



INTERNATIONAL ZOO NEWS

A magazine for the exchange of news, information and ideas between the zoos of the world.

Proprietor: JOHN ASPINALL.

Editor: NICHOLAS GOULD, 80 CLEVELAND ROAD, CHICHESTER, WEST SUSSEX PO19 2HF, GREAT BRITAIN.

Advisory Editor: GEOFFREY SCHOMBERG.

International Zoo News is published eight times a year; the approximate publication dates are mid-February, end of March, mid-May, end of June, mid-August, end of September, mid-November and end of December.

Annual Subscriptions

U.K.: £35.00

Overseas, Surface Mail: £37.50 or US\$75.00

Airmail: £40.00 or US\$85.00

Subscription cheques should be sent to I.Z.N., 80 Cleveland Road, Chichester, West Sussex PO19 2HF, U.K. (Tel. and Fax: 0243.782803.) Cheques should be made payable to 'International Zoo News' or 'I.Z.N.' Sterling cheques should be payable through a British bank (or a British branch of a foreign bank); Eurocheques are also acceptable. Dollar cheques should be drawn on a U.S. bank. Payment may also be made direct to I.Z.N.'s bankers (Barclays Business Centre, Knightsbridge, P.O. Box 40, London SW3 1QB; Account No. 90491144), but if doing so subscribers are recommended also to notify the I.Z.N. office, as the senders of such payments are sometimes difficult to identify from the information provided by the bank.

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Cover Illustration: Golden takin at Tama Zoo, Japan. (Photo: Takashi Fukaya)

From ecology to economics, from politics and development to animal welfare – this is all the stuff of conservation. As noted recently by Jeremy Mallinson, Zoological Director of the Jersey Wildlife Preservation Trust, 'The balancing of conservation and animal welfare and the adoption of a more interdisciplinary approach is, in my opinion, paramount in the development of future strategies to safeguard individual welfare and biotic diversity.'

Andrew Pinchin

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Full Page	£75.00 \$150.00	Half Page	£40.00 \$80.00
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PACHYDERMS AND UNGULATES IN JAPANESE ZOOS, 1993

BY KEN KAWATA

Of all the publications by the Japanese Association of Zoological Gardens and Aquariums (JAZGA), the *Annual Report* is the most noteworthy, offering information on widely varying subjects from business administration to animal inventory. The circulation of the *Report* is limited to its member institutions for internal reference, thus the existence of this publication is rarely known outside the small circle of zoos and aquariums. There are peculiarities in the manner the Japanese compile statistics, an aspect that must be taken into consideration. For instance, their fiscal year begins in April and ends in March of the following year. Therefore the *1993 Annual Report* presents data as of 31 March 1994, not 31 December 1993; the animal inventory, however, is an exception to the rule, listing animals as of 31 December.

The *1993 Annual Report* consists of 546 pages, summarizing statistics from member institutions, including 96 zoos and 63 aquariums. From this issue, I have chosen pachyderms and ungulates as a focal topic to excerpt, interpret and translate. (Since aquariums maintain none of these mammalian species, this article relies exclusively on zoo data.) Possible errors in data compilation are mine.

1. Overview

Pachyderm is a convenient but arbitrary term, referring to loosely grouped families from three mammalian orders. Although the term forms no part of taxonomic nomenclature, these large and sparsely-haired mammals – elephants, rhinoceroses, hippopotami and tapirs – are among the most popular of zoo animals. In this account, the term ungulates refers to orders Perissodactyla and Artiodactyla, excluding those families that are in the pachyderm group. Ungulates include other popular zoo mammals, such as giraffes and zebras. Thus, these two mammalian groups constitute an important component in a zoo's animal collection. Taxonomy in this article adheres to the system adopted by the JAZGA.

The animal inventory in the *Report* lists all animals, from insects to primates, kept by JAZGA member institutions. The inventory includes large numbers of domesticated ungulates, including horses, donkeys, pigs, Bactrian and dromedary camels, alpacas, llamas, reindeer, water buffalo, cattle, yaks, goats and sheep. Since zoos are essentially devoted to wild animal species, these domestic forms have been omitted from this account. Also excluded are hybrids, such as horse-zebra crosses, as well as hybrids between wild animal species. Exclusive of these groups, the

Report lists 132 animals in Proboscidea, 417 animals in Perissodactyla and 3,480 animals in Artiodactyla, as shown in Table 1.

