

ZOO GUIDELINES FOR KEEPING LARGE FELIDS IN CAPTIVITY

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GENERAL INTRODUCTION

Within the family Felidae, determination of minimum husbandry needs of large cats is variable because of differences in size, morphology, and behavior. For purposes of this discussion, a large felid is identified as any species of cat belonging to the genus *Panthera*, including: lion, *P. leo*; tiger, *P. tigris*; jaguar, *P. onca*; leopard, *P. pardus*; and snow leopard, *Uncia uncia*; as well as the puma (cougar or mountain lion), *Puma concolor*; clouded leopard, *Neofelis nebulosa*; and cheetah, *Acinonyx jubatus*.

With one exception, large felids are solitary carnivores functioning at or near the top of their trophic level. While this behavior permits them to be housed singly, it also requires that the introduction of potential mates be done carefully to prevent fighting, injury, or death. Their aggressive nature and physical capabilities demand that owners exercise the utmost care when designing cages or exhibits for any species, regardless of size, to insure that specimens cannot escape or reach into adjacent cages or public areas. Caution also should be exercised when handling otherwise "tame" individuals.

Minimum requirements for exhibit size and furnishings, diet, veterinary needs, and social groupings are broken down in the following way: 1) very large pantherids, 2) other large felids, and 3) cheetahs.

GENERAL REQUIREMENTS

Some aspects of captive management for all large felids are similar and are discussed below. Requirements unique to certain groups are listed separately.

Temperature - Although large felids may originate from all manner of climates, most are tolerant of wide temperature extremes, at least during daylight hours. Animals kept outside should always have access to shade, especially during warmer months of the year. When acclimated, most species without young require only minimal unheated shelter at night. Clouded leopards are more cold sensitive than the other species and should be protected from minimum extremes in weather. When kept indoors year around, animals should be protected from temperatures above 85 degrees Fahrenheit.

Lighting - In nature, most species of large felids are nocturnal and, therefore, less active during daylight hours. Accordingly, they all do well under normal light cycles although shy or secretive specimens will thrive with less exposure. Smaller species may be exhibited under reversed light cycles without harm. Fluorescent lighting is an efficient light source providing broad-spectrum illumination.

Ventilation and Humidity - Indoor exhibits should have a negative air pressure of 10-15 air changes per hour of non-recirculated air. Relative humidity should be within the range of 30 -

70%. Separate ventilation systems should be maintained between exhibit and visitor areas to reduce the potential of disease transmission from the public as well as complaints from odor. If possible, separate systems also should be maintained for individual exhibits.

Water - Fresh clean water for drinking should be available at all times. Watering devices should consist of either exhibit built-ins for the larger species or sturdy portable containers for smaller species. Regardless of size, water containers should be cleaned and disinfected daily. Some large felids, especially tigers and jaguars, enjoy bathing and swimming, and large pools should be incorporated into outside exhibits, as appropriate.

Sanitation - Hard-surface primary enclosures and food containers (if used) should be cleaned daily with detergent and disinfectant. Perches and shelves where animals climb and sit should also be included in this regime. Dirt substrates in outdoor planted exhibits should be raked and spot-cleaned daily. Footbaths containing quaternary chemicals should be used prior to entering all felid enclosures or areas containing enclosures. Each should be filled with a disinfectant and its use strictly adhered to by all personnel.

Food - Large felids are easily maintained when fed prepared diets made from beef or horse products. Diets of this type may be obtained from commercial sources that already have the appropriate vitamins and minerals added, in amounts that vary according to the age and status of the specimen. Similar diets may also be prepared in-house. Whole animal carcasses (rodents, rabbits, or fowl), may be substituted upon occasion to vary the diet. To address problems with obesity, felids may be fasted one or two days a week. Bones, especially those from joints or knuckles, also should be given at least once or twice a week to maintain good oral hygiene and muscle tone; fast days are good opportunities.

In the past, many zoos fed large felids muscle meat from freshly butchered livestock. Although this source of feed is still occasionally used, owners are cautioned that diets consisting primarily of whole or ground muscle meat may be inadequate in vitamin/mineral content. Diets containing high percentages of fowl by-products such as chicken or turkey necks may also be nutritionally unbalanced. Owners should also be wary of carcasses obtained from road kills or donations because of the potential for contamination, and feed animals selected from such sources should be inspected to insure that they are free of disease..

