

ELEPHANTS AND UNGULATES IN JAPANESE ZOOS, 2003

BY KEN KAWATA

The 2003 Japanese Association of Zoos and Aquariums (JAZA) Annual Report lists 95 zoos and 68 aquariums as of 31 March 2004, the end of the Japanese fiscal year. For this instalment of the JAZA animal collection series I have chosen the groups of largest terrestrial mammals, elephants and ungulates (perissodactyls and artiodactyls), which I previously reviewed based on the data ten years earlier (Kawata, 1994). Nearly all animal groups in this series are exhibited by both zoos and aquariums. Elephants and ungulates, however, are featured exclusively by zoos and related institutions, namely drive-through parks, commonly called safari parks, often in large numbers. These herbivores are among the most popular of zoo animal groups, representing an essential part of the animal collection.

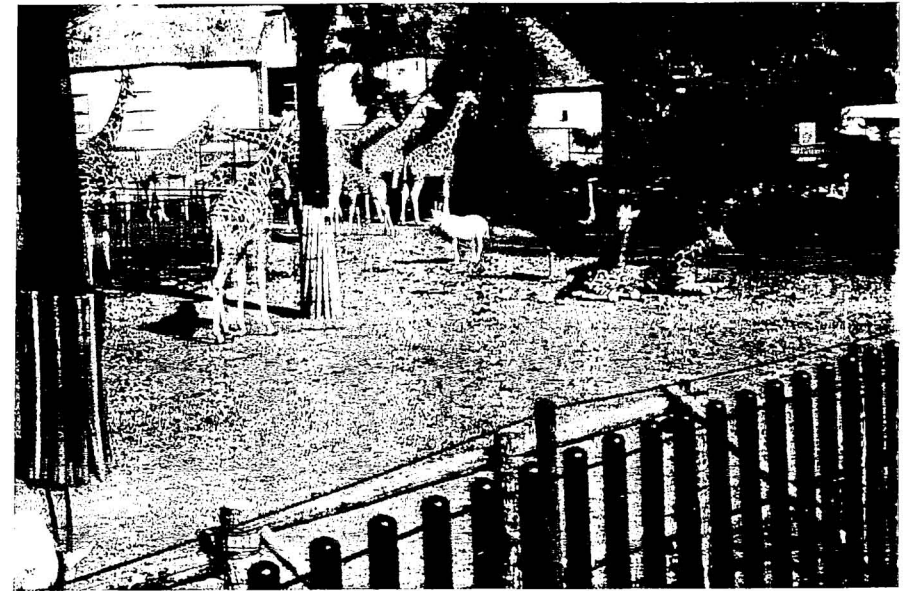
Overview

JAZA annually publishes an animal inventory, a soft-bound volume which lists from insects to mammals held by member institutions. There are non-JAZA member animal collections that are open to the public, but it is probably safe to assume that the JAZA inventory covers nearly all live animal collections in public exhibits in the country. Data from the 2003 inventory have been organized, as shown in Table 1, as of 31 December 2003. In all, the three mammalian orders contain 11 families, 65 species and 3,586 specimens. Excluded from the JAZA inventory for this account are hybrids between full species and between domesticated and wild species. Also deleted are the large numbers of domesticated species; although domesticated camelids are popular and often regarded as 'exotics', it is my position that wild species are the primary focus for zoos. Taxonomy in this account adheres to the system used by JAZA; taxa have been lumped into full species to simplify the statistics, although the inventory lists subspecies in some genera, which will later be discussed as needed.

As in other animal groups, a handful of species have become quite common in zoos due to availability, tolerance of captive conditions, high fecundity and popularity. Seven out of the 65 species are represented by more than 100 specimens each; the largest number of all, sika deer, with 731 specimens, takes up one-fifth of all specimens combined. Adding mouflons and blackbucks the number climbs to more than 40%. Furthermore, four or five safari parks stand out as holders of large numbers of animals. For instance, Nanki Shirahama Adventure World alone has three species with more than 100 specimens each – 125 mouflon, 103 blackbuck and 101 sika deer. (Also see Himeji Central Park, Kawata, 2008). Although safari parks represent a small number on the JAZA membership roster, they play an important role in JAZA's activities as well as in animal husbandry. To cite another example of the difference from typical

urban zoos, while the latter often maintain large mammals in solitary or dyadic situations, safari parks tend to keep them in multiple-number groupings, often in larger areas. At least in theory, this should benefit species that are said to breed in a group, as opposed to a pair, in larger areas, such as the white rhinoceros.