A quick review of the animal inventory reveals age-old characteristics, as well as emerging trends, of Japanese zoos. For example, many institutions still subscribe to the 'postage stamp collection' theme, having even fairly common species represented by only a few animals. In the meantime, increasingly more species have been added to the collections in recent years, offering the visiting public a more diverse representation within a taxonomic group. Species once considered extremely rare or unusual are now routinely on exhibit.

For instance, it would have been unthinkable only a few decades ago for so many zoos to exhibit white rhinoceroses, which now outnumber the once common black rhinoceroses by several times. Likewise, African elephants, once considered dangerous and thus inadvisable for zoos, are quite common, with many zoos even maintaining males. Also, within a given species, more subspecies, or geographical races, may be exhibited. The giraffe is a case in point, with four races represented; the same is true of the sika deer, a familiar native species.

Another phenomenon that has become undeniable is the emerging presence of the drive-through animal parks, or safari parks. In the more traditional urban zoos, which tend to be municipally controlled, species are represented by small numbers, often in dyadic situations. By contrast, safari parks frequently maintain animals in herds. To cite an example, there are 65 African elephants (excluding *L. a. cyclotis*, the forest elephant) in 20 institutions. Of these, 37 are kept in six safari parks, or about six animals per park, compared to traditional zoos that have two animals each. There are five singles in the inventory, none of which is in a safari park. Another example is the American bison. Of the 142 animals, 103 are in safari parks, or 17 animals per park. By comparison, traditional zoos have an average of merely three animals each.

2. Family-by-family Accounts

Elephantidae: A total of 132 animals in both species are represented in Japanese zoos. Of the Asians, 16 are kept as singles. As for geographical races, four are identified as Ceylonese (Sri Lankan); other designations such as 'Indian' or 'Thai' probably lack taxonomic validity. In the African species, a total of three forest elephants are noted, kept as singles in relatively small zoos.

Equidae: With 286 animals, equids dominate the order Perissodactyla. All 17 mountain zebras in Japanese collections are the Hartmann's (*Equus zebra hartmannae*). Common zebras consist of 140 Grant's (*E. burchelli boehmi*) and 80 listed as Chapman's, though in this writer's opinion the latter could conceivably include *E. b. antiquorum* as well as *E. b. chapmani*.

Tapiridae: Both the number of animals and the number of zoos that maintain tapirs continue to remain small.

Rhinocerotidae: Neither the Indian nor the black rhinoceros has shown any appreciable gain in numbers recently. As with the African elephants, the white rhinos (the entire population belongs to the southern race, *C.*

s. simum) are exhibited in larger numbers in safari parks, compared to their urban counterparts. On the average, safari parks maintain nearly six animals apiece, while conventional zoos have two animals each.

Suidae: The entire holdings consist of native forms, *Sus scrofa*. Four zoos keep the dwarf wild pig (*S. s. riukiuanus*), from the remote southern islands. This taxon is believed to be the smallest and most threatened subspecies of the Eurasian wild boar.

Tayassuidae: The number remains small, kept in two institutions. As exhibit material, the peccary has yet to make an impact in Japanese zoos.

Hippopotamidae: The pygmy hippopotamus continues to sustain a small number, while its larger cousin is a popular mainstay exhibit, kept in nearly 70 per cent of all zoos.

Camelidae: Wild species are overshadowed by the large numbers of domesticated forms, especially the llama and the Bactrian camel. This is a stark contrast, in comparison with the large number of guanacos kept in American zoos.

Cervidae: With 1,622 animals, the deer make up nearly half of the entire Artiodactyla in the inventory. In particular, the popular native sika deer (*Cervus nippon*) numbers 912, or more than a quarter of the order. Of these, 186 are listed as 'subspecies unknown' or as subspecific crosses. Others are categorized in six subspecies. It might be noted at this point that Japanese zoologists treat the subspecies of sika deer in their country in a different way from Western zoologists. What follows is the taxonomy by Yoshinori Imaizumi (1969).

The northernmost is also the largest, *C. n. yezoensis*, from the northern main island of Hokkaido. The main island of Honshu is the home for *centralis*; from the islands of Kyushu and Shikoku, and a few adjacent islands, comes the much smaller *C. n. nippon*. The southernmost race is also the smallest, *yakushimae*, from Yaku Island. An intermediate form between *nippon* and *yakushimae* is *ageshimae*, from the small island of Mage. Imaizumi also includes Formosan sika (*C. n. taiouanus*) from Taiwan; this is probably because a small feral population of this subspecies, started with escapees from a zoo, lives on the island of Oshima, off the coast of Tokyo.

