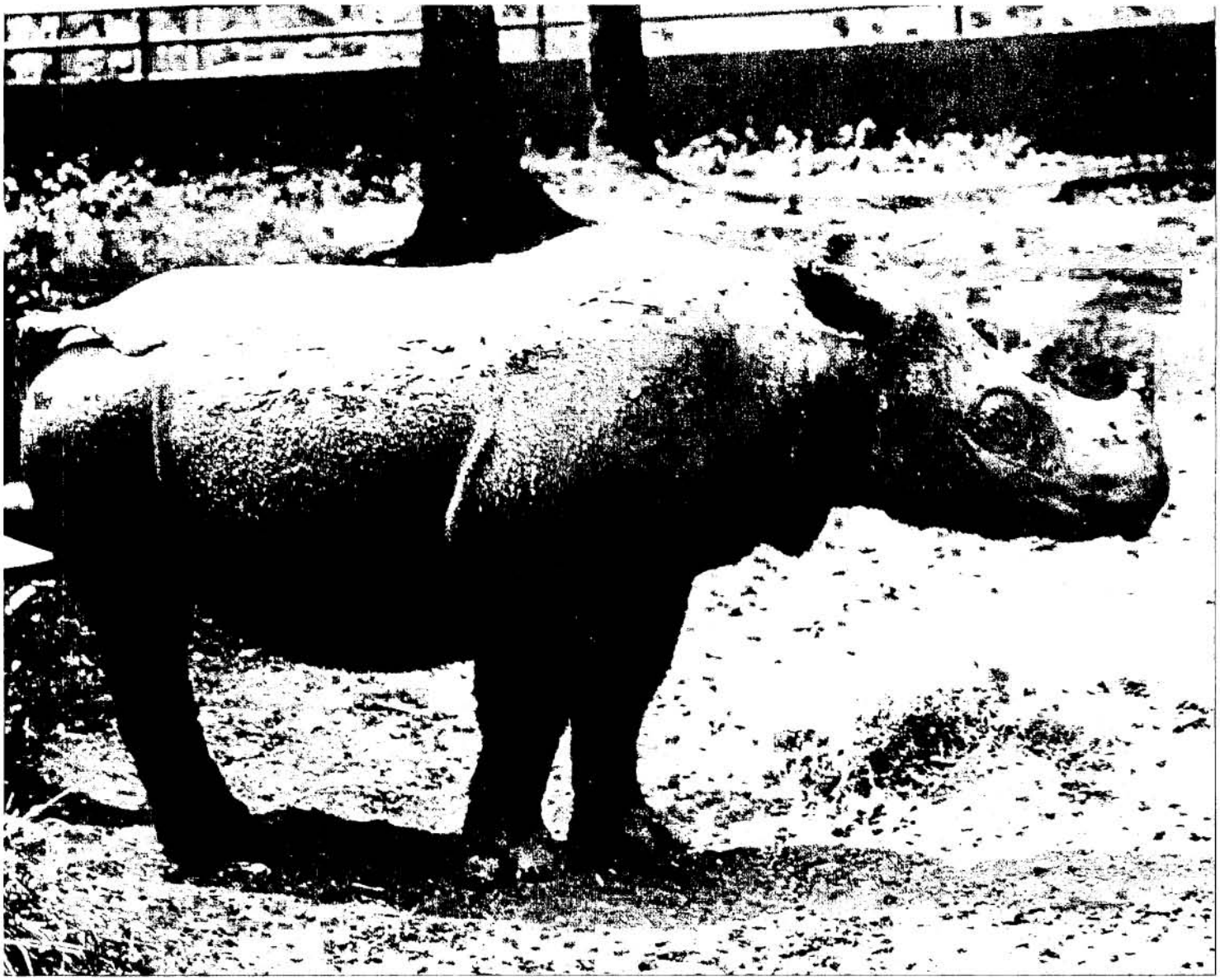
The truth is that zoos can conduct research on animals in captivity that would be impossible to do on species in the wild, and that their studies may eventually save wild populations. For example, the disease chlamydia was decimating the wild koala population in Australia, rendering them incapable of reproducing. But close analysis of groups of koalas in captivity in zoos enabled researchers to study and recognize the disease so that now alternatives in saving the population in their natural habitats can be explored.