While the number of zoos has stayed largely unchanged, the combined number of specimens has shown a decline by 12% over the ten-year period across all three taxonomic orders. In particular, elephants have decreased from 132 to 107. The number of species has also revealed a decline. A simplistic comparison could lead to false conclusions, since there are parameters that require careful examination. It is, however, probably safe to assume that after the earlier decades of rapid growth, zoos and related institutions have more or less hit a plateau; their animal collections have reached a saturating and stabilizing point, showing insignificant fluctuations from one year to another.



A mixed-species exhibit in the African section at Tama Zoo, 1980. (Photo: Ken Kawata)

Table 1. Elephants and ungulates in Japanese zoos.

Species	No. of specimens	No. of institutions
<i>Elephantidae</i>		
Asian elephant (<i>Elephas maximus</i>)	11.53	34
African elephant (<i>Loxodonta africana</i>)	12.31	17

Equidae		
African wild ass (<i>Equus asinus</i>)	2.2	2
Common zebra (<i>E. burchelli</i>)	80.111.1	35
Grevy's zebra (<i>E. grevyi</i>)	11.15	9
Asian wild ass (<i>E. hemionus</i>)	1.0	1
Asian wild horse (<i>E. przewalskii</i>)	3.3	2
Mountain zebra (<i>E. zebra</i>)	8.10	7
Tapiridae		
Central American tapir (<i>Tapirus bairdii</i>)	2.1	1
Malayan tapir (<i>T. indicus</i>)	14.13	8
South American tapir (<i>T. terrestris</i>)	8.10	7
Rhinocerotidae		
White rhinoceros (<i>Ceratotherium simum</i>)	14.23	15
Black rhinoceros (<i>Diceros bicornis</i>)	11.12	7
Indian rhinoceros (<i>Rhinoceros unicornis</i>)	6.3	3
Suidae		
Wild boar (<i>Sus scrofa</i>)	8.26	10
Tayassuidae		
Collared peccary (<i>Pecari [Tayassu] tajacu</i>)	3.4.21	1
Hippopotamidae		
Pygmy hippopotamus (<i>Choeropsis [Hexaprotodon] liberiensis</i>)	3.5	3
Common hippopotamus (<i>Hippopotamus amphibius</i>)	20.26	20
Cervidae [Moschidae]		
Moose (<i>Alces alces</i>)	1.4	3
Axis deer (<i>Cervus axis</i>)	37.41.9	5
Wapiti (<i>C. canadensis</i>)	33.66	5
Fallow deer (<i>C. [Dama] dama</i>)	68.84	8
Red deer (<i>C. elaphus</i>)	17.23	4
Sika deer (<i>C. nippon</i>)	218.387.126	48
Tsushima deer (<i>C. pulchellus</i>)	7.5	1
Sambar (<i>C. unicolor</i>)	1.0	1
Père David's deer (<i>Elaphurus davidianus</i>)	4.6	3
Chinese water deer (<i>Hydropotes inermis</i>)	2.0	1
Reeve's muntjac (<i>Muntiacus reevesi</i>)	32.25.86	11
White-tailed deer (<i>Odocoileus virginianus</i>)	1.1	1
Reindeer (<i>Rangifer tarandus</i>)	18.36	12
Giraffidae		
Giraffe (<i>Giraffa camelopardalis</i>)	51.83	49
Okapi (<i>Okapia johnstoni</i>)	2.5	2
Bovidae		
Addax (<i>Addax nasomaculatus</i>)	6.3.2	1