In the red deer, five are listed as Gansu (a Chinese province) while one is said to be from north-eastern China. Five of the moose in the inventory are listed as American, while the rest (16) are Siberian.

Giraffidae: Fifty-four zoos reported a total of 210 giraffes in the country. Only two are listed as 'subspecies unknown', and three are said to be subspecific crosses. The others are classified into four races, namely *angolensis* (9), *giraffa* (= *capensis*) (6), *reticulata* (151) and *tippelskirchi* (39). With 151 animals, the reticulated makes up over 70 per cent of all giraffes. Tama Zoo, in a Tokyo suburb, is the major holder and breeder of giraffes, with six male and fifteen female reticulated. Of the 54 holders, six keep singles, while 18 keep them in twos.

Antilocapridae: The pronghorn is represented only by a pair in Kanazawa Zoo, Yokohama.

Bovidae: With 1,499 representatives, this family is the second largest group in terms of individual animals. As mentioned before, species once

considered rare and unusual have made entry into Japanese collections, although their numbers are still limited. Anoa, bongo, Arabian oryx, bontebok (included in blesbok), goral and takin can be included in this category. Since the inventory carries no scientific name, this writer could not determine exactly what 'wild goat' refers to.

3. Breeding

Table 2 depicts births of pachyderms and ungulates during the fiscal year. In some taxa, fecundity remains unpredictable and slow. Elephants, due mainly to the obvious difficulty of managing males, and tapirs fall into this group; moose are also known as difficult to breed. Such general tendencies appear universal, and not necessarily unique to Japan.

By and large, however, ungulates are among the 'reliable' breeders in the zoo field. Interestingly, the list reveals a tendency towards uneven birth rates; certain taxonomic groups have had fair numbers of offspring, while others did rather poorly, at least on the record. It almost appears that the latter have not been encouraged to breed randomly. For instance, wild equids have a healthy track record during the year. In common zebras, 27 Grant's (8 did not survive) and 13 so-called Chapman's (6 DNS) were born. Deer, giraffes and selected species of bovids also did well.

On the other hand, disproportionately fewer numbers of offspring are noted in some taxa. For example, only six offspring of wild boars have been reported; likewise, just one hippopotamus was born. In view of the large numbers of adults (assumedly), the birth rate has been extremely low. The underlying reason is probably the same as that for the low birth rates in large felids and bears in Japanese zoos (Kawata, 1994). That is, the carrying capacity of zoos has probably approached saturation point, with all available spaces for certain taxa already taken up. Where this is the case, only the species with higher marketability can be allowed to breed, resulting in uneven birth rate patterns in the overall animal collection.

4. Longevity

In the 1950s, Japan experienced an unprecedented zoo construction boom. This was the decade when citizenry were freed from the hardship of wartime. Coupled with the post-war baby boom, there was a need for more recreational facilities. Supported by the post-war economic prosperity, nearly 30 per cent of JAZGA member zoos opened their gates during this decade. The zoo boom continued into succeeding decades. During the 1980s alone, nearly 20 JAZGA member zoos were born. This means that more than half of JAZGA member zoos came into existence after 1960.

In the process of recording zoo animal longevities, mushrooming zoos can cast a bias. The stock of younger zoos simply cannot make significant contributions to longevity records. This leads to disproportionately small numbers of animals in the database that have lived into ripe old age. Such a result is particularly evident in the animal groups that are known for long life expectancies, such as elephants. Readers must therefore bear

in mind the historical background, and the potentially skewed ratio of long-living animals in this listing. The following data represent pachyderms and ungulates that had been living for at least twenty years as of 31 March 1994. The years indicate duration of captivity, which in some cases (but not all) also represents the age of the animals.

>40 years: 0.9 Asian elephants, 2.1 hippopotami;

35-39 years: 1.3 Asian elephants, 1.0 Indian rhinoceros, 0.2 hippopotami;

30-34 years: 0.3 Asian elephants, 1.3 hippopotami;

25-29 years: 2.1 Asian elephants, 0.1 African elephant, 1.1 white rhinoceros, 1.1 hippopotami, 0.1 pygmy hippopotamus, 0.1 giraffe;

20-24 years: 1.5 Asian elephants, 0.5 giraffes, 1.3 hippopotami, 1.1 Grant's zebras, 0.1 black rhinoceros, 1.0 white rhinoceros, 0.1 pygmy hippopotamus, 0.1 anoa, 0.1 African buffalo, 0.1 American bison, 0.1 mouflon.