In addition, zoos have taken on an educational role, raising public awareness about animals and the importance of their habitats. And they have accepted the responsibility of breeding endangered animals for future release back into the wild so that they will still exist and benefit our descendants.

The Cincinnati Zoo in Cincinnati, Ohio, U.S.A., like many other zoos, has taken this responsibility very seriously. But they have gone a step further than other zoos by developing stopgap measures to counter the timelag between saving natural habitats and the decline in population numbers of animals that are already endangered. They are engaged in a high-tech captive breeding program that uses embryo transplants and a type of cloning to increase the number of offspring from endangered animals.

This approach is needed in many countries in the world where the political process of creating, maintaining and protecting national parks is a lengthy one. Larger animals with slow reproduction rates and a need for large habitat areas are particularly vulnerable to the loss of entire species. The tiger is a good example. Already in Indonesia the Bali tiger is lost

The Sumatran rhino is usually a solitary animal, and it marks its territory using scent. "Jalu" can be seen here marking his territory. The male also uses scent to determine when the female is in estrus and, therefore, is likely to be receptive to an approach.



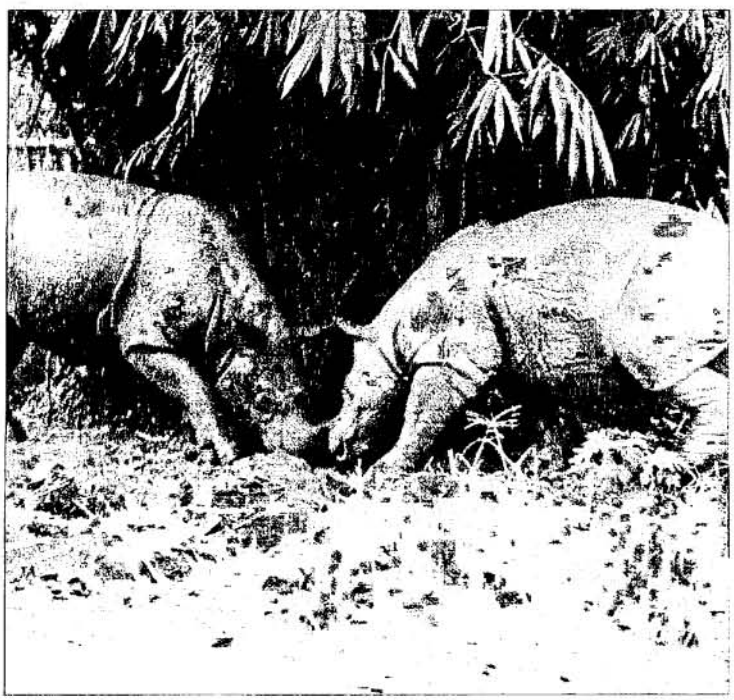
forever and probably the Javan tiger as well. A third group, the Sumatran tiger, is facing increased danger from poaching, poisoning and habitat depletion.

The rhinoceros is another Indonesian animal facing similar problems. The Javan rhino is very rare, although numbers have slowly been increasing, from an estimated 25 in 1967 to 52 in 1980. A World Wide Fund for Nature, Indonesia Program (WWF) project is currently underway in Ujong Kulon National Park to gauge the current population levels. Unfortunately, with another species, the Sumatran rhino, numbers are not increasing. It is still being poached and its environment destroyed; numbers have dropped even within the national parks. *The Jakarta Post* reported in June last year that the Sumatran rhino had virtually disappeared from Gunung Leuser Park, and the poaching of ten animals from Kerinci Seblat National Park between July and October last year served to highlight their plight.

Despite the Sumatran rhinoceros having been protected since 1931, with heavy penalties of ten years in jail and fines of up to Rp. 200 million for killing them, poachers do not seem to be deterred.

The difficulty with the Sumatran rhino and many other rare animals is that their numbers are so low that it will take many generations of protection and breeding before they are out of danger of extinction. In the wild they are not getting the protection needed to survive, and in captivity these animals are scattered throughout the world in different zoos, which means the available gene pool for breeding at any one zoo is extremely limited.

To help in these situations, the IUCN (International Union of Conservation of Nature) has set up a working section, the Captive Breeding Specialist Group, to examine the issues for individual species and to determine what may be the best approach for the preservation of each species. This group



recommended at their latest meeting in Perth, Australia (November, 1990) that the Sumatran rhino be captively bred within Indonesia and in zoos in the United States. The Javan rhino, they said, should be bred only within Indonesia, as there are too few remaining to risk injuries in transportation.

