Red Panda (*Ailurus fulgens*) Care Manual
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Disclaimer: This manual presents a compilation of knowledge provided by recognized animal experts based on the current science, practice, and technology of animal management. The manual assembles basic requirements, best practices, and animal care recommendations to maximize capacity for excellence in animal care and welfare. The manual should be considered a work in progress, since practices continue to evolve through advances in scientific knowledge. The use of information within this manual should be in accordance with all local, state, and federal laws and regulations concerning the care of animals. While some government laws and regulations may be referenced in this manual, these are not all-inclusive nor is this manual intended to serve as an evaluation tool for those agencies. The recommendations included are not meant to be exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Commercial entities and media identified are not necessarily endorsed by AZA. The statements presented throughout the body of the manual do not represent AZA standards of care unless specifically identified as such in clearly marked sidebar boxes.
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Introduction

AZA accreditation standards, relevant to the topics discussed in this manual, are highlighted in boxes such as this throughout the document (Appendix A).

AZA accreditation standards are continuously being raised or added. Staff from AZA-accredited institutions are required to know and comply with all AZA accreditation standards, including those most recently listed on the AZA website (http://www.aza.org) which might not be included in this manual.

Taxonomic Classification

Table 1: Taxonomic classification for red panda

<table>
<thead>
<tr>
<th>Classification</th>
<th>Taxonomy</th>
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<tbody>
<tr>
<td>Kingdom</td>
<td>Animalia</td>
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<tr>
<td>Phylum</td>
<td>Chordata</td>
</tr>
<tr>
<td>Class</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Order</td>
<td>Carnivora</td>
</tr>
<tr>
<td>Suborder</td>
<td>Caniformia</td>
</tr>
<tr>
<td>Family</td>
<td>Ailuridae</td>
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</tbody>
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Genus, Species, and Status

Table 2: Genus, species, and status information for red pandas

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Supspecies</th>
<th>Common Name</th>
<th>USA Status</th>
<th>IUCN Status</th>
<th>AZA Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ailurus</td>
<td>fulgens</td>
<td>fulgens</td>
<td>Red Panda</td>
<td>Not Listed</td>
<td>Vulnerable</td>
<td>SSP</td>
</tr>
<tr>
<td></td>
<td>refulgens (styani)</td>
<td></td>
<td>Lesser Panda</td>
<td>Not Listed</td>
<td>Vulnerable</td>
<td>SSP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Firefox</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General Information

The information contained within this Animal Care Manual (ACM) provides a compilation of animal care and management knowledge that has been gained from recognized species experts, including AZA Taxon Advisory Groups (TAGs), Species Survival Plan® Programs (SSPs), Studbook Programs, biologists, veterinarians, nutritionists, reproduction physiologists, behaviorists and researchers. They are based on the most current science, practices, and technologies used in animal care and management and are valuable resources that enhance animal welfare by providing information about the basic requirements needed and best practices known for caring for ex situ red panda populations. This ACM is considered a living document that is updated as new information becomes available and at a minimum of every five years.

Information presented is intended solely for the education and training of zoo and aquarium personnel at AZA-accredited institutions. Recommendations included in the ACM are not exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Statements presented throughout the body of the manuals do not represent specific AZA accreditation standards of care unless specifically identified as such in clearly marked sidebar boxes. AZA-accredited institutions which care for red pandas must comply with all relevant local, state, and federal wildlife laws and regulations; AZA accreditation standards that are more stringent than these laws and regulations must be met (AZA Accreditation Standard 1.1.1).

The ultimate goal of this ACM is to facilitate excellent red panda management and care, which will ensure superior red panda welfare at AZA-accredited institutions. Ultimately, success in our red panda
management and care will allow AZA-accredited institutions to contribute to red panda conservation, and ensure that red pandas are in our future for generations to come.

The red panda, *Ailurus fulgens fulgens* and *A. f. refulgens* (*styani*), while still something of a taxonomic enigma, is currently accorded separate familial status (*Ailuridae*) (Roberts & Gittleman, 1984). Morphological and physiological adaptations of *Ailurus* are specialized for a high altitude temperate environment and a bamboo diet. The red panda has dense pelage (extending to the soles of the feet) and a low metabolic rate. It also has the capability to reduce its metabolic rate without lowering its body temperature apparently as a conservative energetic strategy. The dentition of *Ailurus* follows the general procyonid pattern, but exhibits significant molar hypertrophy and inclusion of supernumerary molar cusps and cusplets that enlarge occlusal surface area presumably to aid in the mastication of bamboo (Roberts & Gittleman, 1984).

*Ailurus* lives in the montane mixed deciduous-conifer forests of the Himalayas and the major mountain ranges of southwestern China. It is solitary, nocturnal, and scansorial, coming to the ground to eat bamboo and retires to the trees to sleep and nest. It is well adapted morphologically and physiologically to a consistently cool and moist environment. While the red panda feeds primarily on bamboo, its diet is more seasonally variable than the giant panda, another bamboo specialist, in that berries, fruits and even young leaves and bark are eaten. While it occasionally captures birds and small vertebrates, its diet is considerably more herbivorous than that of the procyonids, which are true omnivores (Roberts & Gittleman, 1984).

There are two recognized subspecies, *fulgens* and *refulgens* (*previously designated as *styani*). *Fulgens* are found in the western part of the red panda’s range, including India, Nepal and Myanmar. *Refulgens* (*styani*) are found in the eastern part of the range, primarily China. *Fulgens* tend to be the smaller of the two species with lighter pelage notably the face. *Fulgens* also have sharper looking profile. Average weights for *fulgens* are from 4.5–5.5 kg (10–12 lbs). *Refulgens* (*styani*) average 6.5–7.5 kg (14–16.5 lbs). Please see Appendix I for a calculation worksheet to help determine an appropriate weight for your individual.

The red panda zoo population has been designated as a Species Survival Plan® (SSP) Program by the AZA Small Carnivore Taxon Advisory Group (TAG), and a target population size has been set at 275 (AZA Small Carnivore TAG Regional Collection Plan, 2009). The 2011 population is 182 specimens distributed among 72 AZA institutions.
Chapter 1. Ambient Environment

1.1 Temperature and Humidity

Animal collections within AZA-accredited institutions must be protected from weather detrimental to their health (AZA Accreditation Standard 1.5.7). Animals not normally exposed to cold weather/water temperatures should be provided heated enclosures/pool water. Likewise, protection from excessive cold weather/water temperatures should be provided to those animals normally living in warmer climates/water temperatures.

Temperatures at the upper range are of more concern with red pandas then thermal lows, therefore, some part of the enclosure should be in shade throughout the day, particularly when temperature is above 23.8 °C (75 °F) (Roberts, 1980). Indoor housing or access to an insulated nest box should be provided where winter temperatures drop below -6.6 °C (20 °F). In areas of extreme cold, supplemental heat should be provided in indoor housing and/or nest boxes. Ideally, these areas should be maintained between 1.6 °C (35 °F) and 23.8 °C (75 °F). Red pandas should be given access to their outdoor exhibit at all times (Roberts & Glatston, 1988).

Nest boxes should be placed in areas which are in the shade when the temperature exceeds 23.8 °C (75 °F). Zoos subject to hot summer months should provide access to air conditioned holding or nest boxes and should be provided when temperatures get above 26.6 °C (80 °F) (especially with high humidity) and for pregnant females. Misters are also sometimes provided to keep the animals cool (Roberts & Glatston, 1994). Heat stress in red pandas is greatly exacerbated by high humidity. Air-conditioned indoor holding or nest boxes should be provided where temperatures get above 26.6 °C (80 °F) especially with high humidity.

AZA institutions with exhibits which rely on climate control must have critical life-support systems for the animal collection and emergency backup systems available, while all mechanical equipment should be included in a documented preventative maintenance program. Special equipment should be maintained under a maintenance agreement or records should indicate that staff members are trained to conduct specified maintenance (AZA Accreditation Standard 10.2.1).

1.2 Light

Careful consideration should be given to the spectral, intensity, and duration of light needs for all animals in the care of AZA-accredited zoos and aquariums.

Red pandas should be housed in outdoor exhibits with access to inside quarters if climactic conditions (e.g., extreme heat, rain, or excessive cold) warrant it. Animals should never be locked in holding quarters for extended periods of time (1 month or more, unless a mother with cubs) therefore artificial lighting is not required. If for some reason, such as in quarantine, animals are kept inside, day night cycles should be set to provide photoperiod similar to that at 40 degrees latitude.

1.3 Water and Air Quality

AZA-accredited institutions must have a regular program of monitoring water quality for collections of aquatic animals and a written record must document long-term water quality results and chemical additions (AZA Accreditation Standard 1.5.9). Monitoring selected water quality parameters provides confirmation of the correct operation of filtration and disinfection of the water supply available for the collection. Additionally, high quality water enhances animal health programs instituted for aquatic collections.
Red pandas are a terrestrial species that do not require water systems. However, fresh water should be available to all animals at all times of day. Care should be taken so that sufficient water is available and freezing is avoided. When there is no fresh potable water available in the exhibit, sturdy bowls that are not easily inverted are usually suitable for providing water. Animals with restricted water intake will also decrease food intake, so the availability of fresh water is very important (Roberts & Glatston, 1994).

Air exchange rate needs are not generally applicable since red pandas are usually housed outdoors. If kept indoors, a variable speed ventilation system capable of providing 10 air exchanges per hour is recommended.

1.4 Sound and Vibration
Consideration should be given to controlling sounds and vibrations that can be heard by animals in the care of AZA-accredited zoos and aquariums.

At this time, it is unknown for red pandas what the tolerances are for sound and vibration, however, as with any wildlife, those disturbances should be kept to a minimum. Noise should be minimized before and after parturition. If air conditioning is used, the unit should be on at least one month prior to parturition to allow for acclimation. Some individuals benefit from background noise from televisions or radios.
Chapter 2. Habitat Design and Containment

2.1 Space and Complexity

Careful consideration should be given to exhibit design so that all areas meet the physical, social, behavioral, and psychological needs of the species. Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs (AZA Accreditation Standard 1.5.2).

The same careful consideration regarding exhibit size and complexity and its relationship to the red panda’s overall well-being must be given to the design and size all enclosures, including those used in exhibits, holding areas, hospital, and quarantine/isolation (AZA Accreditation Standard 10.3.3).

In captivity red pandas are nocturnal and crepuscular and exhibit a polyphasic activity pattern throughout the night. Their activity patterns change throughout the year in response to temperature, feeding regimes, and the presence of young (Roberts & Glatston, 1994). Their gross behavioral repertoire includes scent marking behavior, a tendency to maintain personal distance except during breeding season, the propensity to climb and hide from disturbing/frightening elements such as loud noises, natural foraging feeding activities, breeding associated activities, young rearing behaviors, and sleep. To accommodate these behaviors, and others, enclosures should follow these guidelines (Roberts & Glatston, 1994).

Environment: Enclosures should have natural substrate planted with edible grasses and contain a variety of elevations. Red pandas prefer to rest on elevated perches above the level of the viewing public, so attention should be given to furnishing the animals with this possibility by providing a variety of climbing structures and resting perches at various locations and heights, in the enclosure. The environment should include rocks, trees, pools, logs, clumps of vegetation etc. These will provide both adequate shade and facilitate the animals’ need to withdraw from the direct gaze of the general public at times (Roberts & Glatston, 1994). Public access should be restricted to one, or at most two, sides of the enclosure so that animals can retreat from public disturbance (Roberts & Glatston, 1994). Enclosures should not be located near aggressive animals, which can disturb the red pandas: a distance of at least 50 m (164 ft) between a red panda exhibit and that of a large carnivore is recommended. Also, red pandas should not be situated close to busy traffic routes or noisy gathering places. However, enclosure size is an important parameter: animals housed in large enclosures can probably tolerate more disturbance from traffic or the public than those in small ones (Roberts & Glatston, 1994).

Red pandas generally prefer to rest and sleep alone except during breeding season. Exhibits should be designed with this behavioral norm in mind. Pairs of pandas should not be housed closer than 10 m (30 ft) from one another. Visual barriers should be placed between adjacent pairs (Roberts & Glatston, 1994).

Enclosures require a floor area of at least 40 m² (~430 ft²), preferably more, and should be at least 4 m (~12 ft) high or have climbing structures of this height (assuming the enclosure(s) is not entirely open) as red pandas prefer to rest in elevated perches above the level of the viewing public. Natural substrate planted with edible
grasses is strongly recommended, as animals will graze grasses and forbs; it is recommended that at least 50% of the enclosure be planted with edible grasses. Provide climbing apparatus for older animals but beware: red pandas are escape artists.

The size of the enclosure and its location within the zoo should be taken into account when planning public access: a large enclosure in a quiet location can have access around a greater proportion of the perimeter than a small enclosure in a busier area. Following parturition red panda females become increasingly intolerant of public disturbance and provision should be made to reduce public disturbance after birth (Roberts & Glatston, 1994).

For a more natural feeding scenario mechanisms to fasten bamboo to trees, or other upright structures should be incorporated into the exhibit. One inch or less diameter PVC pipes are recommended.

Scent marking is important for this species. On the plantar surface of the feet there are a series of small pores from which small amounts of clear, colorless, and odorless fluid appears. These pores are contained in slightly raised areas between the plantar pads, and are associated with small, slightly elongated, and thickened hairs. The substance, believed to be secreted by these pores, is used in depositing scent trails. Urine and secretions originating from the anogenital region may be other sources of scent.

Because of this propensity to mark their environment, furniture/substrate in red panda enclosures should be allowed to build up scent posts. These areas should be monitored and cleaned on a rotating basis, however.

**Barriers:** Enclosures may be surrounded by mesh, walls, moats, fences, glass, or any combination thereof that does not endanger the health and safety of the animals. Red pandas are excellent climbers, but poor jumpers, so dry-moated enclosures contain them well. Red pandas can swim well, so enclosure barriers need to be constructed with this in mind. Barriers should be at least 1.2 m (4 ft) in height and the surface should be very smooth or they should be topped with a smooth overhang. Water moats should only be used in combination with other barriers (Roberts & Glatston, 1994). Do not let the branches of climbing trees overhang the boundary fence (Roberts & Glatston, 1994). It has not been determined if hotwire is an effective barrier. Hotwire is used in some cases to keep wildlife from entering the exhibit. If used, it should be considered a secondary barrier and should have an alternating current that is no higher than 6.3 khz. If there are cubs in the exhibit, the hotwire should be turned off or reduced.

Barriers function not only to keep the animals in, but also to keep unwanted visitors out. Injury and deaths can arise when zoo visitors, domestic cats or endemic species such as raccoons or badgers enter red panda enclosures (Roberts & Glatston, 1994). Care should be taken to prevent red pandas from having contact with endemic species or their feces (especially raccoons which in many areas carry canine distemper).

**Nest Boxes:** A minimum of n+1 (number of red pandas plus one) nest boxes should be provided to allow hiding and sleeping choices for the animals within the enclosure. These should be constructed of insulative material and placed at different shaded locations in the enclosure so as to maintain a temperature not to exceed 23.8 °C (75 °F) during hot weather. Some part of the enclosure is to be in shade throughout the day when temperature is above 23.8 °C (75 °F) to provide animals relief from the radiant heat of the sun (Roberts & Glatston, 1994).

Nest boxes ranging from 61 cm wide x 91 cm long x 51 cm high, up to 91 cm wide x 127 cm long x 76 cm high (24 in. x 36 in. x 20 in., to 36 in. x 50 in. x 30 in.) have been used in North American zoos. Smaller, insulated nest boxes are preferable in cold climates if supplemental heat is not provided. It is suggested that a choice of sizes should be available (Roberts & Glatston, 1994).
An SSP-endorsed survey targeted at all red panda holding facilities was developed, distributed, and analyzed. The aim of the survey was to elucidate the important components of red panda nest boxes and their management during cubbing season. Cub mortality has historically been the greatest threat to the zoo population. The first 30 days are the most critical—and since cubs are nest-bound for that entire period (and more) the nest box environment is an important factor to assess. Analyses of the survey showed two factors: nest box temperature and keeper access to cubs (location of door where cubs were removed for health checks), significantly impacted cub survival. Nest boxes, which maintained temperatures less than 23.8 °C (75 °F) during cubbing season, had higher cub survival rates. In addition, those with keeper access doors separate from animal access doors had higher cub survival rates.