Aoudad (<i>Ammotragus lervia</i>)	37.76.74	11
Blackbuck (<i>Antilope cervicapra</i>)	132.137.35	6
American bison (<i>Bison bison</i>)	48.63.3	18
European bison (<i>B. bonasus</i>)	0.1	1
Gaur (<i>Bos gaurus</i>)	0.5	2
Nilgai (<i>Boselaphus tragocamelus</i>)	4.12	3
Anoa (<i>Bubalus depressicornis</i>)	1.2	1
Takin (<i>Budorcas taxicolor</i>)	2.4	2
Himalayan tahr (<i>Hemitragus jemlahicus</i>)	15.21.14	3
Markhor (<i>Capra falconeri</i>)	18.11	3
Bezoar goat (<i>C. hircus</i>)	3.9	1
Serow (<i>Capricornis [Naemorhedus] crispus</i>)	26.27.1	16
Brindled gnu (<i>Connochaetes taurinus</i>)	1.1	2
Thomson's gazelle (<i>Gazella thomsonii</i>)	10.7	3
Roan antelope (<i>Hippotragus equinus</i>)	6.12.1	2
Sable antelope (<i>H. niger</i>)	5.5	2
Goral (<i>Naemorhedus goral</i>)	3.6	3
Rocky Mountain goat (<i>Oreamnos americanus</i>)	3.8	3
Scimitar-horned oryx (<i>Oryx dammah</i>)	14.33.2	14
Gemsbok (<i>O. gazella</i>)	4.6	3
Arabian oryx (<i>O. leucoryx</i>)	3.6	3
Bighorn (<i>Ovis canadensis</i>)	7.15	4
Dall's sheep (<i>O. dalli</i>)	2.0	1
Mouflon (<i>O. musimon</i>)	161.199.25	11
Bharal (<i>Pseudois nayaur</i>)	13.24.5	4
Chamois (<i>Rupicapra rupicapra</i>)	4.1	1
African buffalo (<i>Synceros caffer</i>)	16.19.1	2
Bongo (<i>Tragelaphus euryceros</i>)	2.6	3
Eland (<i>T. [Taurotragus] oryx</i>)	23.30	10
Sitatunga (<i>T. spekei</i>)	12.16.7	4
Tragulidae		
Lesser Malay chevrotain (<i>Tragulus javanicus</i>)	1.2.1	1

Order-by-order review

Proboscidea. Of the 34 holders of Asian elephants, 16 still keep single animals. The average number kept by one zoo does not even reach two, a figure that has changed little over ten years. Many fewer holders of their African cousins keep singles, three out of 17: the average number kept by one zoo is 2.5 which, interestingly, is similar to the 1993 figure. The largest holder of either species is Tokyo's Tama Zoo, with 1.5 Africans. Concerning subspecies, 17 out of the 64 Asians are said to be of unknown subspecies; the rest are listed as *indicus*, *hirsutus* and *maximus*. As for Africans, 41 are listed as *africana* and two as *cyclotis*. Perhaps, however, there are more *cyclotis* in zoos erroneously listed as bush elephants than we suspect (Kawata, 2008). Elephants and the following order, Perissodactyla, have no living native species in Japan.

Perissodactyla. With 247 individuals, equids have the largest number in this order, yet it shows a 14% decrease in a decade; the number of species remains

about the same. In most species, subspecies are identified, such as Somali wild ass (*somalicus*), Chapman's and Grant's zebras (*antiquorum* and *boehmi* respectively), Mongolian wild ass (*hemionus*) and Hartmann's mountain zebra (*hartmannae*). Equids are kept in surprisingly small herds by most holders; the largest, consisting of 14.14 Grant's zebra, is reported by a safari park (as expected), Fuji Safari Park. The numbers of tapirs, both species and specimens as well as holders, continue to remain small, unchanged over ten years. By comparison the number of rhinoceroses shows a decrease by nearly a quarter. This is caused by a decline in the number of white rhinoceros, even though the black rhinoceros doubled its numbers in a decade. All white rhinoceroses belong to the southern race (*simum*). Only two out of 23 black rhinoceroses are listed as 'subspecies unknown'; of the rest two are southern (*minor*) and the rest eastern (*michaeli*).



Malayan tapir at Tama Zoo, 2000. (Photo: Akiyoshi Nauwa)

Artiodactyla. This order, the most diverse and numerous in species of the three, also represents the largest number in the JAZA inventory. The entire camelid population consists of domesticated forms and is therefore eliminated from Table 1. Four native species are included in this order, namely the wild boar, sika deer, Tsushima deer (which is considered a separate species) and serow.

The number of species and specimens in suborder Suiformes (pigs and hippopotamuses) has remained basically the same from the 1993 figures. In the suborder Ruminantia, with 1,338 animals, cervids make up nearly 40% of the specimens in the inventory, more than half of which belong to the native sika deer in several subspecies. In this family the reindeer, even though it is

perceived as domesticated, has been added to the statistics for the following reasons. Firstly, there is a chance that the caribou, a North American wild form, may be mixed in the population. Also, the nature of domestication of the reindeer considerably differs from that of horses, cattle and sheep, with limited utilization, mostly by regional ethnic groups. The number of giraffes, as well as the number of holders, has declined from the previous survey (the reason is not clear). Less than 10% of all giraffes are listed as 'subspecies unknown', or as crosses between subspecies. Of the rest, 83% are *reticulata*. Discouragingly, 13 out of all 49 holders maintain single animals. The largest holder is not a safari park but a more traditional municipal institution, Tokyo's Tama Zoo, with 1.13 reticulated. In the 2003 statistics the okapi is a welcome newcomer.