Veterinary Care - Services of a veterinarian should be available. Periodic (at least twice yearly) fecal examinations should be required to check for parasite infestation. When circumstances permit, overall examinations should be performed and the results recorded. Annual vaccinations should include prophylaxis against feline panleukopenia (distemper), rhinotracheitis, and calicivirus. In areas where tetanus is endemic, felids should be vaccinated for this disease on an annual basis. Felids also are susceptible to non-specific diseases like tuberculosis.

All large felids nearing adult size that are likely to be transferred to another institution in the future should be tattooed or receive microchip implants when the opportunity arises. Common species such as pumas, and specimens not otherwise eligible for studbook registration should be identified by their accession or ISIS numbers. Specimens entered in regional or international studbooks should have their registration number tattooed on the inner aspect of the thigh, or other area as directed by the studbook keeper.

SPECIAL REQUIREMENTS

For purposes of the following discussions, large felids are divided into three groups based primarily on size, husbandry, or behavioral idiosyncrasy. No taxonomic relationship should be inferred.

1. VERY LARGE PANTHERIDS: *Panthera leo*, lion, and *P. tigris*, tiger.

Two species of felids may be described in this fashion, the African or Asian lion and the tiger; each species is represented in captivity by several subspecies or combinations thereof. Both are large species filling carnivorous niches at the top of their respective trophic levels. A number of subspecies have been named for each species but husbandry requirements do not differ among them.

Lions are the largest predator in Africa (and formerly the Middle East to India) and males attain weights of 330-550 lb (150-250 kg). Females are somewhat smaller (Nowak & Paradiso, 1983). Tigers occupy a similar niche in Asia and although there is less dimorphism in size; tigers from insular origins are smaller than those from the mainland and Siberia. The most northerly race is the largest living cat and males weight 390 -675 lb (180 - 306 kg). In contrast, male tigers from Sumatra weigh only 220 - 300 lb (100 - 140 kg). Both species have gestations of approximately 105 days, and produce litters of 2-5 young (Nowak & Paradiso, 1983). Both orange and white morphs are present in captivity, although the former is more common (Seifert and Muller, 1987).

A. Social Grouping: Since they are solitary at least part of their life, either species may be kept singly as well as in pairs. Large exhibits may contain additional females although some older female tigers may not tolerate other females. Males should normally be kept separate from other males. Mothers with infants should be moved to a cubbing den or location away from other animals prior to birth, and not reintroduced to other adults until after the cubs are 2 or 3 months old. Adult lions of both sexes will tolerate cubs of other females if adequate space is available. Many adult male tigers also tolerate females and their cubs.

B. Exhibit Size: Lions and tigers are easily maintained in traditional barred or heavily wired cages as well as in large outdoor exhibits employing moats to separate animals and public. A cage for a single animal should measure at least 20 ft (6.1 m) wide x 15 ft (4.6 m) deep (300 sq.ft/27.9 sq.m); cages should be 50% larger per additional animal. Although adults do not climb well, their leaping ability should not be underestimated. Outdoor cages should have vertical jumpwalls at least 16 ft (4.88 m) high or be provided with tops at least 10 ft (3.1 m) high. If moats are used as a barrier, they should be at least 25 ft (7.6 m) wide and 15 ft (4.6 m) deep. All enclosures must have smaller shift facilities to permit safe cleaning, cage repair, or other separations. Shift cages should measure at least 8 ft by 8 ft (2.44 m x 2.44 m). Because both species are easily bred, owners not wanting young or who are unable to use birth control implants or neutering should build separate cages to separate adults.

C. Remarks: Although both lions and tigers are terrestrial in nature, they benefit from raised shelves or ledges for sleeping and resting. Large logs are used for claw sharpening. Young of both species may be raised naturally or by hand without impairing future parenting ability.

2. OTHER LARGE FELIDS: *Panthera onca*, jaguar; *P. pardus*, leopard or panther; *Uncia uncia*, snow leopard; *Puma concolor*, puma, cougar, or mountain lion; *Neofelis nebulosa*, clouded leopard.

The five felids listed above are discussed together because of their similarity in size. All but the snow leopard have numerous subspecies whose distinctions may be ignored for purposes of this discussion.

The jaguar is the largest New World felid and ranges from the southern tip of South America northward into Mexico, and formerly, into the United States. Although similar in length to the leopard, jaguars are heavier and males weigh 79 - 348 lb (36 - 158 kg) ; females are somewhat smaller (Hall, 1981; Nowak & Paradiso, 1983).