**Nest Box Design Recommendations and Suggestions:**

- Separate animal entry doors and keeper entry doors. Keeper entry doors should be out of sight of the mother red panda.
- Temperature and humidity controlled nest boxes. Temperatures should not exceed 23.8° C (75° F).
- Made of materials that are easily cleaned and preferably well insulated.
- Provide a source of natural light.
- An infrared camera setup to observe mother/cub interactions.
- Offer no less than three nest boxes in each enclosure.
- It is good to have nest boxes in shaded areas.
- Nest boxes should be away from public areas.
- Have a way to lock the mother out while the keeper accesses the cubs.

Wood wool, straw, or other appropriate bedding should be provided for all nest boxes (Roberts & Glatston, 1994). Red pandas also will use exhibit plants as nesting material.

### 2.2 Safety and Containment

Animals housed in free-ranging environments should be carefully selected, monitored and treated humanely so that the safety of these animals and persons viewing them is ensured (AZA Accreditation Standard 11.3.3).

Animal exhibits and holding areas in all AZA-accredited institutions must be secured to prevent unintentional animal egress (AZA Accreditation Standard 11.3.1). Exhibit design must be considered carefully to ensure that all areas are secure and particular attention must be given to shift doors, gates, keeper access doors, locking mechanisms and exhibit barrier dimensions and construction.

Red pandas are adept climbers and swimmers, so enclosure barriers should be constructed with this in mind. Barriers should be at least 1.2 m (4 ft) in height, and the surface should be very smooth or they should be topped with a smooth overhang. Water moats should only be used in combination with other barriers.

It has not been determined if hotwire is an effective barrier. Hotwire is used in some cases to keep wildlife from entering the exhibit. If used, it should be considered a secondary barrier and should have an
Alternating current that is no higher than 6.3 khz. If there are cubs in the exhibit, the hotwire should be turned off or reduced.

It is important that branches of climbing trees are not allowed to overhang the boundary fence.

Injury and deaths can arise when zoo visitors, domestic cats, or endemic species such as raccoons or badgers enter red panda enclosures. Care should also be taken to prevent red pandas from having contact with endemic species or their feces (especially raccoons, which in many areas carry canine distemper).

Exhibits in which the visiting public may have contact with animals must have a guardrail/barrier that separates the two (AZA Accreditation Standard 11.3.6).

All emergency safety procedures must be clearly written, provided to appropriate staff and volunteers, and readily available for reference in the event of an actual emergency (AZA Accreditation Standard 11.2.3).

Staff training for emergencies must be undertaken and records of such training maintained. Security personnel must be trained to handle all emergencies in full accordance with the policies and procedures of the institution and in some cases, emergency (AZA Accreditation Standard 11.6.2).

Emergency drills should be conducted at least once annually for each basic type of emergency to ensure all staff is aware of emergency procedures and to identify potential problematic areas that may require adjustment. These drills should be recorded and evaluated to ensure that procedures are being followed, that staff training is effective and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills should be maintained and improvements in the procedures duly noted whenever such are identified. AZA-accredited institutions must have a communication system that can be quickly accessed in case of an emergency (AZA Accreditation Standard 11.2.4).

AZA-accredited institutions must also ensure that written protocols define how and when local police or other emergency agencies are contacted and specify response times to emergencies (AZA Accreditation Standard 11.2.5).

AZA-accredited institutions which care for potentially dangerous animals must have appropriate safety procedures in place to prevent attacks and injuries by these animals (AZA Accreditation Standard 11.5.3).

Animal attack emergency response procedures must be defined and personnel must be trained for these protocols (AZA Accreditation Standard 11.5.3).

To a large extent, red pandas are not dangerous. However, they are more than capable of protecting themselves. Red pandas do have strong, sharp claws and a very strong bite. They are capable of causing injury when trying to climb a person like a tree. There have been a few cases of red pandas that have exhibited aggression towards keepers, and in those cases, the ability to shift the animal to another area for cleaning is recommended. It is also recommended to train red pandas to go into a crate, so netting is not necessary.

Animal attack emergency drills should be conducted at least once annually to ensure that the institution’s staff know their duties and responsibilities and know how to handle emergencies properly when they occur. All drills need to be recorded and evaluated to ensure that procedures are

AZA Accreditation Standard
(11.2.3) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency. These procedures should deal with four basic types of emergencies: fire, weather/environment; injury to staff or a visitor; animal escape.

AZA Accreditation Standard
(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e., shooting teams).

AZA Accreditation Standard
(11.2.4) The institution must have a communication system that can be quickly accessed in case of an emergency.

AZA Accreditation Standard
(11.2.5) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

AZA Accreditation Standard
(11.5.3) Institutions maintaining potentially dangerous animals (sharks, whales, tigers, bears, etc.) must have appropriate safety procedures in place to prevent attacks and injuries by these animals. Appropriate response procedures must also be in place to deal with an attack resulting in an injury. These procedures must be practiced routinely per the emergency drill requirements contained in these standards. Whenever injuries result from these incidents, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident.

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being followed, that staff training is effective, and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills must be maintained and improvements in the procedures duly noted whenever such are identified (AZA Accreditation Standard 11.5.3).

If an animal attack occurs and injuries result from the incident, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident (AZA Accreditation Standard 11.5.3).
Chapter 3. Transport

3.1 Preparations

Animal transportation must be conducted in a manner that adheres to all laws, is safe, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11). Safe animal transport requires the use of appropriate conveyance and equipment that is in good working order.

The equipment must provide for the adequate containment, life support, comfort, temperature control, food/water, and safety of the animal(s).

Safe transport also requires the assignment of an adequate number of appropriately trained personnel (by institution or contractor) who are equipped and prepared to handle contingencies and/or emergencies that may occur in the course of transport. Planning and coordination for animal transport requires good communication among all affected parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

After capture red pandas should always be weighed. When animals are transferred to a new exhibit/zoo, the tattoo and/or chip should be checked and the gender of the animals should be checked. Red pandas do not need to be sedated during transport.

Red pandas should be transported in an IATA recommended crate (50 cm long x 40 cm wide x 45 cm high [19.6 in. x 15.7 in. x 17.3 in.]). One of the short sides of the crate should be made of cage wire for ventilation. Sky kennels or similar airline approved plastic pet carriers work well. Modifications should be made to prevent airport personnel from accidentally opening crates. Any doors of the sky kennel should be secured with zip-ties on all four corners. Mesh ventilation panels and doors should be loosely covered with an open weave fabric such as burlap to provide privacy without overly restricting airflow.

In the event of a longer journey sliced fruit should be provided. The animal’s normal diet can be sent along during transport to provide familiar foods. If being transferred to another institution, sufficient food to transition to an alternative diet should be provided as well. Food and water containers should be securely fastened to the door of the crate with access from the outside to add or refill.

3.2 Protocols

Transport protocols should be well defined and clear to all animal care staff.

Capture: If not already crate trained, red pandas can be safely captured using a net or, if on the ground, a plastic bin can be placed over the animal and then the top slid underneath. One institution developed a method of trapping red pandas in a perspex tube. The animals were trained to accept food inside wooden nest-boxes, and were then closed inside the box when it was necessary to inject them or handle them in other ways. Once inside, a translucent metacrilate tube 2.5 m long and about 0.25 m in diameter is attached to the nest-box hole. The small sliding door is removed, and the animal may pass into the cylinder. Both ends of the tube are then closed with pieces of plastic. Since the diameter of the tube does
not let the animal turn one has access to the red panda's tail and can inject the vaccine or anesthetic while a keeper grasps the hind legs to avoid injuries to the veterinarian's hands. Usually the whole procedure is very fast and within a few seconds the animal is released, either into another box while the anesthetic takes effect, or into the enclosure, depending on the situation (Garcia del Campo and Monsalve, personal communication).

Prior to capture it is helpful if the trees are made inaccessible to the animals. This can be achieved by tacking a flexible sheet of plastic, 50 cm (20 in.) wide, around the trunks of the climbing trees. Hand restraint is not recommended.

**Shipping:** Red pandas should always be shipped individually. Each crate should contain a layer of wood wool or similar bedding material. In the event of a longer journey sliced fruit should be provided. Red pandas do not need to be sedated during transport.

Red pandas should only be transported in spring or fall, ideally in temperatures between 7.2–15.5 °C (45–60 °F).
4.1 Group Structure and Size

Careful consideration should be given to ensure that animal group structures and sizes meet the social, physical, and psychological well-being of those animals and facilitate species-appropriate behaviors.

Breeding red pandas should remain together 24 hours per day throughout the year. Exceptions would be in the case of male aggression towards cubs or if the female is denned before parturition. Adult males (>1 year old) are not to be housed together in the presence of a female. Even when no female is present, all male groups can be difficult and are best attempted in large enclosures and should be monitored closely. Male siblings who have been together since birth can be usually maintained successfully as groups in the absence of females.

The male may remain in the enclosure with the female after birth unless there are obvious signs that he is interfering with or inhibiting normal maternal care. Temporary (when no other pairing options are available) trios of one male and two females may be assembled for breeding purposes providing that one female is separated from the group at least 2–4 weeks prior to parturition (Roberts & Glatston, 1994).

Young may remain with the parents at least through the next breeding season and up to one month prior to the next anticipated birth. Juveniles should not be separated from their parents earlier than February to ensure proper socialization and weaning. To avoid inbreeding, young should be separated from their opposite sex parent at no older than 18 months. After separation, juveniles and sub-adults should remain in social groupings until they are placed in breeding pairs (Roberts, 2002).

Every effort should be made to house solitary individuals with similarly aged individuals to ensure socialization. Pair formation should occur no later than 6 weeks prior to the onset of the forthcoming breeding season. In the northern hemisphere, the breeding season begins approximately at the beginning of winter (i.e., the end of December).

4.2 Influence of Others and Conspecifics

Animals cared for by AZA-accredited institutions are often found residing with conspecifics, but may also be found residing with other species. Red pandas are typically maintained in single species exhibits. In 2010, the zoos that were holding red pandas at that time were asked if they were or had held pandas with other species. The following table shows what species have been exhibited with red pandas and any considerations or problems that occurred.

Table 4: Species successfully exhibited with red pandas

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Considerations / problems</th>
</tr>
</thead>
</table>
| Chinese Muntjac | Muntiacus reevesi | • Both species share the exhibit during the day; the pandas are closed into their shelter and separated from the muntjac overnight.  
• Need a slow intro- if the red pandas are non-breeders, they will do fine.  
• A muntjac ended up breaking its leg trying to get out of the exhibit and panicking with people around.  
• During breeding season for the pandas, pandas sometimes became aggressive. Pandas were aggressive towards Muntjac fawns. Male muntjac sometimes aggressive with pandas. |
| Japanese Koi | Cyprinus carpio | • No problems |
| White-naped Crane | Grus vipio | • They all get along very well. Pandas stay up in the tree 90% of the time. |
| Chinese Goral | Naemorhedus griseus | • Species ignore each other. |

Human Interaction: Keepers generally work in enclosures with red pandas, taking care to give the animals opportunity to avoid them. Physical contact should be avoided as it may stress animals and can lead to aggression. Red pandas should be regarded with caution as they do have sharp claws and extremely strong jaws, and will defend themselves and young. “Unprovoked” attacks on keepers have been reported, most commonly with hand raised individuals. Red pandas that show aggression towards keepers should be shifted so keepers do not have to enter exhibits with them. Scruffing is not an
appropriate or effective means of restraint and could potentially result in serious keeper injury. Red pandas have been successfully trained to enter holding areas or crates, to station on scales and even to hold for injections, palpation, and vaginal swabs.

4.3 Introductions and Reintroductions

Managed care for and reproduction of animals housed in AZA-accredited institutions are dynamic processes. Animals born in or moved between and within institutions require introduction and sometimes reintroductions to other animals. It is important that all introductions are conducted in a manner that is safe for all animals and humans involved.

Red panda introductions rarely result in aggression, but should be done gradually nonetheless. It is better to introduce a male to a female once she is established in the enclosure. Gradual introduction (e.g., olfactory, followed by visual, followed by physical contact) in neutral territory is preferred. Providing distractions (e.g., bamboo or treats spread through the introduction area) can help ease introductions. Care should be taken to not provide areas where one animal can corner another.
5.1 Nutritional Requirements

A formal nutrition program is recommended to meet the nutritional and behavioral needs of all red pandas (AZA Accreditation Standard 2.6.2). Diets should be developed using the recommendations of nutritionists, the Nutrition Scientific Advisory Group (NAG) feeding guidelines (http://www.nagonline.net/Feeding%20Guidelines/feeding_guidelines.htm), and veterinarians as well as AZA Taxon Advisory Groups (TAGs), and Species Survival Plan® (SSP) Programs. Diet formulation criteria should address the animal’s nutritional needs, feeding ecology, as well as individual and natural histories to ensure that species-specific feeding patterns and behaviors are stimulated.

Feeding Ecology and Digestive System Morphology & Physiology: Red pandas are in the order Carnivora and are the only species in the family Ailuridae. Red pandas have a simple stomach, with no cecum and a short gastrointestinal tract (Stevens & Hume, 1995). These are adaptations for easily digestible foods that usually form the diet of carnivores (i.e., meat). However in the wild, red pandas have specialized in a diet of bamboo leaves and shoots that could account for ~95% of the total food consumed. In autumn, the diet of in situ red pandas also contains fruits, acorns, and mushrooms (Wei & Zhang, 2011; Wei, 2000; Wei, 1999). In situ, in order to thrive it is suggested the red panda selects high-quality portions of the bamboo like the tender leaves and shoots. However due to a rapid passage rate, they have to ingest large quantities (1.5 kg [3.3 lb] of leaves and 4 kg [8.8 lb] of shoots, as fed) to maximize nutrient intake and absorption (Wei & Zhang, 2011; Wei, 1999). The simple structure of their digestive system limits the ability to process this high fibrous diet. However, to cope with it, red pandas have developed several morphological, physiological, and behavioral strategies: 1) skull and teeth adaptations for effective mastication, 2) ability to select the most nutritious parts of bamboo, 3) daily consumption of large amounts of food and rapid passage time of digesta to maximize the rate of energy intake, and 4) low metabolic rate that reduces energy requirements (Wei, 1999).

Energy: Animals require energy for basal metabolic functions—(vital cell activity, respiration, cardiovascular distribution of the blood), in a resting, unstressed, post-absorptive state, in a thermoneutral environment (no shivering or special activity to maintain body temperature). Basal energy expenditure is related to body surface; Kleiber (1975) concluded fasting homeotherms produce 1,000 kcal of heat per square meter body surface. Kleiber (1975) used previously published research to establish the equation 70BWkg0.75 to express kilocalories needed per day for basal metabolic functions.

Red pandas vary their intake of shoots and leaves relative to seasonal changes both in the wild and in zoos. It was noted by McNab (1988) that the red panda have a low rate of metabolism, which is only 39% of the value predicted by the Kleiber equation at ambient temperature of 25–30 °C (77–86 °F). Red pandas have a higher energy requirement in the winter months and probably also in late gestation, during lactation and especially during growth. During these times the animals should always be fed enough so as to have at least 3% of the total food offered is left uneaten (Nijboer & Dierenfeld, 2011).

Seasonal Influence: Increased or decreased requirements for illness, thermoregulation, or activity can be met by offering diets ad lib. and monitoring body condition. In general diets should be offered so that a small amount of food is remaining at the end of the feeding period.