It has been suggested that an alternative breeding site be established for the Javan rhino as they are in competition with the indigenous cow, the *banteng*, in Ujong Kulon for food, and, more importantly, the park may have reached its carrying capacity for the animals. However, tracks of at least two juveniles have been sited recently casting doubts on this theory.

Representatives from the IUCN, the Captive Breeding Specialist Group, and the Cincinnati Zoo recently visited Indonesia and Malaysia to examine the situation of the Sumatran rhino. Estimates of how many are left in the wild vary greatly, but in an article in *The Jakarta Post* in November last year, reports were that numbers may be as low as 50 to 100. The rhino is a large animal and generally does not breed until it is about eight years old, and then a mother may only have four or five offspring in her lifetime. For such a slow-breeder with a low population that is already split geographically into smaller groups (making the inbreeding potential higher), the decision has been made to try advanced captive breeding techniques.

Sumatran rhinos have never been bred in captivity, partly as there are very few in zoos anywhere in the world and even fewer breeding pairs. Consequently, there is a lot of interest in this new program. Very little is known about their habits or breeding cycles, and studies to help understand the animal are currently underway. However, simply putting a male and a female together is not always sufficient, and the IUCN has promised to support Indonesia in its captive breeding program and to help train veterinarians in invitro-fertilization technology.

When the two animals become close they often stand head to head and tussle with each other. While this appears to be aggressive, it is unusual for injuries to occur. If the female is not yet ready to mate, she will push him away.

He starts by resting his chin on her rear.

He then mounts. It is not always that easy for "Jalu", as "Dusun" is often covered in mud, and his hooves can easily slip off her back.

in semen collection, and in other necessary areas. Ragunan Zoo in Jakarta has a pair of Sumatran rhinos, and the male is believed to now be of breeding age. Matings have occurred, and it is hoped they will soon be successful and that Indonesia can have the world's first captively-born Sumatran rhino.

The United States already has three females and has just arranged to receive a male caught from the wild in Sumatra. A contract has been entered into with the Indonesian Forestry Service (Perlindungan Hutan dan Pelestarian Alam) for 14 Sumatran rhinos in total to be sent to the United States for a captive breeding program. According to the agreement, the rhinos and their offspring will be returned to Sumatra eventually for release back into the wild.

Release programs such as this have already proved successful with the Arabian oryx antelope, dramatically increasing numbers by carefully managed captive breeding programs. Animals were re-released in Oman, Jordan and Saudi Arabia. Also, the ancestor of the domestic horse, the Przewalski horse, was close to extinction in the wild and was reintroduced from zoo stock into its native homeland in Western Mongolia. Similarly, the red wolf and the black-footed ferret have also been released in North America. In releasing animals bred in captivity great care has to be taken to ensure that the animals are healthy and that exotic diseases from zoos are not introduced to the wild population. Another consideration is that some species are far easier to rehabilitate into the wild than others, as some zoo-born creatures have not learned how to find food and protect themselves against predators.

The Cincinnati Zoo has already commenced some detailed reproductive studies on more common rhinos and is examining the possibilities of inter-species embryo transplants from the Sumatran rhino to either the Black or Indian rhino. By using the latest in reproductive technology they can attempt to achieve their goal of increasing the population of Sumatran rhinos much more quickly than would otherwise be possible. When the first male arrives at the Zoo, they will be able to further their studies on the animal's reproductive cycle and examine the feasibility of this technique.

Embryo transfer is a procedure where an embryo from one mother is implanted into another female animal who carries, gives birth and rears the baby. The advantage here is that a number of fertilized eggs from one female of a rare species can be implanted into several females of a more common species, allowing many more offspring to be born than would be naturally. Hence it is a more expedient way to increase the numbers of a rare species.