With 1,516 individuals in 31 species, bovids represent the largest group in terms of species and specimens. Compared with the 1993 figure, however, the number of species has declined; no longer on the inventory are waterbuck, beisa oryx, blesbok, springbok and musk ox, all of which had been kept in small numbers. In the current inventory there are species maintained by fewer than five individuals each, including European bison, anoa, brindled gnu, Dall's sheep and chamois. Without importation, if attrition continues apace, they will sooner or later disappear from Japanese collections, further reducing the diversity. With regard to subspecies, little interest seems to exist in bovids, in clear contrast to other groups. The exception is the serow; out of the population of 54, three are reported to belong to the Taiwanese race, *swinhoei*, and the rest to the Japanese, *crispus*.

Species management programs

Many species in this account are listed in various national and international conservation programs and measures, such as CITES and the IUCN Red Data Book. Fifteen species are on Appendix I of CITES; another seven are listed in Appendix II, while three are classified as either I or II, depending on the subspecies or local populations within the species. The Japanese serow is protected by the government as a Special National Monument. Also, eight species are on the Rare animal list of the *International Zoo Yearbook*. In total, 35 out of the 65 species are listed in the above measures and programs, a very high occurrence in proportion to the number of species. In particular, every species in the three families Elephantidae, Tapiridae and Rhinocerotidae are in either Appendix I or II of CITES.

Reflecting their global importance, 13 taxa are included in the collective management measures by the Species Survival Committee of Japan (SSCJ, a management program under the JAZA umbrella): Asian elephant, African elephant, Grevy's zebra, Hartmann's mountain zebra, southern white rhinoceros, black rhinoceros, Indian rhinoceros, Central American tapir, Malayan tapir, South American tapir, giraffe, Japanese serow and scimitar-horned oryx. A coordinator and a studbook are assigned to each one of them. Common challenges for the coordinators include the need to bring in new founders from overseas, recruitment of participating zoos, increasing the heterozygosity of populations, and information exchange with range countries and overseas institutions. The serow is the only indigenous animal in the program with a stabilized population; a small number of individuals keeps trickling in from the wild as a result of emergency rescue operations.

Depending on the taxa, various challenges await zoo officials. Concerning

collective species management programs, there are issues that are all too familiar in international zoo circles, and debates continue. There follow some examples from the SSCJ meetings (Japanese Association of Zoos and Aquariums, 2003B). The majority of species are large mammals that require correspondingly large housing facilities (elephants and the Indian rhinoceros are prime examples). The cost becomes a limiting factor for increased participation by zoos. Also, in all species successful breeding eventually produces an undesirable sex ratio of offspring and surplus stock, which add to housing shortages. For this reason, in some cases reproduction of individuals whose genetic desirability is fully recognized is often suppressed, creating a serious hindrance for the goal of breeding programs. In some taxa there have already been surplus individuals, but communication between the holder and the owner of available spaces has not always been adequate. In another area, the choice between reversible (such as separation) and permanent (e.g. vasectomy) birth control measures must be carefully discussed. Surplus stock is inevitable and leads to a dilemma. To solve the problems, some surplus individuals have been used solely for exhibit purposes. However, uniform application of this approach for large ungulates is problematic.



Japanese serows at the Japan Serow Center, 1969; the Center had kept animals for years before the official opening to the public in 1973. (Photo: Ken Kawata)

Breeding

Table 2 depicts births of ungulates in JAZA member zoos during the fiscal year, extracted from the birth/hatching section of the Annual Report (no elephants were born in this period). Each zoo is required to report the number born, number survived, and whether parent-raised or artificially raised. Re-

viewing the data, what stands out is the varying degree of thoroughness of information by individual zoos; there exists a clear contrast between excellent and poor reporting. For instance, some zoos report gestation periods (including those that are indicated as estimates), birth dates, singles or twins, stillbirths, sex ratio, the dates of infant deaths and, in one case, the place of births (main campus or a branch facility). By comparison, some zoos reveal nothing but the mere number of offspring born. (The level of thoroughness becomes more noticeable in the animal longevity section which will be discussed below.)