Body Condition: Wild red panda (Ailurus fulgens) weights range between 3–5 kg (6.6–11 lbs) (Nowak, 1999; Macdonald, 1999). Adult A. fulgens (in zoos) with a body weight of between 5–6 kg (11–13 lbs) have been found to consume between 145–200 g of nutritionally complete biscuits (as fed) each day. This represents intake of animals in a maintenance situation, (e.g., when the animals were under little stress from the weather, not pregnant or lactating, and in the absence of any other food item) (Nijboer & Dierenfeld, 2011). Due to their dense hair coat and body shape, it is difficult to determine a standard body condition score for red pandas. Periodic photos taken in the same position, over time, may be helpful to pair with weights, as an assessment of body condition.
**Target Nutrients:** Target nutrient levels for red pandas are listed in Table 5. These are adapted from Fulton et al. (1989) and based on National Research Council (NRC) requirements for non-human primates (2003) and cats (2006) with American Association of Feed Control Officials (AAFCO) requirements for cats (2011) (AAFCO, 2011; Fulton et al., 1989; NRC Cats, 2006; NRC Nonhuman Primates, 2003). These nutrient ranges represent the best-studied domestic animals, which match most closely the foraging ecology and gastrointestinal tract morphology of the red panda.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Recommended Target Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein, %</td>
<td>15–30</td>
</tr>
<tr>
<td>Fat, %</td>
<td>5–8.5</td>
</tr>
<tr>
<td>Linoleic Acid</td>
<td>0.5–2.0</td>
</tr>
<tr>
<td>Acid detergent fiber (ADF), %</td>
<td>5–15</td>
</tr>
<tr>
<td>Calcium, %</td>
<td>0.30–1.2</td>
</tr>
<tr>
<td>Phosphorous, %</td>
<td>0.30–1.0</td>
</tr>
<tr>
<td>Sodium, %</td>
<td>0.04–0.3</td>
</tr>
<tr>
<td>Potassium, %</td>
<td>0.40–0.60</td>
</tr>
<tr>
<td>Magnesium, %</td>
<td>0.04–0.10</td>
</tr>
<tr>
<td>Iron, mg/kg</td>
<td>20–100</td>
</tr>
<tr>
<td>Iodine, mg/kg</td>
<td>0.35–2.0</td>
</tr>
<tr>
<td>Copper, mg/kg</td>
<td>6.0–20.0</td>
</tr>
<tr>
<td>Manganese, mg/kg</td>
<td>5.0–40.0</td>
</tr>
<tr>
<td>Selenium, mg/kg</td>
<td>0.11–0.35</td>
</tr>
<tr>
<td>Zinc, mg/kg</td>
<td>20–120</td>
</tr>
<tr>
<td>Thiamin, mg/kg</td>
<td>1.0–3.0</td>
</tr>
<tr>
<td>Riboflavin, mg/kg</td>
<td>2.2–10.5</td>
</tr>
<tr>
<td>Pyridoxine, mg/kg</td>
<td>1.0–4.0</td>
</tr>
<tr>
<td>Vitamin B12, mg/kg</td>
<td>0.01–0.035</td>
</tr>
<tr>
<td>Niacin, mg/kg</td>
<td>11.4–30.0</td>
</tr>
<tr>
<td>Folate, mg/kg</td>
<td>0.18–4.0</td>
</tr>
<tr>
<td>Biotin, mg/kg</td>
<td>0.10–0.2</td>
</tr>
<tr>
<td>Choline, mg/kg</td>
<td>750–1700</td>
</tr>
<tr>
<td>Pantothenate, mg/kg</td>
<td>10.0–15.0</td>
</tr>
<tr>
<td>Vitamin A, IU/g</td>
<td>0.5–8.0</td>
</tr>
<tr>
<td>Vitamin E, mg/kg</td>
<td>30.0–100</td>
</tr>
<tr>
<td>Vitamin D, IU/g</td>
<td>0.5–2.5</td>
</tr>
</tbody>
</table>

Nutrient requirements are based on Fulton et al., (1989), NRC Cats (2006), NRC Nonhuman Primates (2003), and AACFO requirements for cats (2011).

**Provision of Variability in Food Type and Presentation:** Based on SSP nutrition research from the late 1980’s and current feeding ecology information, red pandas should be offered a large quantity of bamboo and provided with a nutritionally balanced diet of good quality nutritionally complete primate leaf eater biscuits (nutrient profile of: protein 23%, fat 5–6.5%, crude fiber 10–12%, acid detergent fiber 13–16%)(Eriksson, 2010; Pradhan, 2001; Wei, 1999; Wei, 2000). Bamboo should be offered ad libitum *Pseudosomas, Phyllostachys* and/or *Pseudosasa spp*, among others (Fulton, 1989). Some red pandas will self-limit intake of leaf eater biscuits; others will become obese if fed biscuits ad lib. Red pandas can be easily trained to climb on to platform scales and frequent weighing and adjustment of the biscuit portion of the diet is recommended based on weight, condition, intake, and behavioral observations.

Dietary ingredients should be fresh and of good quality. Fresh water should always be available. Every effort should be taken to avoid spoilage of the food during warm weather and freezing during cold. Offering bamboo with a dry biscuit should help eliminate these kinds of problems. To further reduce this problem it is suggested that the animals are fed at least twice per day; at these times fresh food should be provided and the old food removed (Nijboer & Dierenfeld, 2011). This will help minimize the impacts of desiccation, by keeping fresh, hydrated product available through the day. When animals are housed together it may be important to offer food in more than one bowl and in several locations. This will ensure that all animals will have access to the same food items and will help prevent one animal from potentially dominating the food situation and excluding others from the more nutritious components of the diet (Roberts & Glatston, 1994).

Red pandas that are “off” their food (this can occur in varying circumstances) can be tempted to eat by soaking their biscuit in water or apple juice, making a sweetened gruel or by smearing their biscuits
with a sweet product. It is important that the sweetener/gruel is withdrawn from the diet as soon as possible to avoid dental problems (Nijboer & Dierenfeld, 2011).

**Bamboo:** Fresh bamboo should be offered *ad lib*. Red pandas readily consume many species of bamboo. In 2010 a survey was completed by the AZA Red Panda SSP on what species of bamboo was offered and consumed. Forty-five institutions responded and the list of bamboo offered is in Table 6 in order of most commonly provided, the most common species being *Phyllostachys aureosulcata*. Although it is not recommended to offer a diet without bamboo if bamboo is unavailable, or only seasonally available, then fiber should be incorporated into the diet as the nutritionally complete biscuit (Nijboer & Dierenfeld, 2011). If fresh bamboo is not readily available in your area, please contact the AZA Red Panda SSP for information on where to purchase bamboo.

<table>
<thead>
<tr>
<th>Table 6: Bamboo species fed to red panda in order of most commonly offered</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Phyllostachys aureosulcata</em></td>
</tr>
<tr>
<td><em>P. aurea</em></td>
</tr>
<tr>
<td><em>P. japonica</em></td>
</tr>
<tr>
<td><em>P. bissetii</em></td>
</tr>
<tr>
<td><em>P. nuda</em></td>
</tr>
<tr>
<td><em>P. decora</em></td>
</tr>
<tr>
<td>*P. nigra &quot;Henon&quot;</td>
</tr>
<tr>
<td><em>P. angusta</em></td>
</tr>
<tr>
<td><em>P. nidularia</em></td>
</tr>
<tr>
<td><em>P. heteroclada</em></td>
</tr>
<tr>
<td><em>P. nigra</em></td>
</tr>
<tr>
<td><em>P. bambustoides</em></td>
</tr>
<tr>
<td><em>P. edulis</em></td>
</tr>
<tr>
<td><em>P. dulcis</em></td>
</tr>
<tr>
<td><em>P. ventricosa</em></td>
</tr>
<tr>
<td><em>P. vivex</em></td>
</tr>
<tr>
<td><em>P. purpurata</em></td>
</tr>
<tr>
<td><em>Fargesia sp.</em></td>
</tr>
<tr>
<td><em>Indocalamus tessellatos</em></td>
</tr>
<tr>
<td>*Sasaella masamuneana 'albotriata'</td>
</tr>
<tr>
<td><em>Semiarundinaria okuboi</em></td>
</tr>
<tr>
<td><em>Arundinarea gigantean</em></td>
</tr>
<tr>
<td><em>Sasa pygmaea</em></td>
</tr>
<tr>
<td><em>Bambusa chungii</em></td>
</tr>
<tr>
<td><em>Bambusa vulgaris</em></td>
</tr>
</tbody>
</table>

**Fruit:** These are not important nutritionally to the diet of the red panda. In fact, they can be harmful especially if offered in large quantities, as they will dilute the nutrients in the biscuit thus lowering the nutrient content of the diet (Fulton, 1987; Nijboer & Dierenfeld, 2011). In addition, fruits provide readily fermentable carbohydrate and little fiber, which is not appropriate for the gastrointestinal health of the red panda.

Fruit can be useful in small amounts as a training reward or when providing medications to the animals as undesirable substances can be presented in a palatable form (Nijboer & Dierenfeld, 2011). Many red pandas readily accept apples and bananas, but all produce should be fed very sparingly as it can cause the animals to become overweight.

**Provision of Food and Water:** Fresh water needs to be available to all animals at all times of day. Care should be taken so that sufficient water is available and freezing is avoided. Where there is no fresh potable water available in the exhibit, sturdy bowls that are not easily inverted are usually suitable for providing water. Animals with restricted water intake will also decrease food intake so the availability of fresh water is very important. All food and water containers should be cleaned and disinfected daily.

In general, only foods that can easily be contaminated by dirt (e.g., moist foods or fruit) should be placed in containers, the rest can be scattered or hidden for the animals to find. Dry foods, or foods that can be left whole, can be scattered or hidden around the exhibit. Bamboo should be placed in holders that are attached to the trees and/or structures so the long stalks of bamboo reaches higher parts of the exhibit. Smaller branches can also be placed on the ground for variety (AZA Small Carnivore TAG, 2010).
5.2 Diets

The formulation, preparation, and delivery of all diets must be of a quality and quantity suitable to meet the animal’s psychological and behavioral needs (AZA Accreditation Standard 2.6.3). Food should be purchased from reliable, sustainable, and well-managed sources. The nutritional analysis of the food should be regularly tested and recorded.

Food preparation must be performed in accordance with all relevant federal, state, or local regulations (AZA Accreditation Standard 2.6.1). Meat processed on site must be processed following all USDA standards. The appropriate hazard analysis and critical control points (HACCP) food safety protocols for the diet ingredients, diet preparation, and diet administration should be established for the taxa or species specified. Diet preparation staff should remain current on food recalls, updates, and regulations per USDA/FDA. Remove food within a maximum of 24 hours of being offered unless state or federal regulations specify otherwise and dispose of per USDA guidelines.

If browse plants are used within the animal’s diet or for enrichment, all plants must be identified and assessed for safety. The responsibility for approval of plants and oversight of the program should be assigned to at least one qualified individual (AZA Accreditation Standard 2.6.4). The program should identify if the plants have been treated with any chemicals or near any point sources of pollution and if the plants are safe for the red pandas. If animals have access to plants in and around their exhibits, there should be a staff member responsible for ensuring that toxic plants are not available. (Cheeke, 1985; Kingsbury, 1964)

**Diet Composition:** All red panda diets should contain bamboo and a dry biscuit with very little fruit. The recommended composition of red panda diet is shown in Table 7.

<table>
<thead>
<tr>
<th>Food Type</th>
<th>% In Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo</td>
<td>65%–75%</td>
</tr>
<tr>
<td>Nutritionally Complete Leafeater Biscuit</td>
<td>23%–33%</td>
</tr>
<tr>
<td>Produce</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Listed below in Table 8 are sample diets for red panda. Both subspecies are represented in Table 8 to show different quantities based on the fact that *refulgens (styani)* are larger bodied animals than *fulgens*. Tables 9 &10 outline the nutrient analysis from those diets.
Table 8: Sample diets from successful red panda holding and/or breeding institutions