By far the longest living of all animal groups are the female Asian elephants. As in other countries, most zoo elephants are females, which indicates a built-in bias in the population. Ranking at the top of the longevity list is Hanako, who has the longest residency of all the animals in Japanese zoos and aquariums. As a two-and-a-half year old calf she arrived at the port of Kobe on 2 September 1949, and made entry into Ueno Zoo in Tokyo on 4 September. This Thai elephant was transferred to Inokashira Zoo in a Tokyo suburb on 5 March 1954.

Hanako's longevity is followed by two female Asian elephants at the Tennoji Zoo in Osaka; Haruko (age 2) arrived there on 14 April 1950, while Yuriko (age 1) arrived on 5 June the same year. The current generation of Japanese cannot even begin to imagine the citizens' enthusiasm and news media excitement generated by the arrivals of these young elephants. Cities still had heaps of rubble mile after mile, from the devastation in World War II. Japan was a demoralized, poor country, and essential goods were in short supply. Arrivals of elephants in zoos vividly symbolized the fact that peace had become a reality, and that the nightmarish war years were finally over.

African elephants began to arrive in zoos in large numbers much later than their Asian cousins, and have not made it into the list of animal longevities. Unlike elephants, most hippopotami on the list are zoo-born, and we can look forward to keeping track of their accurate ages in the years to come. One of the noteworthy animals on the list is a female mouflon, born at Tama Zoo on 17 March 1974. In the latest *International Zoo Yearbook*, Marvin Jones (1993) presents a list of longevity records of captive ungulates, and gives the world record for the mouflon (established as long ago as 1887) as 19 years and two months. Possibly Tama Zoo's mouflon, still living as of March 1994 at age 20, has made a new world record.

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Ken Kawata, Belle Isle Zoo, Box 39, Royal Oak, Michigan 48068, U.S.A.

Table 1. Pachyderms and ungulates in Japanese zoos.

Species	No. of animals	No. of zoos
<i>Elephantidae</i>		
Asian elephant	10.54	38
African elephant	17.51	23
<i>Equidae</i>		
Asian wild horse	5.6	3
Somali wild ass	3.2	2
Grevy's zebra	14.19	9
Mountain zebra	5.12	3
Common zebra	98.122	40
<i>Tapiridae</i>		
South American tapir	11.12	9
Baird's tapir	3.2	2
Malayan tapir	10.9	9
<i>Rhinocerotidae</i>		
Indian rhinoceros	4.3	3
Black rhinoceros	5.7	5
S. white rhinoceros	29.36	20
<i>Suidae</i>		
Japanese wild boar	24.27.2	19
<i>Tayassuidae</i>		
Collared peccary	8.11.5	2
<i>Hippopotamidae</i>		
Hippopotamus	26.34	27
Pygmy hippopotamus	3.3	2
<i>Camelidae</i>		
Guanaco	1.0	1
Vicuna	2.1	2
<i>Cervidae</i>		
Chinese water deer	1.3	1
Reeves' muntjac	45.52.48	15
Fallow deer	119.161.34	15
Axis deer	27.40.2	8
Sambar	1.2	1
Sika deer	340.500.72	62
Red deer	10.20.2	6
Wapiti	37.52.14	8

Père David's deer	7.9	4
Moose	8.13	7
White-tailed deer	3.2	1
<i>Giraffidae</i>		
Giraffe	84.126	54
<i>Antilocapridae</i>		
Pronghorn	1.1	1
<i>Bovidae</i>		
Sitatunga	17.17	3
Eland	37.53	14
Bongo	3.7	3
Nilgai	5.12	3
Anoa	3.3	2
African buffalo	16.16	4
Gaur	3.1	2
European bison	2.5	3
American bison	58.83.1	19
Waterbuck	3.7	2
Roan antelope	3.10	2
Sable antelope	6.3	4
Scimitar-horned oryx	47.41	14
Arabian oryx	3.4	1
Beisa oryx	0.1	1
Gemsbok	16.11	4
Addax	13.7	3
Brindled gnu	6.17	4
Blesbok	4.1	2
Blackbuck	49.84.4	9
Springbok	2.1	2
Thomson's gazelle	5.6	3
Goral	10.11	4
Japanese serow	32.33	18
Formosan serow	7.10	1
Rocky mountain goat	10.7	4
Chamois	5.4	3
Musk ox	0.2	1
Golden takin	2.3	2
Himalayan tahr	7.9	2
'Wild goat'	5.15.2	2
Markhor	2.13	4
Bharal	5.9	3
Aoudad	88.119.54	18
Mouflon	151.159.12	14
Dall's sheep	1.2	1
Bighorn sheep	8.6	4

Note: As a general rule, taxa are treated on the species basis. Thus, African elephants include both bush and forest types; likewise, blesbok includes bontebok.