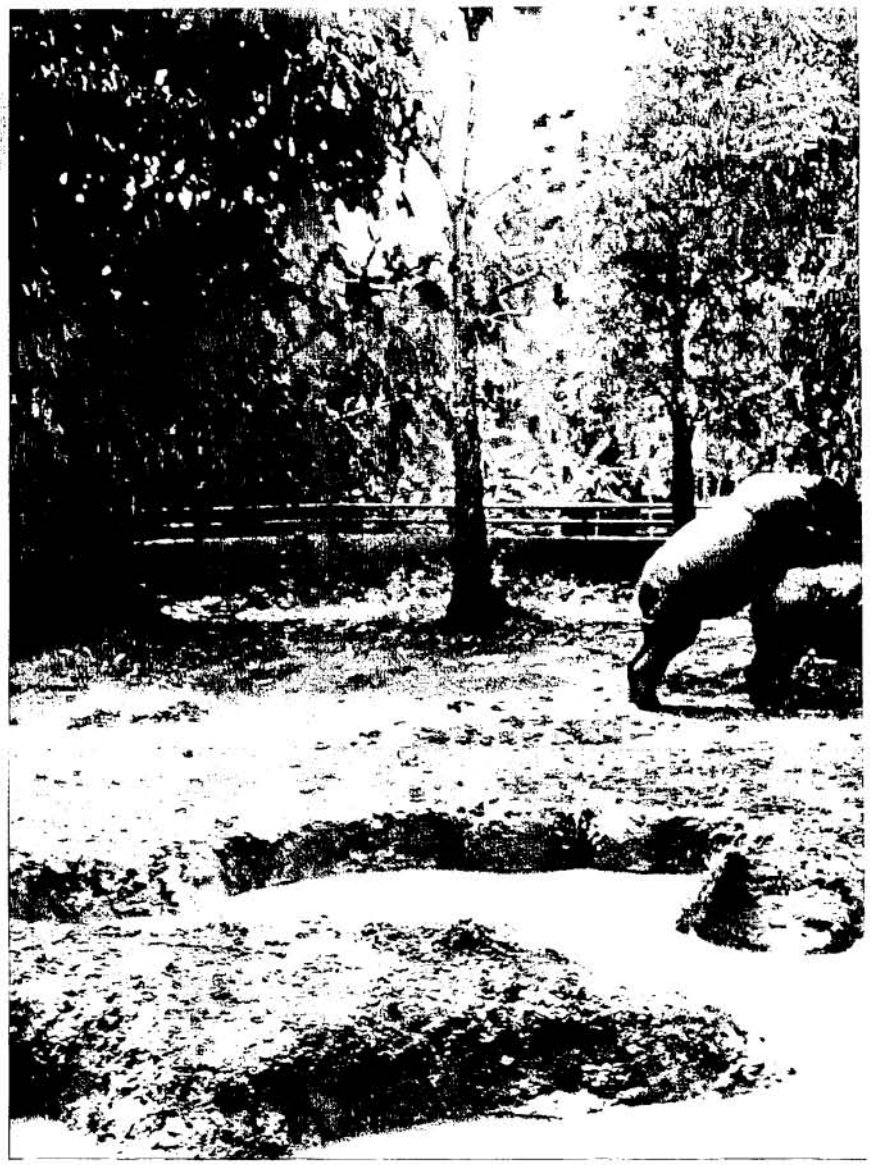
The process is done non-surgically, reducing [illegible]. A female is given a [illegible] the number of eggs she [illegible] normal ovulation cycle. [illegible] fertilized either naturally or [illegible] insemination.[1] After fertilization [illegible] the embryos move into the uterus where they float for a period of time before they normally attach to the wall of the uterus. During this floating period fluid is flushed into the uterus, picking up the embryos. The fluid is collected and examined under a microscpes, and the healthy, fertilized embryos are selected for transplant.

At this stage several decisions have to be made. The embryos can be used live or frozen for future use. And they may be transplanted into the same species or another species, in other words, intra-or inter-species, respectively. To increase the population of rare species by the fastest method, inter-species transfers are the primary objective. An animal species very close taxonomically is chosen, but, unfortunately, only trial and error determines whether the selection will be successful or not.

It has taken the Cincinnati Zoo eight years to develop this process. So far, with inter-species transfers they have succeeded with antelopes, rare African bongo embryos have been transplanted to the more common eland; wild cattle, Gaur embryos into domestic Holstein cattle; and with cats, Indian desert cat embryos to domestic cats. Because each time the species used have had to be so close taxonomically for this innovative process to work, the new mothers have been able to provide compatible milk for the new babies.