<table>
<thead>
<tr>
<th>Subspecies</th>
<th>Institution</th>
<th>Food Item</th>
<th>Grams/day</th>
<th>% in Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>refugens (styani)</td>
<td>A: adult male</td>
<td>Marion Leafeater biscuit</td>
<td>225</td>
<td>33.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banana – peeled</td>
<td>104</td>
<td>15.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vionate supplement</td>
<td>1</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bamboo</td>
<td>340</td>
<td>50.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>670</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>A: adult female</td>
<td>Mazuri Leafeater 5M02 biscuit</td>
<td>300</td>
<td>43.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banana – peeled</td>
<td>55</td>
<td>7.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vionate supplement</td>
<td>1</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bamboo</td>
<td>340</td>
<td>48.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>696</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>B: young female</td>
<td>Apple – every day</td>
<td>87</td>
<td>9.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mazuri Leafeater 5M02 biscuit</td>
<td>288</td>
<td>32.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bamboo</td>
<td>275</td>
<td>31.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grapes – every day</td>
<td>67</td>
<td>7.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Papaya – 4x/wk</td>
<td>28</td>
<td>3.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pear – 3x/wk</td>
<td>21</td>
<td>2.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frozen Blueberries – 4x/wk</td>
<td>21</td>
<td>2.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cantaloupe – 4x/wk</td>
<td>28</td>
<td>3.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banana – 5x/wk</td>
<td>35</td>
<td>4.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kale – 2x/wk</td>
<td>6</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endive – 1x/wk</td>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Romaine – 1x/wk</td>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spinach – 1x/wk</td>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collards – 1x/wk</td>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Leaf Lettuce – 1x/wk</td>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>874</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>B: young male</td>
<td>Apple – every day</td>
<td>80</td>
<td>11.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mazuri Leafeater 5M02 biscuit</td>
<td>220</td>
<td>30.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bamboo</td>
<td>275</td>
<td>38.09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grapes – every day</td>
<td>53</td>
<td>7.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Papaya – 4x/wk</td>
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<tr>
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<td>Frozen Blueberries – 4x/wk</td>
<td>11</td>
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<td></td>
<td>Cantaloupe – 4x/wk</td>
<td>15</td>
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<td></td>
<td></td>
<td>Banana – 5x/wk</td>
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<td>Endive – 1x/wk</td>
<td>4</td>
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</tr>
<tr>
<td></td>
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<td>Romaine – 1x/wk</td>
<td>4</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Spinach – 1x/wk</td>
<td>4</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Collards – 1x/wk</td>
<td>4</td>
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</tr>
<tr>
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<td></td>
<td>Red Leaf Lettuce – 1x/wk</td>
<td>4</td>
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<td>722</td>
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</tr>
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<td></td>
<td>B: adult male</td>
<td>Apple – every day</td>
<td>39</td>
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<td>Cantaloupe – 4x/wk</td>
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<td>Banana – 5x/wk</td>
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<td>Spinach – 1x/wk</td>
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<td>0.37</td>
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<td></td>
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<td>Collards – 1x/wk</td>
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<td>Red Leaf Lettuce – 1x/wk</td>
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<td>Institution</td>
<td>Food Item</td>
<td>Grams/day</td>
<td>% in Diet</td>
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<td>-------------</td>
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<td>Fulgens</td>
<td>C</td>
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<td>Grapes</td>
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<td>Babyfood</td>
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<td>88</td>
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<td>Total</td>
<td>665</td>
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<td>D</td>
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<td></td>
<td>Apples</td>
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<td></td>
<td>Total</td>
<td>1100</td>
<td>100</td>
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*Marion Zoological 03 E. Center Circle, Plymouth, MN 55441, PMI Nutrition International (Mazuri), Grays Summit, MO 63039, STAT supplement PRN Pharmacal Pensacola, FL 32514, Vionate vitamin mineral powder Gimborn Pet Specialties Atlanta, GA 30340.*
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Protein (%)</td>
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<td>18.3</td>
<td>17.7</td>
<td>16.9</td>
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<td>5.4</td>
<td>5.2</td>
<td>5.3</td>
<td>5.3</td>
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<tr>
<td>Essential n-6 Fatty Acids, %</td>
<td>1.3</td>
<td>1.9</td>
<td>1.9</td>
<td>1.7</td>
<td>2.0</td>
</tr>
<tr>
<td>ADF, %</td>
<td>25.9</td>
<td>26.4</td>
<td>23.8</td>
<td>25.6</td>
<td>23.0</td>
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<tr>
<td>Calcium (%)</td>
<td>0.73</td>
<td>0.77</td>
<td>0.74</td>
<td>0.70</td>
<td>0.78</td>
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<td>Phosphorus (%)</td>
<td>0.45</td>
<td>0.49</td>
<td>0.47</td>
<td>0.44</td>
<td>0.50</td>
</tr>
<tr>
<td>Sodium (%)</td>
<td>0.17</td>
<td>0.18</td>
<td>0.18</td>
<td>0.17</td>
<td>0.19</td>
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<tr>
<td>Potassium (%)</td>
<td>0.91</td>
<td>1.01</td>
<td>1.0</td>
<td>1.01</td>
<td>1.08</td>
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<tr>
<td>Magnesium (%)</td>
<td>0.15</td>
<td>0.17</td>
<td>0.16</td>
<td>0.16</td>
<td>0.17</td>
</tr>
<tr>
<td>Iron (mg/kg)</td>
<td>143</td>
<td>407</td>
<td>390</td>
<td>371</td>
<td>409</td>
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<tr>
<td>Iodine (mg/kg)</td>
<td>0.032</td>
<td>1.14</td>
<td>1.1</td>
<td>1.0</td>
<td>1.1</td>
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<tr>
<td>Copper (mg/kg)</td>
<td>19.4</td>
<td>14.0</td>
<td>15.5</td>
<td>14.6</td>
<td>16.3</td>
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<tr>
<td>Manganese, mg/kg</td>
<td>44.1</td>
<td>89.9</td>
<td>87.2</td>
<td>81.7</td>
<td>92.3</td>
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<td>Selenium (mg/kg)</td>
<td>0.23</td>
<td>0.16</td>
<td>0.15</td>
<td>0.14</td>
<td>0.17</td>
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<tr>
<td>Zinc (mg/kg)</td>
<td>76.7</td>
<td>104</td>
<td>100</td>
<td>94.4</td>
<td>106</td>
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<tr>
<td>Thiamin (mg/kg)</td>
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<td>7.5</td>
<td>7.5</td>
<td>6.9</td>
<td>8.0</td>
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<tr>
<td>Riboflavin (mg/kg)</td>
<td>4.4</td>
<td>8.3</td>
<td>8.2</td>
<td>7.5</td>
<td>8.8</td>
</tr>
<tr>
<td>Pyridoxine (mg/kg)</td>
<td>4.5</td>
<td>8.1</td>
<td>8.1</td>
<td>7.4</td>
<td>8.7</td>
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<tr>
<td>Vitamin B12 (mg/kg)</td>
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<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Niacin (mg/kg)</td>
<td>29.8</td>
<td>75.1</td>
<td>74.4</td>
<td>68.4</td>
<td>79.7</td>
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<td>Folacin (mg/kg)</td>
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<td>7.3</td>
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<tr>
<td>Biotin (mg/kg)</td>
<td>0.11</td>
<td>0.2</td>
<td>0.19</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>Choline, mg/kg</td>
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<td>1018</td>
<td>991</td>
<td>913</td>
<td>1059</td>
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<tr>
<td>Pantothenic acid (mg/kg)</td>
<td>12.3</td>
<td>40.9</td>
<td>40.2</td>
<td>36.9</td>
<td>42.9</td>
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<tr>
<td>Vitamin A (IU/g)</td>
<td>5.4</td>
<td>13.8</td>
<td>18.2</td>
<td>17.2</td>
<td>19.5</td>
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<td>Vitamin E (mg/kg)</td>
<td>145</td>
<td>129</td>
<td>129</td>
<td>119</td>
<td>138</td>
</tr>
<tr>
<td>Vitamin D (IU/g)</td>
<td>1.15</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
<td>2.1</td>
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Table 10: Nutrient content of sample red panda sp. diets\(^1\) (dry matter basis)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Inst. C</th>
<th>Inst. D: Female</th>
<th>Inst. E</th>
<th>Target Nutrients(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein (%)</td>
<td>21.2</td>
<td>13.0</td>
<td>15.3</td>
<td>15–30</td>
</tr>
<tr>
<td>Fat, %</td>
<td>10.8</td>
<td>5.5</td>
<td>7.5</td>
<td>5–8.5</td>
</tr>
<tr>
<td>Essential n-6 Fatty Acids, %</td>
<td>1.9</td>
<td>0.78</td>
<td>0.92</td>
<td>0.5–2.0</td>
</tr>
<tr>
<td>ADF, %</td>
<td>15.9</td>
<td>34.3</td>
<td>32.7</td>
<td>5–15</td>
</tr>
<tr>
<td>Calcium (%)</td>
<td>0.94</td>
<td>0.50</td>
<td>0.43</td>
<td>0.30–1.2</td>
</tr>
<tr>
<td>Phosphorus (%)</td>
<td>0.60</td>
<td>0.29</td>
<td>0.28</td>
<td>0.30–1.0</td>
</tr>
<tr>
<td>Sodium (%)</td>
<td>0.25</td>
<td>0.10</td>
<td>0.12</td>
<td>0.04–0.3</td>
</tr>
<tr>
<td>Potassium (%)</td>
<td>0.85</td>
<td>0.79</td>
<td>0.37</td>
<td>0.40–0.60</td>
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<tr>
<td>Magnesium (%)</td>
<td>0.17</td>
<td>0.11</td>
<td>0.08</td>
<td>0.04–0.10</td>
</tr>
<tr>
<td>Iron (mg/kg)</td>
<td>138</td>
<td>143</td>
<td>59.3</td>
<td>20–100</td>
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<tr>
<td>Iodine (mg/kg)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0.35–1.5</td>
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<tr>
<td>Copper (mg/kg)</td>
<td>25.6</td>
<td>12.9</td>
<td>11.8</td>
<td>6.0–20.0</td>
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<tr>
<td>Manganese, mg/kg</td>
<td>55.8</td>
<td>31.9</td>
<td>25.6</td>
<td>5.0–40.0</td>
</tr>
<tr>
<td>Selenium (mg/kg)</td>
<td>0.33</td>
<td>0.13</td>
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<td>0.11–0.35</td>
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<td>Zinc (mg/kg)</td>
<td>102</td>
<td>51.7</td>
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<td>Thiamin (mg/kg)</td>
<td>5.7</td>
<td>2.0</td>
<td>2.4</td>
<td>1.0–3.0</td>
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<td>Riboflavin (mg/kg)</td>
<td>6.6</td>
<td>2.4</td>
<td>2.8</td>
<td>2.2–10.5</td>
</tr>
<tr>
<td>Pyridoxine (mg/kg)</td>
<td>5.1</td>
<td>1.7</td>
<td>2.0</td>
<td>1.0–4.0</td>
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<tr>
<td>Vitamin B12 (mg/kg)</td>
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<td>0.01</td>
<td>0.01</td>
<td>0.01–0.035</td>
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<tr>
<td>Niacin (mg/kg)</td>
<td>48.9</td>
<td>16.8</td>
<td>19.8</td>
<td>11.4–30.0</td>
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<tr>
<td>Folic acid (mg/kg)</td>
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<td>0.27</td>
<td>0.32</td>
<td>0.18–4.0</td>
</tr>
<tr>
<td>Biotin (mg/kg)</td>
<td>0.17</td>
<td>0.07</td>
<td>0.08</td>
<td>0.10–0.2</td>
</tr>
<tr>
<td>Choline, mg/kg</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>750–1700</td>
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<tr>
<td>Pantothenic acid (mg/kg)</td>
<td>20.7</td>
<td>6.7</td>
<td>7.92</td>
<td>10.0–15.0</td>
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<tr>
<td>Vitamin A (IU/g)</td>
<td>9.1</td>
<td>2.91</td>
<td>3.4</td>
<td>0.5–8.0</td>
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<td>Vitamin E (mg/kg)</td>
<td>221</td>
<td>83.9</td>
<td>98.9</td>
<td>30.0–100</td>
</tr>
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<td>Vitamin D (IU/g) 3</td>
<td>1.7</td>
<td>0.65</td>
<td>0.77</td>
<td>0.5–2.5</td>
</tr>
</tbody>
</table>

\(^1\)Nutrient requirements are based on Fulton et al., (1989), NRC Cats (2006), NRC Nonhuman Primates (2003), and AACFO requirements for cats (2011).

\(^2\)There is no value for iodine or choline for the Marion Leaf eater biscuit.

5.3 Nutritional Evaluations

Diets should be formulated taking into account an animal’s size, activity level, age, and over-all health. Target weights should be set for each animal and diets formulated to maintain that weight. Red pandas have been noted to become obese from overfeeding, lack of exercise, or a combination of the two. “Goal weights” for individuals should be established (ideally, general, and seasonal), and body weight checked frequently, so that diet adjustments can be made in a timely fashion to avoid over or under-condition.

The AZA Red Panda SSP has collected the weights of red pandas in the North American population for the past several years (2008–2011) and based on the pairs that have bred, a correlation can be made that red pandas do not breed when obese. Careful weight management of breeding pairs, the females in particular, is very important. Red pandas have been noted to easily gain weight in zoos and aquariums. This can be managed by regularly monitoring their weight and adjusting diets as needed. See Appendix I for weight calculation chart.
**Health Status:** Increased or decreased requirements for illness, thermoregulation, or activity can be met by offering diets *ad lib* and monitoring body weight and condition over time. In general, diets should be offered so that a small amount of food is remaining at the end of the feeding period; however this should be managed on an individual basis to avoid obesity.

Analysis of weight fluctuations can be a valuable tool for managing individuals and populations. Weight changes can reflect nutritional problems (e.g., obesity and under-conditioning), illness (e.g., cancer, organ failure, etc.), other medical conditions (e.g., intestinal blockage, etc.), changes in reproductive condition (e.g., pregnancy or weight loss during lactation), and hormonally or environmentally induced changes in metabolism (e.g., prior to dormancy and the onset of the breeding season). Correlating weight changes with key life history parameters will enable animals to be managed much more effectively and efficiently (AZA Small Carnivore TAG, 2010).
6.1 Veterinary Services

Veterinary services are a vital component of excellent animal care practices. A full-time staff veterinarian is recommended, however, in cases where this is not practical, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection and to any emergencies (AZA Accreditation Standard 2.1.1). Veterinary coverage must also be available at all times so that any indications of disease, injury, or stress may be responded to in a timely manner (AZA Accreditation Standard 2.1.2). All AZA-accredited institutions should adopt the guidelines for medical programs developed by the American Association of Zoo Veterinarians (AAZV) www.aazv.org/associations/6442files/zoo_aquarium_vet_med_guidelines.pdf.

Protocols for the use and security of drugs used for veterinary purposes must be formally written and available to animal care staff (AZA Accreditation Standard 2.2.1). Procedures should include, but are not limited to: a list of persons authorized to administer animal drugs, situations in which they are to be utilized, location of animal drugs and those persons with access to them, and emergency procedures in the event of accidental human exposure.

The 2012 AZA Red Panda SSP Veterinary Advisor is:
Dr. Ed Ramsay, Knoxville Zoo
Email: eramsay@utk.edu

Red pandas are very susceptible to canine distemper, which is nearly always fatal. Prevention of exposure to canine distemper and vaccination against the disease is critical. Red panda should never be vaccinated with live or modified live virus vaccine, only killed virus vaccines—Purvax® from Merial pharmaceuticals should be used.

Routine Health Inspection: Ideally, an initial series of vaccinations should start at 8 weeks and be repeated every 3 weeks until 16 weeks; red pandas should be vaccinated twice a year for protection (Roberts & Glatston, 1994). However, practical considerations are also of importance, it is best to vaccinate young red pandas when it is least likely to disturb maternal behavior. In some cases this may mean that vaccination is delayed until at least 16 weeks.

Rabies vaccination with a killed vaccine is used in endemic rabies areas. Red pandas develop titers comparable to protective titers in domestic carnivores following vaccination with a 1 ml dose intramuscularly (IM) (Roberts & Glatston, 1994). Similarly killed vaccine products should be administered when vaccinations against feline enteritis are considered necessary by the attending veterinarian.

Parasite checks should be conducted on a twice-yearly basis. A fecal exam includes:
• A direct smear for the detection of protozoa (e.g., amoeba, ciliates) or motile larvae;
• Flotation methods for nematodes, cestodes, and coccidia;
• Sedimentation techniques for identification of various lungworm larva.

The lungworms that occur in red pandas are Crenosoma, Troglostrongulus, and Metastrongyloides. Most parasites are easily identified and eliminated with proper anti-parasitic therapy. The patient is treated for parasites and proven free of parasites on two successive exams.

Red pandas are susceptible to heartworm disease (*Dirofilaria immitis*) and should be treated with appropriate preventative. Stools of red pandas with diarrhea should be examined for parasites and cultured for enteric pathogens and subsequent antibiotic sensitivity of these pathogens to direct
appropriate therapy. An important adjunct to treating diarrhea is to reduce various supplements (e.g., fruit, vegetables, gruel, etc.) and provide a high quality bamboo. Rodents are potential sources of pathogens such as Yersinia spp., Salmonella spp., and Leptospira spp. especially for pandas maintained outdoors. Therefore, a rodent control program is part of an overall preventative medical program. Special precautions should be taken to ensure that pandas do not have access to any rodenticides. There have been isolated cases of the following infections reported in the red panda: tuberculosis, erysipelas and salmonellosis, Chagas’ disease, Tyzzer’s disease, and toxoplasmosis (Roberts & Glatston, 1994).

Again, intermittent odiferous mucus-like stools preceded up to three days by lethargy are commonly reported in managed red pandas. This is a very common occurrence and does not usually require any medical attention. Regularly feeding bamboo appears to prevent this condition.
It is recommended to weigh the animal every time it is captured for transport. Adequate, regular parasite checks are to be made by qualified medical technicians.

Obtaining regular weights is essential to good management. Red pandas can easily be trained to enter a nest box or shipping crate for food. Obtaining a weight simply involves closing the animal in the box, weighing the nest box with the animal in it and subtracting the known weight of the nest box. This precludes stressful capture by net or other potentially injurious means. Red pandas are also easily trained to walk onto and to station on a scale. Forethought in nest box design can also minimize the potential disturbance of monitoring infants in the nest or when obtaining cub weights (Roberts & Glatston, 1994).

Thorough physical examination of animals 3 years and older, including weighing and dental check-ups, should be performed on a regular basis, preferably annually due to potential dental issues—if the animals are set up for breeding, the female should be examined in October/November if she had cubs the year before—if not, an exam can be conducted August–November. Paired males should only receive their exams April–November. Exams should not interfere with the breeding season; so paired animals should not receive annual exams between December and April (males) or August (females).

Physical examination of an ill panda should include appropriate bacteriologic and cytologic examination of wounds, abscesses, sputum, urine, rectal, body cavity fluids, etc. If septicemia or bacteremia is suspected, blood cultures should be obtained. Blood collection for hematology and serum chemistries aids the initial diagnostic examination and in monitoring the course of the disease during and after treatment (Roberts & Glatston, 1994).

Animal recordkeeping is an important element of animal care and ensures that information about individual animals and their treatment is always available. A designated staff member should be responsible for maintaining an animal record keeping system and for conveying relevant laws and regulations to the animal care staff (AZA Accreditation Standard 1.4.6). Recordkeeping must be accurate and documented on a daily basis (AZA Accreditation Standard 1.4.7). Complete and up-to-date animal records must be retained in a fireproof container within the institution (AZA Accreditation Standard 1.4.5) as well as be duplicated and stored at a separate location (AZA Accreditation Standard 1.4.4).

Thorough and accurate medical records are essential to learn and understand more about the medical problems of the red panda.

For information on best practices for medical record keeping for the red panda, please see Appendix F: Small Carnivore Medical Management Guidelines (AAZV).

A complete postmortem examination is a vital part of the preventative medical program to monitor disease outbreaks, subclinical medical problems, and potential nutritional problems. For information on necropsy protocol please see Appendix G: AZA Small Carnivore TAG Necropsy Protocol.

A complete report, including histopathology and test results, should be submitted to the veterinary advisor on an annual basis.

### 6.2 Identification Methods

Ensuring that red pandas are identifiable through various means increases the ability to care for individuals more effectively. Animals must be identifiable and have corresponding ID numbers whenever practical, or a means for accurately maintaining animal records must be identified if individual identifications are not practical (AZA Accreditation Standard 1.4.3).

ID/Recognition is considered important to the effective management of this species, therefore it is recommended that all animals should be permanently identified via transponder chip between the shoulder blades (Roberts & Glatston, 1994).
AZA member institutions must inventory their population at least annually and document all red panda acquisitions and dispositions (AZA Accreditation Standard 1.4.1). Transaction forms help document that potential recipients or providers of the animals should adhere to the AZA Code of Professional Ethics, the AZA Acquisition-Disposition Policy (see Appendix B), and all relevant AZA and member policies, procedures and guidelines. In addition, transaction forms must insist on compliance with the applicable laws and regulations of local, state, federal and international authorities. All AZA-accredited institutions must abide by the AZA Acquisition and Disposition policy (Appendix B) and the long-term welfare of animals should be considered in all acquisition and disposition decisions. All species owned by an AZA institution must be listed on the inventory, including those animals on loan to and from the institution (AZA Accreditation Standard 1.4.2).