Table 2. Pachyderms and ungulates born in Japanese zoos. (Figures in brackets represent the number of animals that failed to survive.)

Species	No. born	No. of zoos
Somali wild ass	1 (1)	1
Grevy's zebra	3 (0)	2
Mountain zebra	3 (0)	2
Common zebra	40 (14)	20
South American tapir	1 (1)	1
Black rhinoceros	2 (1)	1
So. white rhinoceros	2 (1)	1
Japanese wild boar	6 (1)	2
Collared peccary	11 (7)	1
Hippopotamus	1 (1)	1
Reeve's muntjac	27 (13)	6
Fallow deer	50 (15)	6
Axis deer	26 (17)	5
Sika deer	133 (36)	32
Red deer	8 (2)	2
Wapiti	24 (6)	6
White-tailed deer	3 (0)	1
Giraffe	30 (15)	22
Sitatunga	12 (7)	2
Eland	17 (6)	7
Bongo	3 (3)	2
Nilgai	7 (3)	1
African buffalo	13 (12)	2
Gaur	1 (1)	1
European bison	1 (0)	1
American bison	18 (1)	7
Roan antelope	2 (2)	2
Sable antelope	1 (0)	1
Scimitar-horned oryx	19 (9)	6
Arabian oryx	1 (0)	1
Gemsbok	4 (1)	2
Addax	4 (4)	1
Brindled gnu	4 (1)	1
Blackbuck	51 (24)	6
Thomson's gazelle	6 (6)	2
Goral	2 (0)	2
Japanese serow	9 (5)	6
Himalayan tahr	6 (4)	1
'Wild goat'	9 (7)	1
Markhor	3 (2)	2
Bharal	5 (3)	2
Aoudad	60 (27)	11
Mouflon	82 (20)	5
Dall's sheep	1 (1)	1
Bighorn sheep	3 (1)	3

REPTILE WELFARE IN ZOO COLLECTIONS

BY RAY CIMINO

Background

As progressive western zoos have responded to concerns over the welfare of birds and mammals, improving conditions or even ceasing to display certain species, it is now time to give equal consideration to reptiles, a group of animals which are numerically significant in many zoos. Much has already been done – the old, outdated reptile houses have largely been refurbished or rebuilt, breeding is increasingly along organised, systematic lines, and a greater number of reptile EEPs can be anticipated before the end of the century. Reptile welfare, however, is still an almost alien phrase. The old chestnut of successful breeding being the principal indicator of good welfare, rarely heard these days about mammals or birds, is still trundled out as a defence of a zoo's reptile collection. Increased breeding is certainly taking place, but is, in turn, creating new problems of its own, with surplus animals frequently sold off to private keepers whose mere membership of a herpetological society is no guarantee of their husbandry skills. Indeed, at times it is almost as if zoos had become little more than battery producers of reptiles, with huge numbers of common 'pet trade' species being produced.

Measurements of reptile welfare

Good husbandry equates with good welfare, and to broadly establish whether an acceptable standard is being reached, a zoo should look at:

- Longevities being achieved in the collection;
- The range and frequency of health problems being encountered;
- Breeding results;
- Environmentally-produced physiological and behavioural abnormalities;
- Whether keeping staff are sufficiently expert and have sufficient time to deal with the extent of the collection.

Of course, these divisions can be subdivided many times, but the essential factor in the keeping of reptiles, and the main focus of this article, is the avoidance of damaging *stress* factors, the elimination of which will result in normal behaviour and improved longevity, health and breeding, and make husbandry an easier task.

Stress in reptiles

Definitions of stress are numerous, but one which fits the case of reptiles very well is that stress is 'stimulation beyond the capacity for complete adaptation' (Broom and Johnson, 1993). Being relatively primitive vertebrates, reptiles have a very limited capacity for adaptation, and