One large advantage to this type of breeding is that the embryo can be moved from site to site rather than having to move the animal, reducing stress and risk to rare species. Already Cincinnati Zoo has successfully transferred fresh bongo embryos from Los Angeles (California, U.S.A.) to Minnesota (U.S.A.), taking only 12 hours from the time they were removed from the natural mother to being in place in the surrogate. The five bongo embryos were transported by airplane taped to a human armpit to keep them at body temperature. No one else on the flight knew they were travelling with a herd of bongos!

Until this process was developed, the animals themselves had to be transported from site to site, as many zoos have only a few of a particular species, and cross-breeding with other animals is necessary to prevent inbreeding. To accommodate this type of exchange, an international computerized database known as



ISAS, International Species Information System, exists compiling records of all the species housed in more than 340 zoos and animal parks throughout the world. There are also studbooks available for most of the endangered animals so that zookeepers can study the lineage of prospective partners to ensure that inbreeding is minimized. As an example of these exchanges, as part of an international red panda breeding program Adelaide Zoo in Australia imported a breeding male from the Metro Toronto Zoo in Canada and sent one of its females on a breeding loan to Rotterdam, Holland. At the same time they also sent a young pair to Hong Kong to help with the breeding program there. Exchanges like this help to ensure that the genes are mixed internationally, but the movement of animals is always risky.

Zoos are increasingly working together to achieve the aims of breeding endangered animals. An alternate approach for some species

For successful matings to occur the animals must be healthy and have a peaceful, large enclosure. "Dusun" and "Jalu" have found their two adjacent enclosures at Ragunan Zoo to their liking. Hopefully by placing "Jalu", the male, with "Dusun", the female, on a regular basis, nature will soon take its course, and a baby will be born at Ragunan Zoo.

is to group them together in one zoo in a viable breeding group instead of having individuals or pairs segregated geographically in many different zoos. This method is particularly suitable for animals who live in herds or flocks that often need the security of numbers in order for them to breed naturally. England, for example, no longer has elephants at each of its zoos but has grouped them at one site for the advantages of a larger gene pool.

Obviously the benefit of only transporting sperm or embryos is great, but internationally the time span for travel is too long, and the embryos would have to be frozen before use. The Cincinnati Zoo was the first to develop the medical technology to produce healthy offspring from frozen embryos. They have successfully bred a healthy eland from an embryo that had been frozen for two years. However, only four species have been reproduced from frozen embryos so far, so there is still much work to be done.

Because embryo transfers are not successful with all the species they have experimented with, an alternative method of reproduction is a type of cloning. In this process an embryo is allowed to form and be fertilized in its own mother. Micro-surgery is then used to cut the embryo in half. The effect is the same as that which naturally occurs with the development of identical twins. This process has already been used domestically for some time with horses, cattle, sheep and goats but had not been attempted in zoos until two years ago. Again, with rare species the benefit of this method is the ability to increase the number of offspring. Elands were the first species to propogate this way at the Cincinnati Zoo, and now they are successfully creating bongo twins.

To further their work in this area the Zoo is building a "Frozen Zoo" at a cost of over US$3.5 million. Contrary to how the name sounds, this is not a new enclosure to display penguins or polar bears, but rather it is a new laboratory at the forefront of modern technology. It will house a frozen bank of genes, both embryos and sperm, of endangered animals and will eliminate having to use the obstetrics and gynecological sections of local hospitals, among other benefits. The building will also be used for developing plant reproduction techniques in an effort to save endangered flora. The new structure will have glass walls and will be open to the public so that tour groups can view the work in progress.

The concept of a Frozen Zoo to be shared by all countries needs to be developed. Laws must be changed to facilitate the movement of fresh and frozen embryos and sperm between countries. Checks need to be in place to ensure diseases are not being imported. Developments used on domestic animals must be applied to endangered breeds, and more effort needs to be put into researching the reproduction cycles of endangered animals, as all the details need to be known in order for these types of technology to be applied.

There is obviously a long way to go yet before many rare species can be saved from extinction, but the advantages of a genetic bank, allowing a larger gene pool for breeding, requiring fewer animals in capitivity, and providing the ability to produce many more offspring for reintroduction to the wild is an important step forward. In the meantime, the creation of safe parks and the preservation of natural habitats for these animals of the future to be returned to must remain as the primary goal. □