6.3 Transfer Examination and Diagnostic Testing Recommendations

The transfer of animals between AZA-accredited institutions or certified related facilities due to AZA Animal Program recommendations occurs often as part of a concerted effort to preserve these species. These transfers should be done as altruistically as possible and the costs associated with specific examination and diagnostic testing for determining the health of these animals should be considered.

For information on pre-shipment examination procedures and diagnostic tests for the red panda, please see Appendix F: Small Carnivore Medical Management Guidelines (AAZV).

6.4 Quarantine

AZA institutions must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals (AZA Accreditation Standard 2.7.1). All quarantine, hospital, and isolation areas should be in compliance with AZA standards/guidelines (AZA Accreditation Standard 2.7.3; Appendix C). All quarantine procedures should be supervised by a veterinarian, formally written and available to staff working with quarantined animals (AZA Accreditation Standard 2.7.2). If a specific quarantine facility is not present, then newly acquired animals should be kept separate from the established collection to prohibit physical contact, prevent disease transmission, and avoid aerosol and drainage contamination. If the receiving institution lacks appropriate facilities for quarantine, pre-shipment quarantine at an AZA or American Association for Laboratory Animal Science (AALAS) accredited institution may be applicable. Local, state, or federal regulations that are more stringent than AZA Standards and recommendation have precedence.

AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferable diseases (AZA Accreditation Standard 11.1.2) with all animals, including those newly acquired in quarantine. Keepers should be designated to care only for quarantined animals if possible. If keepers must care for both quarantined and resident animals of the same class, they should care for the quarantined animals only after caring for the resident animals. Equipment used to feed, care for, and enrich animals in quarantine should be used only with these animals. If this is not possible, then all items must be appropriately disinfected, as designated by the veterinarian supervising quarantine before use with resident animals.

Quarantine durations span of a minimum of 30 days (unless otherwise directed by the staff veterinarian). If additional mammals, birds, reptiles, amphibians, or fish of the same order are introduced
into their corresponding quarantine areas, the minimum quarantine period must begin over again. However, the addition of mammals of a different order to those already in quarantine will not require the re-initiation of the quarantine period.

During the quarantine period, specific diagnostic tests should be conducted with each animal if possible or from a representative sample of a larger population (e.g., birds in an aviary or frogs in a terrarium) (see Appendix C). A complete physical, including a dental examination if applicable, should be performed. Animals should be evaluated for ectoparasites and treated accordingly. Blood should be collected, analyzed and the sera banked in either a -70 °C (-94 °F) freezer or a frost-free -20 °C (-4 °F) freezer for retrospective evaluation. Fecal samples should be collected and analyzed for gastrointestinal parasites and the animals should be treated accordingly. Vaccinations should be updated as appropriate, and if the vaccination history is not known, the animal should be treated as immunologically naive and given the appropriate series of vaccinations.

A tuberculin testing and surveillance program must be established for animal care staff as appropriate to protect both the health of both staff and animals (AZA Accreditation Standard 11.1.3). Depending on the disease and history of the animals, testing protocols for animals may vary from an initial quarantine test to yearly repetitions of diagnostic tests as determined by the veterinarian. Animals should be permanently identified by their natural markings or, if necessary, marked when anesthetized or restrained (e.g., tattoo, ear notch, ear tag, etc.). Release from quarantine should be contingent upon normal results from diagnostic testing and two negative fecal tests that are spaced a minimum of 2 weeks apart. Medical records for each animal should be accurately maintained and easily available during the quarantine period.

If a red panda should die in quarantine, a necropsy should be performed on all it and the subsequent disposal of the body must be done in accordance with any local or federal laws (AZA Accreditation Standard 2.5.1). Necropsies should include a detailed external and internal gross morphological examination and representative tissue samples form the body organs should be submitted for histopathological examination (see Chapter 6.7).

For information on quarantine procedures for the red panda, please see Appendix F: Small Carnivore Medical Management Guidelines (AAZV).

6.5 Preventive Medicine

AZA-accredited institutions should have an extensive veterinary program that must emphasize disease prevention (AZA Accreditation Standard 2.4.1). The American Association of Zoo Veterinarians (AAZV) has developed an outline of an effective preventative veterinary medicine program that should be implemented to ensure proactive veterinary care for all animals (www.aazv.org/associations/6442/files/zoo_aquarium_vet_med_guidelines.pdf).

As stated in the Chapter 6.4, AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferrable diseases (AZA Accreditation Standard 11.1.2) with all animals. Keepers should be designated to care for only healthy resident animals, however if they need to care for both quarantined and resident animals of the same class, they should care for the resident animals before caring for the quarantined animals. Care should be taken to ensure that these keepers are “decontaminated” before caring for the healthy resident animals again. Equipment used to feed, care for, and enrich the healthy resident animals should only be used with those animals.

Animals that are taken off zoo/aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution’s healthy population. AZA-accredited institutions must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5).
Also stated in Chapter 6.4, a tuberculin testing and surveillance program must be established for animal care staff, as appropriate, to protect the health of both staff and animals (AZA Accreditation Standard 11.1.3). Depending on the disease and history of the animals, testing protocols for animals may vary from an initial quarantine test, to annual repetitions of diagnostic tests as determined by the veterinarian. To prevent specific disease transmission, vaccinations should be updated as appropriate for the species.

6.6 Capture, Restraint, and Immobilization
The need for capturing, restraining and/or immobilizing an animal for normal or emergency husbandry procedures may be required. All capture equipment must be in good working order and available to authorized and trained animal care staff at all times (AZA Accreditation Standard 2.3.1).

Red pandas can be safely and easily captured using a net. Prior to capture it is helpful if the trees are made inaccessible to the animals. This can be achieved by tacking a flexible sheet of plastic, 50 cm wide (19.6 in.), around the trunks of the climbing trees. After capture the animal can be transported to the hospital/clinic in a plastic sky kennel. Red pandas are also easily trained to enter a squeeze/transfer cage. Some short minor manipulative procedures on red pandas (e.g., vaccinations or injectable medications) can be accomplished using physical restraint by a net, heavy gloves, or a squeeze cage (Roberts & Glatston, 1994).

Anesthesia: Any prolonged procedure or painful manipulation is performed under anesthesia. Pre-anesthetic preparations facilitate the procedure and increase patient safety. Food and water are withheld for 12 hours to minimize vomiting which can cause fatal inhalation pneumonia. Confining the patient to a small dark area during induction of anesthesia minimizes excitement and stress and lowers the amount of anesthetic drug required (Roberts & Glatston, 1994).

Dissociative anesthetics in combination with sedatives or tranquilizers are the choice of injectable anesthetic agents for red pandas since Ketamine (11–14 mg/kg) alone usually results in a patient with extreme muscle rigidity and minor CNS stimulations. Ketamine (6–9 mg/kg) is therefore combined with Xylazine (0.2–0.4 mg/kg). Telazol is the anesthetic of choice for red pandas at a dose of 4.5–6 mg/kg,
which produces a rapid and safe anesthesia with acceptable muscle relaxation. For prolonged procedures such as major surgery, supplemental injections of Telazol are given or the patient is given an inhalation anesthetic such as halothane (Roberts & Glatston, 1994). An induction chamber can also be used with gas anesthesia.

6.7 Management of Diseases, Disorders, Injuries and/or Isolation

AZA-accredited institutions should have an extensive veterinary program that manages animal diseases, disorders, or injuries and has the ability to isolate these animals in a hospital setting for treatment if necessary. Red panda keepers should be trained for meeting the animal’s dietary, husbandry, and enrichment needs, as well as in restraint techniques, and recognizing behavioral indicators animals may display if their health becomes compromised (AZA Accreditation Standard 2.4.2). Protocols should be established for reporting these observations to the veterinary department. Red panda hospital facilities should have x-ray equipment or access to x-ray services (AZA Accreditation Standard 2.3.2), contain appropriate equipment and supplies on hand for treatment of diseases, disorders or injuries, and have staff available that are trained to address health issues, manage short and long term medical treatments and control for zoonotic disease transmission.

**Dental Disease:** This is common in red pandas and is a source of bacterial entry, which may progress to tissue infection and/or sepsis. Although dental disease may not be listed as a cause of death in pathology records it can be an important underlying causative factor for poor nutrition and/or bacterial sepsis. Animals fed soft gruel diets high in carbohydrates are very prone to tarter accumulation, gingival problems which lead to generalized dental disease with loss of teeth; this can be prevented by feeding the recommended biscuit and bamboo diet. Routine dental care is indicated in all older pandas as we see dental problems such as tartar, gingivitis, chronic tooth wear, abscessed teeth, and periodontitis in most middle aged pandas which result in loss of masticatory surfaces with resulting chronic weight loss and deterioration of physical condition. Regular removal of tartar with tooth polishing minimizes periodontitis and resultant gingival disease with its tooth loss (Roberts & Glatston, 1994).

**Hair Loss:** This is not uncommon in managed red pandas. There is a seasonal molt which hair loss can be quite pronounced, especially in the flanks and the tails. This usually occurs in the spring, but there can be individual cases where it occurs in the fall. Hair loss can range from a thinning of tail hair to pronounced bald areas from shoulder to the tail tip. This seasonal hair loss can also increase as the panda ages. In young pandas with focal areas of hair loss on the face, head, under the neck and feet the diagnosis of a dermatophytosis (*Microsporum gypseum*) should be considered. To treat, an Itraconazole/Fluconazole oral suspension along with a topical anti-fungal powder has worked well. If there are puncture wounds from maternal carrying, antibiotic treatment should also be considered. Hair loss in older animals may indicate other skin parasites and should be scraped and/or biopsied. We have diagnosed hypothyroidism as a cause of a non-pruritic dermatitis with alopecia and obesity by thyroid biopsy and response to thyroid supplementation (Roberts & Glatston, 1994).

Red pandas are susceptible to flea...

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infestation, especially in warm weather. There have been several instances recorded of red pandas dying from flea infestation. Even in cases of severe flea infestation red pandas should NOT be treated with a flea bath as this can result in death. It is therefore advisable that the keepers caring for red pandas are not in contact with common flea carrying species such as cats. Where this is unavoidable measures should be taken to avoid contamination of the red panda nest boxes. It is advisable to change red panda bedding regularly. When birth is imminent it is advisable to treat the floors of the nest-boxes with some preparatory anti-flea preparation to avoid this problem. Topical treatment for domestic cats/kittens generally is considered safe and effective for adults.

AZA-accredited institutions must have a clear process for identifying and addressing animal welfare concerns within the institution (AZA Accreditation Standard 1.5.8) and should have an established Institutional Animal Welfare Committee. This process should identify the protocols needed for animal care staff members to communicate animal welfare questions or concerns to their supervisors, their Institutional Animal Welfare Committee or if necessary, the AZA Animal Welfare Committee. Protocols should be in place to document the training of staff about animal welfare issues, identification of any animal welfare issues, coordination and implementation of appropriate responses to these issues, evaluation (and adjustment of these responses if necessary) of the outcome of these responses, and the dissemination of the knowledge gained from these issues.

AZA-accredited zoos and aquariums provide superior daily care and husbandry routines, high quality diets, and regular veterinary care, to support red panda longevity; In the occurrence of death however, information obtained from necropsies is added to a database of information that assists researchers and veterinarians in zoos and aquariums to enhance the lives of red pandas both in their care and in the wild. As stated in Chapter 6.4, necropsies should be conducted on deceased red pandas to determine their cause of death, and the subsequent disposal of the body must be done in accordance with local, state, or federal laws (AZA Accreditation Standard 2.5.1). Necropsies should include a detailed external and internal gross morphological examination and representative tissue samples form the body organs should be submitted for histopathological examination. Many institutions utilize private labs, partner with Universities or have their own in-house pathology department to analyze these samples. The AZA and American Association of Zoo Veterinarians (AAZV) website should be checked for any AZA Red Panda SSP Program approved active research requests that could be filled from a necropsy. For necropsy information for the red panda, please see Appendix F: Small Carnivore Medical Management Guidelines (AAZV).
Chapter 7. Reproduction

7.1 Reproductive Physiology and Behavior

It is important to have a comprehensive understanding of the reproductive physiology and behaviors of the animals in our care. This knowledge facilitates all aspects of reproduction, artificial insemination, birthing, rearing, and even contraception efforts that AZA-accredited zoos and aquariums strive to achieve.

Per studbook data, both male and female red pandas will reach sexual maturity in approximately 1 year, 7 months (in the second breeding season after birth). In the northern hemisphere, red pandas breed in January–February and give birth in June–July. Red pandas do not breed when obese. Careful weight management of breeding pairs (for females in particular) is very important.

Pregnant females may require isolation from disruption by the visiting public. To facilitate this preparation should be made in advance to restrict access to the exhibit area, particularly for the first several weeks after parturition. A choice of nest boxes also is important, as it is not atypical for a female to move the cubs. The male may be left in the exhibit unless friction between the pair or agitation in the female indicates otherwise.

The provision of at least three, insulated nest boxes located in shaded areas is recommended. Nest boxes from 60.1 cm wide x 91.4 cm long x 50.8 cm high (24 in. x 36 in. x 20 in.) to 91.4 cm wide x 127 cm long x 76 cm high (36 in. x 50 in. x 30 in.) have been used in North American zoos.

The results of an SSP-endorsed survey of red panda breeding institutions found that there were several important attributes of the nest box provided to females for the successful rearing of cubs. These include: separate animal and keeper entry doors, the ability to lock the mother away from the cubs while being checked, keeper entry doors to the nest box out of sight of the female, temperature and humidity controlled nest boxes, nest box temperatures not exceeding 23.8–26.6° C (75–80° F), provision of natural light source, and the nest boxes should be located away from the public. Additional suggestions included the ability to set up cameras to monitor mother/cub interactions and the construction of nest boxes out of easily cleaned materials. (McMillan & Glass, 1995)

7.2 Assisted Reproductive Technology

The practical use of artificial insemination (AI) with animals was developed during the early 1900s to replicate desirable livestock characteristics to more progeny. Over the last decade or so, AZA-accredited zoos and aquariums have begun using AI processes more often with many of the animals residing in their care. AZA Studbooks are designed to help manage animal populations by providing detailed genetic and demographic analyses to promote genetic diversity with breeding pair decisions within and between our institutions. While these decisions are based upon sound biological reasoning, the efforts needed to
ensure that transports and introductions are done properly to facilitate breeding between the animals are often quite complex, exhaustive, and expensive, and conception is not guaranteed.

AI has become an increasingly popular technology that is being used to meet the needs identified in the AZA Studbooks without having to re-locate animals. Males are trained to voluntarily produce semen samples and females are being trained for voluntary insemination and pregnancy monitoring procedures such as blood and urine hormone measurements and ultrasound evaluations. Techniques used to preserve and freeze semen have been achieved with a variety, but not all, taxa and should be investigated further.

Electro-ejaculation and artificial insemination have not been researched in red pandas. Research into these options is warranted, however, due to the loss of genetic variability in red pandas that are not reproducing.

7.3 Pregnancy and Parturition

It is extremely important to understand the physiological and behavioral changes that occur throughout an animal’s pregnancy. The average gestation of red panda cubs is 134 days, with a range of 93–156 days. Ultrasounds have been successful in determining pregnancy, but anesthetizing a female red panda to ultrasound is not recommended because training a red panda to be given an ultrasound while awake is fairly easy. Some research is occurring on running fecal assay hormones to determine pregnancy and the results will be published when complete.

When a female is pending parturition there are very few visible signs until late in the pregnancy. Decreased activity about 1 month before has been observed. Increased appetite is common, and diet increases are recommended. A change in gait will be noticed, such as a distinctive waddle, within a week of cubbing. The female may build nests in the nest boxes with any available material, but this is not always the case. Nests can be elaborate, with multiple materials, or simple, with just a few leaves. Removing those nest materials is not recommended, if fecal material is present, the feces should be removed. Within one or two days of birth, grumpiness, restlessness, and decreased appetite may be noted. Den cameras are highly recommended to monitor for birth. Females will occasionally give birth outside of the nest boxes. In these cases, the females will usually move them into the chosen nest box on their own, but if they don’t, monitor the situation and decide whether intervention (move the cubs to a nest box or pull for hand-rearing) is necessary for the cub’s welfare.