Table 2. Ungulates born in Japanese zoos between 1 April 2003 and 31 March 2004. (Figures in brackets represent the number of animals that survived.)

Equids		Bovids	
Common zebra	20 (11)	Addax	1 (0)
Grevy's zebra	2 (2)	Aoudad	18 (10)
Mountain zebra	1 (1)	Blackbuck	138 (33)
		American bison	24 (15)
Tapirs		Himalayan tahr	12 (7)
Malayan tapir	1 (1)	Markhor	5 (5)
Rhinoceroses		Serow	7 (6)
White rhinoceros	1 (0)	Thomson's gazelle	3 (1)
Black rhinoceros	1 (0)	Roan antelope	2 (1)
Pigs		Sable antelope	1 (1)
Collared peccary	5 (2)	Rocky Mountain goat	2 (1)
Hippopotamuses		Scimitar-horned oryx	4 (3)
Pygmy hippopotamus	1 (1)	Arabian oryx	1 (1)
Common hippopotamus	2 (2)	Bighorn sheep	2 (0)
Cervids		Mouflon	76 (18)
Axis deer	28 (4)	Bharal	7 (5)
Wapiti	9 (4)	African buffalo	7 (5)
Fallow deer	2 (0)	Eland	2 (2)
Red deer	2 (2)	Sitatunga	8 (3)
Sika deer	62 (39)	Chevrotains	
Muntjac	7 (4)	Lesser Malay chevrotain	2 (1)
Reindeer	6 (4)	Giraffes	
Giraffes		Giraffe	13 (6)
Okapi	1 (0)	Okapi	1 (0)

The 2003 data reveal the same trend that was noted a decade ago: some species have noticeably higher reproductive rates, such as blackbuck and mouflon, while others, such as fallow deer, show lower reproductive rates in proportion to the large populations. It appears that just as was seen ten years earlier, captive spaces in many collections reached a saturation point, and zoo managers ceased breeding the species with lower marketability. One might suspect, however,

that this sample year may not represent an average or normal annual pattern. With that in mind I examined the breeding data from the following year, 2004, as well. The results did not disclose much difference between the two. Over the two-year period no elephant was born, there was no surviving rhinoceros neonate and about the same numbers of giraffes were born in each year. Cervids and bovids had similar breeding results in each year, with a few exceptions (for instance, 76 mouflons were born in 2003 compared to 17 in 2004). Also, in both years several safari parks, including Nanki Shirahama Adventure World and Himeji Central Park, proved to be prominent breeders of ungulates: in 2003 the former had 67 blackbucks, 47 mouflon and 18 sika deer born, while the latter had 47 blackbucks and 23 axis deer born.



Asian elephants at Ueno Zoo, 2004. (Photo: Akiyoshi Nawa)

Longevity

Data on animals that had been living for at least 25 years as of 31 March 2004 are represented in Table 3. The years indicate duration in captivity but not ages of animals (unless specified below). As expected, elephants and hippopotamuses (common in this case) dominate the list. Five Asian elephants (all females), who had arrived at a time when Japan was still recovering from WWII, marked 50 years in zoos. At the top of the list is Hanako, the first post-war elephant to reach Ueno Zoo, arriving on 4 September 1949; she was transferred to Inokashira Zoo in a Tokyo suburb on 5 March 1954. Haruko ranks second, arriving at Tennoji Zoo, Osaka, on 15 April 1950. Suwako, the third oldest, in Kobe, arrived on 28 September of the same year (she died on 10 April 2008; Kawata, 2008). As for African elephants, the oldest are two females who arrived at Tama Zoo on 21 July 1967. (On arrival they were so small that I easily hopped on one of them,

as keepers walked them for exercise. At that time I was employed by the Tokyo Zoological Park Society.) All the above elephants arrived young, but their exact ages are not known.

Table 3. Longevity of elephants and ungulates in Japanese zoos. (The years indicate duration in captivity of animals living as of 31 March 2004.)