The puma, also called cougar, panther, or mountain lion in various parts of its range, is distributed throughout the New World from the tip of South America northward to British Columbia and Alberta. Puma weights, 148 - 227 lb (68 - 103 kg) vary widely throughout their range; specimens from Canada are largest (Hall, 1981; Nowak & Paradiso, 1983).

The leopard is the widest ranging felid in the world, and is found from South Africa across that continent to the Middle East, Java, and northward to Siberia. Sizes vary widely according to habitat, and range from 82 - 200 lb (37 - 90 kg) (Nowak & Paradiso, 1983); those from desert areas are smallest. Patterns vary markedly throughout their range and animals from moist dense forests may be melanistic (Kingdon, 1977).

The snow leopard appears similar in size to the common leopard although thick fur belies its lighter weight: 55- 165 lb (25-75 kg) (Nowak & Paradiso, 1983). The smallest member of the "large" felids is the Clouded leopard (Nowak & Paradiso, 1983). Highly arboreal and restricted to undisturbed forests of South-east Asia and Indonesia, it weighs only 35 - 50 lb (16-23 kg). Average gestation for all five species is 90 - 103 days, slightly less for clouded leopards. Litter sizes average 2-3 young (Nowak & Paradiso, 1983).

A. Social Grouping: All five species are solitary in nature and may be kept by themselves or in pairs except when young are present. Compatibility in some species, especially leopards and clouded leopards, may be a problem. Some leopards are only compatible while the female is in estrus (heat).

Clouded leopards are the most difficult members of this group to establish as compatible pairs. To insure compatibility, potential mates should be introduced to each other while approximately 4-12 months of age and not separated for long periods thereafter. While the female is separated and raising young, the male should be housed nearby; some females will, while raising cubs, even tolerate the male in the same exhibit if space and den size is sufficient (Shoemaker, pers. ob.).

B. Exhibit Size: Felids in this group are generally kept indoors or in situations that permit viewing through glass, bars or sturdy wire. Otherwise their small size and secretive nature make them difficult to safely exhibit in large moated facilities commonly used for lions and tigers. Minimum cage dimensions for single animals should equal at least 200 square feet, and be increased by 50% for each additional animal. As in the case of large pantherids, a shift cage(s) should be available. Because all five species are excellent climbers and leapers, secure tops should cover all outside enclosures.

C. Remarks: All five species are arboreal or live in rocky habitats and should be furnished with elevated ledges or perches for sleeping and resting. Wood logs or other devices should also be included. Young of all species may be raised naturally or by hand.

3. CHEETAH: *Acinonyx jubatus*. The cheetah is morphologically and behaviorally quite unlike the two groups discussed above. A diurnal species, cheetahs are physically adapted for running at very high speed over short distances. Although approximately the same length as most large felids, they are much lighter in build and weigh only 77 - 125 lb (35 - 57 kg). Like other large felids, males are larger. Gestation is 90-95 days and litter sizes are 3-5 (Nowak & Paradiso, 1983).

A. Social Grouping: In nature, cheetahs tend to be solitary but adults may be kept as pairs or in larger groups with little difficulty. Problems in establishing breeding groups may, however, necessitate keeping adults of either sex separate from each other except during pairing to stimulate reproduction.

B. Exhibit Size: Cheetahs do best in spacious outdoor areas surrounded by fence or moated barriers. If kept in caged conditions, minimum dimensions should equal at least 200 square feet (18.6 square meters). Because they lack sharp retractable claws, cheetahs climb poorly but benefit from elevated wooden platforms or ledges for sleeping and resting.

C. Remarks: Cheetahs are relatively easy to keep in captivity but remain the most difficult large felid to propagate consistently. With the exception of the Pretoria Zoological Garden's breeding facility at DeWildt Breeding and Research Center, this species is not self-sustaining in captivity (Marker, 1977). Although consistent husbandry techniques have not been identified to date, many owners experiencing successful reproduction keep female(s) separate from males except when they are in estrus (heat). Young may be raised naturally or by hand although breeders were primarily mother reared.

Cheetahs suffer from unusually high incidences of liver disease and research is presently (1988) seeking solutions to this aspect of their husbandry. Other investigations of their physiology seem to suggest that dietary idiosyncrasies play a more important role in the cheetah's fecundity than for other large felids, and managers should stay abreast of new developments.

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