Normally, red panda mothers spend nearly all their time in the nest box during the first several weeks after parturition; cubs should be evaluated if mothers are spending excessive amounts of time out of the nest box. If possible, and if the mothers are comfortable, weekly cub checks and weights are recommended. Nest box cameras may not be sufficient to detect certain medical issues. Red panda mothers will move cubs between nest boxes, but moving cubs excessively or constantly carrying cubs around enclosures can indicate that the female is not comfortable with nest boxes or the environment and can result in injury to cubs or cub abandonment. Additionally, mothers will sometimes cause injury to cubs due to excessive grooming. Any of these situations may warrant removing the cubs for hand rearing.

7.4 Birthing Facilities

As parturition approaches, animal care staff should ensure that the mother is comfortable in the area where the birth will take place, and that this area is “baby-proofed.”

The provision of at least three, insulated nest boxes located in shaded or air-conditioned areas is recommended. Nest boxes from 60.1 cm wide x 91.4 cm long x 50.8 cm high (24 in. x 36 in. x 20 in.) to 91.4 cm wide x 127 cm long x 76 cm high (36 in. x 50 in. x 30 in.) have been used in North American zoos. Wood wool, straw, or other appropriate bedding should be provided for all nest boxes.

There are two types of dam and cub management used by zoos. Both types are appropriate depending on the design of the exhibit and the personality of the dam. One is to allow the dam and cubs access to the exhibit before, during, and after parturition. Considerations for this type of management would be to dial down any electrical voltage appliances used to keep the animals on exhibit (e.g., hot wire, etc.) and to lower or drain any water features, depending on the mobility of the cub and/or if the dam is carrying the cubs around the exhibit. Following parturition red panda mothers become increasingly intolerant of public disturbance and provisions may have to be made. Since containment may be altered for the cub’s safety, other measures may need to be taken.

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The other type of dam/cub management is to lock the dam into her nest area in mid-May and keep her and the cubs inside until the cubs are 2–3 months old. Considerations for this type of management would be to make sure the denning area is air conditioned and that the male, if he is outside on exhibit, has access to other nest areas. Also, the denning area needs to consist of more than one nest box to give the dam choice of nesting areas. When the dam/cubs are released out on exhibit, the depth of any water features will still need to be considered to avoid any drowning possibilities.

Combinations of these two management styles may also be considered. The personality of the dam will determine which management style of combination works best.

7.5 Assisted Rearing

Although mothers may successfully give birth, there are times when they are not able to properly care for their offspring, both in the wild and in ex situ populations. Fortunately, animal care staff in AZA-accredited institutions are able to assist with the rearing of these offspring if necessary.

Poor milk production has also been known to occur in some red panda mothers. If the cubs do not appear to be receiving any or enough milk, they can be pulled for hand rearing, or if the mother’s personality allows, they can be supplement fed while remaining with their mother.

Due to a powerful sucking response that could result in aspiration of liquid, animals should be fed initially by stomach tube (size 7–10 French, depending on animal size). A measured volume is delivered by syringe. The procedure is simple and easily taught to handlers by veterinary staff. Attempts at bottle-feeding should be delayed until animals are well stabilized to milk formula (one week or longer, depending on animal age and condition). Initial bottle-feeding attempts should utilize a sterile solution of 5% dextrose and 0.9% NaCl in case of aspiration. For young red pandas the small teats
designed for premature human infants may be appropriate. Bottle-feeding can be adopted when controlled sucking is obtained. The size of the hole in the teat is important for regulation of milk flow rate and should be monitored periodically to avoid excessive milk flow.

The milk formula generally used is a solution of powdered Esbilac® (Borden, Inc.) in boiled water to which a lactase enzyme preparation is added at rate of 1 drop per 100 g formula. The formula should be predigested with the enzyme for 24 hours in a refrigerator or for 90 minutes at 32–35°C (90–95°F) (e.g., in a water bath). Due to possible bacterial contamination use the 24-hour formula for one day only (discard at 48 hours after initial preparation). 90-minute formula is kept for only 12 hours prior to being discarded. Formula is kept refrigerated after the pre-digestion period and only the amount required for each feed is warmed prior to feeding. Please see Appendix K for the feeding chart. (Esbilac® is a product from Borden, Inc. Lacteeze, Gelda Scientific 6320 Northwest Drive, Mississauga, Ontario, Canada, L4V 1J7, phone (905) 673-9320 fax (905) 673-8114 (toll free: 1-866-673-9320), email: gelda@globalserve.net; web: www.gelda.com). In order to aid the development of a new milk substitute, any zoo which has to sedate a lactating panda is asked to obtain a milk sample for analysis.

For the first few feeds the formula should be very dilute (7% Esbilac® by weight, e.g., 7 g Esbilac®, 93 g boiled water, one drop Lactaid or Lacteeze [make sure to check expiration dates]) to allow acclimation to formula constituents. Formula concentration is gradually increased in stepwise fashion (10%, 12%, 15%, 18%, 20% Esbilac®) according to animal performance and age. Thus the formula concentration might reach 15% strength in one week and 20% in three weeks. Formula is kept at this strength until weaning. In some instances pediatric vitamins (ABDEC, Parke-Davis, Morris Plains, N.J. 07950) or iron supplements have been given to hand reared red pandas but these may not be necessary in most cases as Esbilac contains generous levels of these nutrients.

Animals are initially fed at 3-hour intervals (8x per day). As the animals stabilize and get stronger the interval can be increased to 4 hours (6x per day). The amount fed per day is based on body weight; therefore it is essential to weigh the animals each day. A typical regimen for the first week would be 25–30% of body weight distributed over 8 feeds (3.1–3.8% of body weight per feed). The amount to feed is recalculated at 3–4 days intervals based on body weight changes. As the animal ages the percentage of body weight fed per day is gradually reduced, (e.g., at about 1 month old, the panda is fed 20–25% of its body weight per day, at 2 months old 16–18% per day, and at 3 months old about 15% per day). These amounts are modeled after milk intakes of mother-reared carnivores; small (undersized) animals should be fed at the upper end of these percentage ranges.
Weaning in bottle-raised red pandas is begun at approximately 4 months, which can include offering panda gruel, or formula soaked biscuits in a bowl, in addition to the formula. The animals should be taught to consume formula from a bowl, which can prove difficult. A spoon can be used over the bowl at first, slowly lowering the spoon until the panda is prompted to eat from the bowl. In one case the teat had to be placed in the bowl of formula to initiate feeding. The amount of gruel or softened biscuits added is gradually increased then changed to hard biscuits such that animals may be fully weaned by 5 to 6 months. Fruit can be added gradually after hard biscuits are being readily eaten or to entice the cubs to eat the hard biscuits. Red pandas resist rapid dietary change. Bamboo can be offered separately from about 70–90 days to allow manipulation and investigation; they may not be eaten at first. Water should be made available as solids are introduced.

The gruel to which animals are weaned is a mixture of red panda formula and crushed leaf eater biscuits. The amount of biscuit added to the formula is gradually increased until cubs are ready to transition to formula softened biscuits, then to water softened biscuits then to the adult diet of hard biscuits and bamboo.

Young red pandas are initially kept in an incubator or warm box at 29.4–32.2 °C (85–90 °F). As they mature, they are prone to heat stress. Fans can help in hot weather.

Hand reared red pandas gain weight at a rate equal to or above that of mother-reared young. Weights of hand-reared animals are provided below. Early weights of animals pulled due to small size are excluded (i.e., animals much smaller than those below are underweight). For both subspecies, an average weight gain of 7–10 g per day is healthy.

**A. fulgens**
- Birth ca. 100 g
- 10 weeks 0.9–1.4 kg
- 2 weeks 160–210 g
- 3 months 1.3–1.9 kg
- 4 weeks 260–360 g
- 4 months 1.8–2.6 kg
- 6 weeks 460–650 g
- 5 months 2.4–3.7 kg
- 8 weeks 650–960 g
- 6 months 3.2–4.8 kg

**A. refulgens (styani)**
- Birth 110–169 g
- 2 weeks 213–359 g
- 3 months 2.8–3.1 kg
- 4 weeks 447–592 g
- 4 months 4.2–5.2 kg
- 6 weeks 685–1.01 kg
- 5 months 5.7–7.4 kg
- 8 weeks 1.1–1.5 kg
- 6 months 6.9–7.6 kg

**Additional Considerations:** Animals should be reared as a group if at all possible to prevent abnormal socialization as they mature. If you are hand rearing a single red panda cub, contact the SSP to see if a...
peer rearing opportunity exists. Since young animals tend to suck on each other, they may need to be housed separately for an initial period.

Stimulate young animals to induce elimination. Stimulate anal and urethra separately to avoid urinary tract infections. Lubricants are not necessary and may contribute to infections. Diaper cream (Desitin®) can be used for irritation. Older cubs may develop soreness in the anal region from frequent scent marking (anal rubbing) of objects in the enclosure.

Nails will require periodic trimming, even so it may be necessary to wrap older cubs in a towel for feeding to avoid scratches. Handlers will need heavy trousers when animals start to climb on them (this behavior should be discouraged and not inadvertently positively trained in any way).

**Myconium:** The first stool a baby passes after birth looks different than normal stool and is one way to tell if a baby has nursed. Red panda cubs typically do not pass myconium until they have nursed. There may be the odd time they will pass myconium in utero or during labor, however when this happens it can cause respiratory distress after the birth.

The normal range for rectal temperature appears to be 35.2–36.6 °C (95.4–98 °F). Rectal temperatures above 37.2–37.7 °C (99–100 °F) may indicate a medical problem. Rectal temperature should be monitored once or twice a day in young animals.
7.6 Contraception

Many animals cared for in AZA-accredited institutions breed so successfully that contraception techniques are implemented to ensure that the population remains at a healthy size. The AZA Red Panda SSP does not recommend any form of chemical contraception for red pandas. No research has been conducted into the efficacy of chemical contraception and the viability of the red panda females after contraception is removed. Physical separation is the only recommended form of contraception at this time. Since the breeding season is only from December to April, physical separation would only be necessary during this time.

It is the goal at every masterplanning session to pair all viable animal for breeding. Please contact the AZA SSP Coordinator if you are unable to breed your pair and cannot physically separate your animals and one of them will be placed at another facility.
Chapter 8. Behavior Management

8.1 Animal Training

Classical and operant conditioning techniques have been used to train animals for over a century. Classical conditioning is a form of associative learning demonstrated by Ivan Pavlov. Classical conditioning involves the presentation of a neutral stimulus that will be conditioned (CS) along with an unconditioned stimulus that evokes an innate, often reflexive, response (US). If the CS and the US are repeatedly paired, eventually the two stimuli become associated and the animal will begin to produce a conditioned behavioral response to the CS.

Operant conditioning uses the consequences of a behavior to modify the occurrence and form of that behavior. Reinforcement and punishment are the core tools of operant conditioning. Positive reinforcement occurs when a behavior is followed by a favorable stimulus to increase the frequency of that behavior. Negative reinforcement occurs when a behavior is followed by the removal of an aversive stimulus to also increase the frequency of that behavior. Positive punishment occurs when a behavior is followed by an aversive stimulus to decrease the frequency of that behavior. Negative punishment occurs when a behavior is followed by the removal of a favorable stimulus also to decrease the frequency of that behavior.

AZA-accredited institutions are expected to utilize reinforcing conditioning techniques to facilitate husbandry procedures and behavioral research investigations. A keeper/animal association based on trust and consistency is important with red pandas and can pay off at extremely critical periods (McMillan et al., 2002). For example, females with offspring are very sensitive to environmental disturbances during the nesting season. Resulting maternal stress may increase the likelihood of cub mortality through such means as excessive carrying or grooming, or milk suppression. If a female is comfortable with keeper presence and has a working routine, she is more likely to be calm and cooperative during cubbing season.

Red pandas are easily trained to shift, target, crate up, tolerate close visual inspection, medicate, and perform many other routine procedures. Obtaining regular weights is essential to good management. Red pandas can easily be trained to enter a nest box or shipping crate for food (Roberts & Glatston, 1994). Other non-routine procedures that red panda have been trained to tolerate, or participate in, are vaginal swabs, palpation and general body condition checks, measurements, and ultrasound (McMillan et al., 2002).

During procedures involving physical contact with a panda, it is often useful to shift enclosure mates to another location to eliminate the potential of distraction. The panda should then be targeted to its familiar training position and rewarded. All training or performance of contact procedures should be performed at the habituated training location by people in which the animal is familiar.

8.2 Environmental Enrichment

Environmental enrichment, also called behavioral enrichment, refers to the practice of providing a variety of stimuli to the animal’s environment, or changing the environment itself to increase physical activity, stimulate cognition, and promote natural behaviors. Stimuli, including natural and artificial objects, scents, and sounds are presented in a safe way for the red pandas to interact with. Some suggestions include providing food in a variety of ways (i.e., frozen in ice or in a manner that requires an animal to solve simple puzzles to obtain it), using the presence or scent/sounds of other animals of the same or different species, and incorporating an animal training (husbandry or behavioral research) regime in the daily schedule.

Enrichment programs for red pandas should take into account the natural history of the species, individual needs of the animals, and facility constraints. The red panda enrichment plan should include the following elements: goal-setting, planning and approval process, implementation, documentation/record-keeping, evaluation, and subsequent program refinement. The red panda enrichment program should ensure that all environmental enrichment devices (EEDs) are “red panda” safe and are presented on a variable schedule to prevent habituation AZA-accredited institutions must have a formal written enrichment program that promotes species-appropriate behavioral opportunities.
Red Panda (*Ailurus fulgens*) Care Manual

A program that promotes red panda-appropriate behavioral opportunities (AZA Accreditation Standard 1.6.1).

Red panda enrichment programs should be integrated with veterinary care, nutrition, and animal training programs to maximize the effectiveness and quality of animal care provided. AZA-accredited institutions must have specific staff members assigned to oversee, implement, train, and coordinate interdepartmental enrichment programs (AZA Accreditation Standard 1.6.2).

**AZA Small Carnivore TAG Recommendations:** Development of enrichment ideas should be goal-oriented, proactive, based upon the animal’s natural history, individual history, and exhibit constraints, and should be integrated into all aspects of their *ex situ* population management. Successful enrichment techniques include variation of exhibit schedule or exhibit mates (where appropriate only), rearranging of exhibit furniture/features, change of furniture (some of the old should always be retained to maintain the animal's scent and an element of the familiar), scents, sounds, toys (natural and artificial; care should be taken they cannot be eaten, broken, or become stuck in the animal's mouth), herbs, spices, different substrates for digging/rolling, food items, and novel presentation of food items. It is important that enrichment items are not merely thrown in an exhibit and allowed to stay for extended periods—an enrichment program is only successful and useful if actively managed and constantly reviewed. The American Association of Zoo Keepers (AAZK) Enrichment committee provides the follow general guidelines about enrichment:

"The goal of enrichment should be to maximize the benefit while minimizing unacceptable risks. All enrichment should be evaluated on three levels: 1) whether the enrichment item itself poses an unacceptable risk to the animals, 2) what benefit the animals will derive from the enrichment, and 3) whether the manner of enrichment delivery is apt to lead to problems.

A written plan of action that eliminates the most dangerous risk factors while maintaining the benefits of a challenging and complex environment can help animal managers develop a safe and successful enrichment program. Keepers should evaluate new and creative enrichment ideas with their managers and staff from other departments (curatorial, janitorial, maintenance, veterinary, nutritional, etc.) to decrease the frequency of abnormal and stereotypic behaviors or low activity levels, and to fine-tune enrichment ideas. For enrichment to be safely provided, it is strongly recommended that each institution establish enrichment procedures, protocols, and a chain of command that keepers can follow" (AZA Small Carnivore TAG, 2010).

Factors that should be considered when determining how often behavioral or environmental enrichment is offered include the species and individual(s) involved as well as the physical characteristics of the exhibit. Large, complex exhibits may offer ample opportunities for animals to exercise natural behaviors with infrequent enrichment (2–3 times weekly). Other exhibits or individuals may require more frequent enrichment (daily or multiple times per day). Husbandry staff should monitor all individuals in an exhibit and structure an enrichment schedule for the needs of those animals, providing them opportunities several times a day to interact positively with their environment. Enrichment should not be offered on a regular schedule, instead times, items, and delivery methods should be rotated so there is always an element of novelty associated with each item or activity.