Group	>40 yrs	35-39	30-34	25-29	Total
Elephants	10	5	6	3	24
Tapirs	0	0	0	1	1
Rhinoceroses	0	1	3	5	9
Hippopotamuses	2	3	4	2	11
Giraffes	0	0	0	2	2
Total	12	9	13	13	47

A female hippopotamus, who arrived at Ishikawa Zoo on 31 March 1962, is the oldest of the species, followed by another female born in Fukuoka Zoo on 2 August 1962. In the rhinoceros group, a male southern white rhinoceros, purchased by Yagiyama Zoo in Sendai on 29 September 1969, tops the list with an estimated age of 37. Next come two (1.1) black rhinoceroses who arrived at Asa Zoo in Hiroshima on 14 July 1971, barely six weeks after the opening of the zoo. A female black rhinoceros, born at Tennoji Zoo on 1 February 1972, is the only specimen clearly indicated as captive-born among the older rhinoceroses. She is followed by a male Indian rhinoceros who arrived at Higashiyama Zoo in Nagoya on 18 March 1972. The longest-living tapir on the list is a male South American tapir who arrived at Toho Zoo on 4 December 1976. The distinction for the giraffe goes to two females, a Masai in Maruyama Zoo in Sapporo, born there on 10 April 1978, and a reticulated, born in Misaki Park on 18 September of the same year and now residing in Tennoji Zoo.

The reliability of the records becomes an issue for the reviewer when dealing with zoo animal data, as discussed above in the breeding section. In any account on statistical data, information submitted by various organizations could be inconsistent and uneven, to an extent. Some zoos submit detailed information on individual animals including the places and dates of births, previous holders, sources and status on entry (such as young or adult), and house names or even reproductive history. At the other extreme are zoos (small in number, luckily) that send in incomplete information, typically mere years in captivity, e.g. '35' or '30.3' – but does that mean 30 years and three months or 30 years and one-third of a year? And there is the question of accuracy, as in any zoo in any country. As far as I am aware, at least two zoos have regularly submitted inaccurate arrival dates on certain individuals.

Real events in the zoo, such as reproductive activities and longevity, are abstracted into figures and facts, just as field biologists collect *in situ* data, and are eventually transformed into a print medium to become a part of our knowledge. The question here is the process of such data gathering and

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BY ROBERT E. WRIGLEY

reporting. It solely depends on the zoo staff and we, at the other end of this tricky journey of information, are at the mercy of those who record and report the events. In fairness, compliments should be given to the zoos that have consistently turned in detailed information over the years. These include Kyoto, Ueno, Tama (both in Tokyo), Tennoji (Osaka) and Asa (Hiroshima), among other zoos. Their expertise, in turn, highlights the inadequate and often insufficient information which mostly originates in smaller zoos. Probably, those in charge of such zoos are 'park people' in most cases, who manage zoos just as they take care of swimming pools and tennis courts, with little sensitivity to biology (see further Kawata, 2008, pp. 278–9). In order to upgrade Japanese zoos as a whole, I would like to encourage those in charge of zoos to make an earnest attempt to acquire professional awareness and technically-oriented staff. It would be a vital step towards the common goal and also towards making contributions to the collective data base for the zoos of the world.

Acknowledgments

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References

- Japanese Association of Zoos and Aquariums (2003A): The 2003 Annual Report. (In Japanese.)
Japanese Association of Zoos and Aquariums (2003B): The 2003 Species Survival Committee of Japan Activity Report. (In Japanese.)
Kawata, K. (1994): Pachyderms and ungulates in Japanese zoos, 1993. *International Zoo News* 41 (8): 5–12.
Kawata, K. (2008): *Hanzaki*, elephants and amusement rides: a visit to fourteen animal collections in Japan. *International Zoo News* 55 (5): 262–281.

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In 1973–74, two rehabilitated bald eagles (*Haliaeetus leucocephalus*) arrived at Assiniboine Park Zoo in Winnipeg, Canada, donated by Calgary Zoo (female) and Manitoba Conservation (male). Both were wild birds with injuries that prevented their release back into the wild, but were still capable of flight. With complete, definitive white plumage on the head and tail, they were presumed to be at least 5.5 years old (Buehler, 2000), but there was no way of determining their actual ages. These individuals were placed into an exhibit at the same time as two other bald eagles, and the former two soon paired off and began attacking the others, who were then removed to other quarters. The new pair underwent a nine-year courtship before embarking on an annual breeding pattern for the next 25 years, producing a total of 23 surviving offspring. An elevated nesting platform with sides was used, and nesting material (grass and twigs) was picked up by the birds as soon as these were exposed by the melting snow (late March to early April).



Assiniboine Park Zoo's senior bald eagles, male (left) and female (right). (Photos: Darlene Stack)