Red pandas have acute olfactory senses, enrichment designed to stimulate these senses and encourage foraging should be well-received and stimulate species-appropriate behaviors. All enrichment items should be approved by an institution’s management team, including the veterinarian and horticulturist (AZA Small Carnivore TAG, 2010).
8.3 Staff and Animal Interactions

Animal training and environmental enrichment protocols and techniques should be based on interactions that promote safety for all involved.

Red pandas have been successfully trained to enter holding areas or crates, to station on scales and even to hold for injections, palpation, and vaginal swabs. Keepers generally work in enclosures with red pandas, taking care to give the animals opportunity to avoid keepers. Red pandas should, however, be regarded with caution as they do have sharp claws and extremely strong jaws, and will defend themselves and their young. “Unprovoked” attacks on keepers have been reported, most commonly with hand raised individuals. Red pandas that show aggression towards keepers should be shifted so keepers do not have to enter exhibits with them.

8.4 Staff Skills and Training

Red panda staff members should be trained in all areas of red panda behavior management. Funding should be provided for AZA continuing education courses, related meetings, conference participation, and other professional opportunities. A reference library appropriate to the size and complexity of the institution should be available to all staff and volunteers to provide them with accurate information on the behavioral needs of the animals with which they work.

The following technical skills and competencies are recommended for all animal care staff working with small carnivores (AZA SCTAG, 2010):

- Keepers and managers should have an in-depth understanding of the species natural history and the individual's history.
- Keepers and managers should have an in-depth understanding of the individual animal's behaviors, an understanding of the function of those behaviors, and the ability to describe those behaviors orally and in writing.
- Keepers should be able to recognize signs of illness and injury in the red pandas they are working with and to communicate those signs orally or in writing to managers and veterinarians.
- Keepers should be able to accurately assess the appropriate level of cleanliness and safety of the animal’s exhibit, holding area, and food-prep area.
- Keepers should have the skills to safely capture or restrain the red pandas in question.
- Keepers should have some understanding of the species natural diet and foraging style.
- Keepers and managers should have an understanding of enrichment concepts and have a commitment to consistently enhance the environments of the species in their care.
- Keepers should understand the concepts of animal learning and training, be able to use a variety of techniques (e.g., habituation, operant conditioning) to train the animals under their care, and to create a training plan (identifying training steps, cues, and criteria). See www.animaltraining.org for additional details.
- Managers should understand the concepts of animal learning and training, be able to coach keepers in all aspects of training, review their training plans, look for consistency among keepers in their training techniques, and help their teams prioritize training, enrichment, and other husbandry goals.
9.1 Program Animal Policy

AZA recognizes many public education and, ultimately, conservation benefits from program animal presentations. AZA’s Conservation Education Committee’s Program Animal Position Statement (Appendix D) summarizes the value of program animal presentations.

For the purpose of this policy, a program animal is described as an animal presented either within or outside of its normal exhibit or holding area that is intended to have regular proximity to or physical contact with trainers, handlers, the public, or will be part of an ongoing conservation education/outreach program.

Program animal presentations bring a host of responsibilities, including the welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that give program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA’s accreditation standards require that the conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, sound and environmental enrichment, access to veterinary care, nutrition, and other related standards (AZA Accreditation Standard 1.5.4). In addition, providing program animals with options to choose among a variety of conditions within their environment is essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, housing may be reduced in size compared to a primary enclosure as long as the animal's physical and psychological needs are being met during the program; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

Red pandas are not recommended to be used as program animals. Some zoos occasionally provide feeding opportunities to guests during “behind-the-scenes” tours, but these programs are restricted and rare.

9.2 Institutional Program Animal Plans

AZA’s policy on the presentation of animals is as follows: AZA is dedicated to excellence in animal care and welfare, conservation, education, research, and the presentation of animals in ways that inspire respect for wildlife and nature. AZA’s position is that animals should always be presented in adherence to the following core principles:

- Animal and human health, safety, and welfare are never compromised.
- Education and a meaningful conservation message are integral components of the presentation.
- The individual animals involved are consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs.

AZA-accredited institutions that have designated program animals are required to develop their own Institutional Program Animal Policy that articulates and evaluates the program benefits (see Appendix E for recommendations). Program animals should be consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs. Education and conservation messaging must be an integral component of any program animal demonstration (AZA Accreditation Standard 1.5.3).
Animal care and education staff should be trained in program animal-specific handling protocols, conservation, and education messaging techniques, and public interaction procedures. These staff members should be competent in recognizing stress or discomfort behaviors exhibited by the program animals and be able to address any safety issues that arise. Program animals that are taken off zoo or aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution’s healthy population. AZA-accredited institutions must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5).

Careful consideration must be given to the design and size of all program animal enclosures, including exhibit, off-exhibit holding, hospital, quarantine, and isolation areas, such that the physical, social, behavioral, and psychological needs of the species are met and species-appropriate behaviors are facilitated (AZA Accreditation Standard 10.3.3; AZA Accreditation Standard 1.5.2).

Similar consideration needs to be given to the means in which an animal will be transported both within the Institution’s grounds, and to/from an off-grounds program. Animal transportation must be conducted in a manner that is lawful, safe, well planned, and coordinated, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11).

**Conservation Education Messages:** Red pandas are the only species of their kind in the world. Their conservation is central to preserving the world’s natural heritage and global biodiversity. The red panda is classified as vulnerable in the IUCN Red List (IUCN 2011) and is listed in CITES Appendix I. Reliable population numbers are hard to find, partly because other animals have been mistaken for the red panda. The population was estimated at less than 2,500 individuals in 1999 and between 16,000 and 20,000 in 2011. The IUCN Red List (IUCN 2011) estimates the total population in China to be between 6,000 and 7,000 and the population in India to be between 5,000 and 6,000 with wild populations still declining. The red panda is protected in all countries where it lives, and hunting is illegal. Beyond this, conservation efforts are highly variable between countries.

**9.3 Program Evaluation**

AZA-accredited institutions which have Institutional Program Animal Plan are required to evaluate the efficacy of the plan routinely (see Appendix E for recommendations). Education and conservation messaging content retention, animal health and well-being, guest responses, policy effectiveness, and accountability and ramifications of policy violations should be assessed and revised as needed.

As per section 9.1, red pandas should not be used as program animals.
Chapter 10. Research

10.1 Known Methodologies

AZA believes that contemporary red panda management, husbandry, veterinary care and conservation practices should be based in science, and that a commitment to scientific research, both basic and applied, is a trademark of the modern zoological park and aquarium. AZA-accredited institutions have the invaluable opportunity, and are expected, to conduct or facilitate research both in in situ and ex situ settings to advance scientific knowledge of the animals in our care and enhance the conservation of wild populations. This knowledge might be achieved by participating in AZA Taxon Advisory Group (TAG) or Species Survival Plan® (SSP) Program sponsored research, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials (AZA Accreditation Standard 5.3).

Research investigations, whether observational, behavioral, physiological, or genetically based, should have a clear scientific purpose with the reasonable expectation that they will increase our understanding of the species being investigated and may provide results which benefit the health or welfare of animals in wild populations. Many AZA-accredited institutions incorporate superior positive reinforcement training programs into their routine schedules to facilitate sensory, cognitive, and physiological research investigations and these types of programs are strongly encouraged by the AZA.

AZA-accredited institutions are required to have a clearly written research policy that identifies the types of research being conducted, methods used, staff involved, evaluations of the projects, the animals included, and guidelines for the reporting or publication of any findings (AZA Accreditation Standard 5.2). Institutions must designate a qualified individual to oversee and direct its research program (AZA Accreditation Standard 5.1). If institutions are not able to conduct in-house research investigations, they are strongly encouraged to provide financial, personnel, logistical, and other support for priority research and conservation initiatives identified by AZA Taxon Advisory Groups (TAGs) or AZA Species Survival Plans® (SSP) Programs.

The following covers a variety of the types of studies that have been conducted on red pandas to date. This list is not exhaustive and those interested in conducting research should perform a thorough literature review prior to beginning.


10.2 Future Research Needs

This Animal Care Manual is a dynamic document that will need to be updated as new information is acquired. Knowledge gaps have been identified throughout the Manual and are included in this section to promote future research investigations. Knowledge gained from areas will maximize AZA-accredited institutions’ capacity for excellence in animal care and welfare as well as enhance conservation initiatives for the species.

Chapter 7: Reproduction

7.2: Assisted Reproductive Technology: Electro-ejaculation and artificial insemination

7.2: Assisted Reproductive Technology: Can fecal hormone assays determine pregnancy in red pandas?

7.5: Assisted Rearing: Maternal care and the question of whether poor milk production is genetic.

7.6: Contraception: The efficacy of chemical contraception and the viability of the red panda females after being removed from the contraception.
11.1 Useful References


Acknowledgements

Thanks to everyone who contributed to this manual. Many years of hard work and patience occurred to make this manual happen.
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Appendix A: Accreditation Standards by Chapter

The following specific standards of care relevant to red panda (*Ailurus fulgens*) are taken from the AZA Accreditation Standards and Related Policies (AZA, 2011) and are referenced fully within the chapters of this animal care manual:

**General Information**

(1.1.1) The institution must comply with all relevant local, state, and federal wildlife laws and regulations. It is understood that, in some cases, AZA accreditation standards are more stringent than existing laws and regulations. In these cases the AZA standard must be met.

**Chapter 1**

(1.5.7) The animal collection must be protected from weather detrimental to their health.

(10.2.1) Critical life-support systems for the animal collection, including but not limited to plumbing, heating, cooling, aeration, and filtration, must be equipped with a warning mechanism, and emergency backup systems must be available. All mechanical equipment should be under a preventative maintenance program as evidenced through a record-keeping system. Special equipment should be maintained under a maintenance agreement, or a training record should show that staff members are trained for specified maintenance of special equipment.

(1.5.9) The institution must have a regular program of monitoring water quality for collections of fish, pinnipeds, cetaceans, and other aquatic animals. A written record must be maintained to document long-term water quality results and chemical additions.

**Chapter 2**

(1.5.2) Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs. Display of single specimens should be avoided unless biologically correct for the species involved.

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal’s physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals.

(11.3.3) Special attention must be given to free-ranging animals so that no undue threat is posed to the animal collection, free-ranging animals, or the visiting public. Animals maintained where they will be in contact with the visiting public must be carefully selected, monitored, and treated humanely at all times.

(11.3.1) All animal exhibits and holding areas must be secured to prevent unintentional animal egress.

(11.3.6) Guardrails/barriers must be constructed in all areas where the visiting public could have contact with other than handleable animals.

(11.2.3) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency. These procedures should deal with four basic types of emergencies: fire, weather/environment; injury to staff or a visitor; animal escape.

(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e., shooting teams).

(11.2.4) The institution must have a communication system that can be quickly accessed in case of an emergency.

(11.2.5) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

(11.5.3) Institutions maintaining potentially dangerous animals (sharks, whales, tigers, bears, etc.) must have appropriate safety procedures in place to prevent attacks and injuries by these animals. Appropriate response procedures must also be in place to deal with an attack resulting in an injury. These procedures must be practiced routinely per the emergency drill requirements contained in these standards. Whenever injuries result from these incidents, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the
safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident.

Chapter 3

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to.

Chapter 5

(2.6.2) A formal nutrition program is recommended to meet the behavioral and nutritional needs of all species and specimens within the collection.

(2.6.3) Animal diets must be of a quality and quantity suitable for each animal’s nutritional and psychological needs. Diet formulations and records of analysis of appropriate feed items should be maintained and may be examined by the Visiting Committee. Animal food, especially seafood products, should be purchased from reliable sources that are sustainable and/or well managed.

(2.6.4) The institution should assign at least one person to oversee appropriate browse material for the collection.

Chapter 6

(2.1.1) A full-time staff veterinarian is recommended. However, the Commission realizes that in some cases such is not practical. In those cases, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection and respond as soon as possible to any emergencies. The Commission also recognizes that certain collections, because of their size and/or nature, may require different considerations in veterinary care.

(2.1.2) So that indications of disease, injury, or stress may be dealt with promptly, veterinary coverage must be available to the animal collection 24 hours a day, 7 days a week.

(2.2.1) Written, formal procedures must be available to the animal care staff for the use of animal drugs for veterinary purposes and appropriate security of the drugs must be provided.

(1.4.6) A staff member must be designated as being responsible for the institution's animal record-keeping system. That person must be charged with establishing and maintaining the institution's animal records, as well as with keeping all animal care staff members apprised of relevant laws and regulations regarding the institution's animal collection.

(1.4.7) Animal records must be kept current, and data must be logged daily.

(1.4.5) At least one set of the institution's historical animal records must be stored and protected. Those records should include permits, titles, declaration forms, and other pertinent information.

(1.4.4) Animal records, whether in electronic or paper form, including health records, must be duplicated and stored in a separate location.

(1.4.3) Animals must be identifiable, whenever practical, and have corresponding ID numbers. For animals maintained in colonies or other animals not considered readily identifiable, the institution must provide a statement explaining how record keeping is maintained.

(1.4.1) An animal inventory must be compiled at least once a year and include data regarding acquisitions and dispositions in the animal collection.

(1.4.2) All species owned by the institution must be listed on the inventory, including those animals on loan to and from the institution. In both cases, notations should be made on the inventory.

(2.7.1) The institution must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals.

(2.7.3) Quarantine, hospital, and isolation areas should be in compliance with standards or guidelines adopted by the AZA.

(2.7.2) Written, formal procedures for quarantine must be available and familiar to all staff working with quarantined animals.

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

(11.1.3) A tuberculin testing and surveillance program must be established for appropriate staff in order to ensure the health of both the employees and the animal collection.

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Disposal after necropsy must be done in accordance with local/federal laws.

(2.4.1) The veterinary care program must emphasize disease prevention.
For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the collection from exposure to infectious agents.

Capture equipment must be in good working order and available to authorized, trained personnel at all times.

Keepers should be trained to recognize abnormal behavior and clinical symptoms of illness and have knowledge of the diets, husbandry (including enrichment items and strategies), and restraint procedures required for the animals under their care. However, keepers should not evaluate illnesses nor prescribe treatment.

Hospital facilities should have x-ray equipment or have access to x-ray services.

The institution must develop a clear process for identifying and addressing animal welfare concerns within the institution.

Chapter 8

The institution must have a formal written enrichment program that promotes species-appropriate behavioral opportunities.

The institution must have a specific staff member(s) or committee assigned for enrichment program oversight, implementation, training, and interdepartmental coordination of enrichment efforts.

Chapter 9

A written policy on the use of live animals in programs should be on file. Animals in education programs must be maintained and cared for by trained staff, and housing conditions must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, social and environmental enrichment, access to veterinary care, nutrition, etc. Since some of these requirements can be met outside of the primary enclosure, for example, enclosures may be reduced in size provided that the animal's physical and psychological needs are being met.

If animal demonstrations are a part of the institution’s programs, an education and conservation message must be an integral component.

For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the collection from exposure to infectious agents.

All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals.

Animal transportation must be conducted in a manner that is safe, well planned, and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to. Planning and coordination for animal transport requires good communication among all involved parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

Institutions should maximize the generation of scientific knowledge gained from the animal collection. This might be achieved by participating in AZA TAG/SSP sponsored research when applicable, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials.

Institutions must have a written policy that outlines the type of research that it conducts, methods, staff involvement, evaluations, animals to be involved, and guidelines for publication of findings.

Research activities must be under the direction of a person qualified to make informed decisions regarding research.
Appendix B: Acquisition/Disposition Policy

I. Introduction: The Association of Zoos and Aquariums (AZA) was established, among other reasons, to foster continued improvement in the zoological park and aquarium profession. One of its most important roles is to provide a forum for debate and consensus building among its members, the intent of which is to attain high ethical standards, especially those related to animal care and professional conduct. The stringent requirements for AZA accreditation and high standards of professional conduct are unmatched by similar organizations and also far surpass the United States Department of Agriculture’s Animal and Plant Health Inspection Service’s requirements for licensed animal exhibitors. AZA member facilities must abide by a Code of Professional Ethics — a set of standards that guide all aspects of animal management and welfare. As a matter of priority, AZA institutions should acquire animals from other AZA institutions and dispose of animals to other AZA institutions.

AZA-accredited zoological parks and aquariums cannot fulfill their important missions of conservation, and science without living animals. Responsible management of living animal populations necessitates that some individuals be acquired and that others be removed from the collection at certain times. Acquisition of animals can occur through propagation, trade, donation, loan, purchase, capture, or rescue. Animals used as animal feed are not accessioned into the collection.

Disposition occurs when an animal leaves the collection for any reason. Reasons for disposition vary widely, but include cooperative population management (genetic or demographic management), reintroduction, behavioral incompatibility, sexual maturation, animal health concerns, loan or transfer, or death.

The AZA Acquisition/Disposition Policy (A/D) was created to help (1) guide and support member institutions in their animal acquisition and disposition decisions, and (2) ensure that all additions and removals are compatible with the Association’s stated commitment to “save and protect the wonders of the living natural world.” More specifically, the AZA A/D Policy is intended to:

- Ensure that the welfare of individual animals and conservation of populations, species and ecosystems are carefully considered during acquisition and disposition activities;
- Maintain a proper standard of conduct for AZA members during acquisition and disposition activities;
- Ensure that animals from AZA member institutions are not transferred to individuals or organizations that lack the appropriate expertise or facilities to care for them.
- Support the goal of AZA’s cooperatively managed populations and associated programs, including Species Survival Plans (SSPs), Population Management Plans (PMPs), and Taxon Advisory Groups (TAGs).

The AZA Acquisition/Disposition Policy will serve as the default policy for AZA member institutions. Institutions may develop their own A/D Policy in order to address specific local concerns. Any institutional policy must incorporate and not conflict with the AZA acquisition and disposition standards.

Violations of the AZA Acquisition/Disposition Policy will be dealt with in accordance with the AZA Code of Professional Ethics. Violations can result in an institution’s or individual’s expulsion from membership in the AZA.

II. Group or Colony-based Identification: For some colonial, group-living, or prolific species, such as certain insects, aquatic invertebrates, schooling fish, rodents, and bats, it is often impossible or highly impractical to identify individual specimens. These species are therefore maintained, acquisitioned, and disposed of as a group or colony. Therefore, when this A/D Policy refers to animals or specimens, it is in reference to both individuals and groups/colonies.

III. Germplasm: Acquisition and disposition of germplasm should follow the same guidelines outlined in this document if its intended use is to create live animal(s). Ownership of germplasm and any resulting animals should be clearly defined. Institutions acquiring or dispositioning germplasm or any animal parts or samples should consider not only its current use, but also future possible uses as new technologies become available.
IV(a). General Acquisitions: Animals are to be acquisitioned into an AZA member institution’s collection if the following conditions are met:

1. Acquisitions must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. The Director or Chief Executive Officer of the institution is charged with the final authority and responsibility for the monitoring and implementation of all acquisitions.
3. Acquisitions must be consistent with the mission of the institution, as reflected in its Institutional Collection Plan, by addressing its exhibition/education, conservation, and/or scientific goals.
4. Animals that are acquired for the collection, permanently or temporarily, must be listed on institutional records. All records should follow the Standards for Data Entry and Maintenance of North American Zoo and Aquarium Animal Records Databases®.
5. Animals may be acquired temporarily for reasons such as, holding for governmental agencies, rescue and/or rehabilitation, or special exhibits. Animals should only be accepted if they will not jeopardize the health, care or maintenance of the animals in the permanent collection or the animal being acquired.
6. The institution must have the necessary resources to support and provide for the professional care and management of a species, so that the physical and social needs of both specimen and species are met.
7. Attempts by members to circumvent AZA conservation programs in the acquisition of SSP animals are detrimental to the Association and its conservation programs. Such action may be detrimental to the species involved and is a violation of the Association’s Code of Professional Ethics. All AZA members must work through the SSP program in efforts to acquire SSP species and adhere to the AZA Full Participation policy.
8. Animals are only to be acquired from sources that are known to operate legally and conduct their business in a manner that reflects and/or supports the spirit and intent of the AZA Code of Professional Ethics as well as this policy. Any convictions of state, federal, or international wildlife laws should be reviewed, as well as any previous dealings with other AZA-accredited institutions.
9. When acquiring specimens managed by a PMP, institutions should consult with the PMP manager.
10. Institutions should consult AZA Wildlife Conservation and Management Committee (WCMC)-approved Regional Collection Plans (RCPs) when making acquisition decisions.

IV(b). Acquisitions from the Wild: The maintenance of wild animal populations for education and wildlife conservation purposes is a unique responsibility of AZA member zoos and aquariums. To accomplish these goals, it may be necessary to acquire wild-caught specimens. Before acquiring animals from the wild, institutions are encouraged to examine sources including other AZA institutions or regional zoological associations.

When acquiring animals from the wild, careful consideration must be taken to evaluate the long-term impacts on the wild population. Any capture of free-ranging animals should be done in accordance with all local, state, federal, and international wildlife laws and regulations and not be detrimental to the long-term viability of the species or the wild or captive population(s). In crisis situations, when the survival of a population is at risk, rescue decisions are to be made on a case-by-case basis.

V(a). Disposition Requirements – living animals: Successful conservation and animal management efforts rely on the cooperation of many entities, both within and outside of AZA. While preference is given to placing animals within AZA member institutions, it is important to foster a cooperative culture among those who share the primary mission of AZA-accredited facilities. The AZA draws a strong distinction between the mission, stated or otherwise, of non-AZA member organizations and the mission of professionally managed zoological parks and aquariums accredited by the AZA.

An accredited AZA member balances public display, recreation, and entertainment with demonstrated efforts in education, conservation, and science. While some non-AZA member organizations may meet minimum daily standards of animal care for wildlife, the AZA recognizes that this, by itself, is insufficient to warrant either AZA membership or participation in AZA’s cooperative animal management programs. When an animal is sent to a non-member of AZA, it is imperative that the member be confident that the animal will be cared for properly.
Animals may only be disposed of from an AZA member institution’s collection if the following conditions are met:

1. Dispositions must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. The Director or Chief Executive Officer of the institution is charged with the final authority and responsibility for the monitoring and implementation of all dispositions.
3. Any disposition must abide by the Mandatory Standards and General Advisories of the AZA Code of Professional Ethics. Specifically, “a member shall make every effort to assure that all animals in his/her collection and under his/her care are disposed of in a manner which meets the current disposition standards of the Association and do not find their way into the hands of those not qualified to care for them properly.”
4. Non-domesticated animals shall not be disposed of at animal auctions. Additionally, animals shall not be disposed of to any organization or individual that may use or sell the animal at an animal auction. In transactions with AZA non-members, the recipient must ensure in writing that neither the animal nor its offspring will be disposed of at a wild animal auction or to an individual or organization that allows the hunting of the animal.
5. Animals shall not be disposed of to organizations or individuals that allow the hunting of these animals or their offspring. This does not apply to individuals or organizations which allow the hunting of only free-ranging game species (indigenous to North America) and established long-introduced species such as, but not limited to, white-tailed deer, quail, rabbit, waterfowl, boar, ring-necked pheasant, chukar, partridge, and trout. AZA distinguishes hunting/fishing for sport from culling for sustainable population management and wildlife conservation purposes.
6. Attempts by members to circumvent AZA conservation programs in the disposition of SSP animals are detrimental to the Association and its conservation programs. Such action may be detrimental to the species involved and is a violation of the Association’s Code of Professional Ethics. All AZA members must work through the SSP program in efforts to deacquisition SSP species and adhere to the AZA Full Participation policy.
7. Domesticated animals are to be disposed of in a manner consistent with acceptable farm practices and subject to all relevant laws and regulations.
8. Live specimens may be released within native ranges, subject to all relevant laws and regulations. Releases may be a part of a recovery program and any release must be compatible with the AZA Guidelines for Reintroduction of Animals Born or Held in Captivity, dated June 3, 1992.
9. Detailed disposition records of all living or dead specimens must be maintained. Where applicable, proper animal identification techniques should be utilized.
10. It is the obligation of every loaning institution to monitor, at least annually, the conditions of any loaned specimens and the ability of the recipient to provide proper care. If the conditions and care of animals are in violation of the loan agreement, it is the obligation of the loaning institution to recall the animal. Furthermore, an institution’s loaning policy must not be in conflict with this A/D Policy.
11. If live specimens are euthanized, it must be done in accordance with the established policy of the institution and the Report of the American Veterinary Medical Association Panel on Euthanasia (Journal of the American Veterinary Medical Association 218 (5): 669-696, 2001).
12. In dispositions to non-AZA members, the non-AZA member’s mission (stated or implied) must not be in conflict with the mission of AZA, or with this A/D Policy.
13. In dispositions to non-AZA member facilities that are open to the public, the non-AZA member must balance public display, recreation, and entertainment with demonstrated efforts in conservation, education, and science.
14. In dispositions to non-AZA members, the AZA members must be convinced that the recipient has the expertise, records management practices, financial stability, facilities, and resources required to properly care for and maintain the animals and their offspring. It is recommended that this documentation be kept in the permanent record of the animals at the AZA member institution.
15. If living animals are sent to a non-AZA member research institution, the institution must be registered under the Animal Welfare Act by the U.S. Department of Agriculture Animal and Plant Health Inspection Service.
Health Inspection Service. For international transactions, the receiving facility should be registered by that country's equivalent body with enforcement over animal welfare.

16. No animal disposition should occur if it would create a health or safety risk (to the animal or humans) or have a negative impact on the conservation of the species.

17. Inherently dangerous wild animals or invasive species should not be dispositioned to the pet trade or those unqualified to care for them.

18. Under no circumstances should any primates be dispositioned to a private individual or to the pet trade.

19. Fish and aquatic invertebrate species that meet ANY of the following are inappropriate to be disposed of to private individuals or the pet trade:
   a. species that grow too large to be housed in a 72-inch long, 180 gallon aquarium (the largest tank commonly sold in retail stores)
   b. species that require extraordinary life support equipment to maintain an appropriate captive environment (e.g., cold water fish and invertebrates)
   c. species deemed invasive (e.g., snakeheads)
   d. species capable of inflicting a serious bite or venomous sting (e.g., piranha, lion fish, blue-ringed octopus)
   e. species of wildlife conservation concern

21. When dispositioning specimens managed by a PMP, institutions should consult with the PMP manager.

22. Institutions should consult WCMC-approved RCPs when making disposition decisions.

V(b). Disposition Requirements – dead specimens: Dead specimens (including animal parts and samples) are only to be disposed of from an AZA member institution's collection if the following conditions are met:

1. Dispositions of dead specimens must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. Maximum utilization is to be made of the remains, which could include use in educational programs or exhibits.
3. Consideration is given to scientific projects that provide data for species management and/or conservation.
4. Records (including ownership information) are to be kept on all dispositions, including animal body parts, when possible.
5. SSP and TAG necropsy protocols are to be accommodated insofar as possible.

VI. Transaction Forms: AZA member institutions will develop transaction forms to record animal acquisitions and dispositions. These forms will require the potential recipient or provider to adhere to the AZA Code of Professional Ethics, the AZA Acquisition/Disposition Policy, and all relevant AZA and member policies, procedures and guidelines. In addition, transaction forms must insist on compliance with the applicable laws and regulations of local, state, federal and international authorities.
Appendix C: Recommended Quarantine Procedures

**Quarantine facility:** A separate quarantine facility, with the ability to accommodate mammals, birds, reptiles, amphibians, and fish should exist. If a specific quarantine facility is not present, then newly acquired animals should be isolated from the established collection in such a manner as to prohibit physical contact, to prevent disease transmission, and to avoid aerosol and drainage contamination.

Such separation should be obligatory for primates, small mammals, birds, and reptiles, and attempted wherever possible with larger mammals such as large ungulates and carnivores, marine mammals, and cetaceans. If the receiving institution lacks appropriate facilities for isolation of large primates, pre-shipment quarantine at an AZA or American Association for Laboratory Animal Science (AALAS) accredited institution may be applied to the receiving institutions protocol. In such a case, shipment must take place in isolation from other primates. More stringent local, state, or federal regulations take precedence over these recommendations.

**Quarantine length:** Quarantine for all species should be under the supervision of a veterinarian and consist of a minimum of 30 days (unless otherwise directed by the staff veterinarian). Mammals: If during the 30-day quarantine period, additional mammals of the same order are introduced into a designated quarantine area, the 30-day period must begin over again. However, the addition of mammals of a different order to those already in quarantine will not have an adverse impact on the originally quarantined mammals. Birds, Reptiles, Amphibians, or Fish: The 30-day quarantine period must be closed for each of the above Classes. Therefore, the addition of any new birds into a bird quarantine area requires that the 30-day quarantine period begin again on the date of the addition of the new birds. The same applies for reptiles, amphibians, or fish.

**Quarantine personnel:** A keeper should be designated to care only for quarantined animals or a keeper should attend quarantined animals only after fulfilling responsibilities for resident species. Equipment used to feed and clean animals in quarantine should be used only with these animals. If this is not possible, then equipment must be cleaned with an appropriate disinfectant (as designated by the veterinarian supervising quarantine) before use with post-quarantine animals.

Institutions must take precautions to minimize the risk of exposure of animal care personnel to zoonotic diseases that may be present in newly acquired animals. These precautions should include the use of disinfectant foot baths, wearing of appropriate protective clothing and masks in some cases, and minimizing physical exposure in some species; e.g., primates, by the use of chemical rather than physical restraint. A tuberculin testing/surveillance program must be established for zoo/aquarium employees in order to ensure the health of both the employees and the animal collection.

**Quarantine protocol:** During this period, certain prophylactic measures should be instituted. Individual fecal samples or representative samples from large numbers of individuals housed in a limited area (e.g., birds of the same species in an aviary or frogs in a terrarium) should be collected at least twice and examined for gastrointestinal parasites. Treatment should be prescribed by the attending veterinarian. Ideally, release from quarantine should be dependent on obtaining two negative fecal results spaced a minimum of two weeks apart either initially or after parasiticide treatment. In addition, all animals should be evaluated for ectoparasites and treated accordingly.

Vaccinations should be updated as appropriate for each species. If the animal arrives without a vaccination history, it should be treated as an immunologically naive animal and given an appropriate series of vaccinations. Whenever possible, blood should be collected and sera banked. Either a -70 °C (-94 °F) frost-free freezer or a -20 °C (-4 °F) freezer that is not frost-free should be available to save sera. Such sera could provide an important resource for retrospective disease evaluation.

The quarantine period also represents an opportunity to, where possible, permanently identify all unmarked animals when anesthetized or restrained (e.g., tattoo, ear notch, ear tag, etc.). Also, whenever animals are restrained or immobilized, a complete physical, including a dental examination, should be performed. Complete medical records should be maintained and available for all animals during the quarantine period. Animals that die during quarantine should have a necropsy performed under the supervision of a veterinarian and representative tissues submitted for histopathologic examination.

**Quarantine procedures:** The following are recommendations and suggestions for appropriate quarantine procedures for red panda (Ailurus fulgens):
Red panda (*Ailurus fulgens*):

Required:
1. Direct and floatation fecals
2. Vaccinate as appropriate

Strongly Recommended:
1. CBC/sera profile
2. Urinalysis
3. Appropriate serology (FIP, FeLV, FIV)
4. Heartworm testing in appropriate species
Appendix D: Program Animal Policy and Position Statement

Program Animal Policy

Originally approved by the AZA Board of Directors – 2003
Updated and approved by the Board – July 2008 & June 2011

The Association of Zoos & Aquariums (AZA) recognizes many benefits for public education and, ultimately, for conservation in program animal presentations. AZA’s Conservation Education Committee’s Program Animal Position Statement summarizes the value of program animal presentations (see pages 42-44).

For the purpose of this policy, a Program Animal is defined as “an animal whose role includes handling and/or training by staff or volunteers for interaction with the public and in support of institutional education and conservation goals”. Some animals are designated as Program Animals on a full-time basis, while others are designated as such only occasionally. Program Animal-related Accreditation Standards are applicable to all animals during the times that they are designated as Program Animals.

There are three main categories of Program Animal interactions:

1. On Grounds with the Program Animal Inside the Exhibit/Enclosure:
   i. Public access outside the exhibit/enclosure. Public may interact with animals from outside the exhibit/enclosure (e.g., giraffe feeding, touch tanks).
   ii. Public access inside the exhibit/enclosure. Public may interact with animals from inside the exhibit/enclosure (e.g., lorikeet feedings, ‘swim with’ programs, camel/pony rides).

2. On Grounds with the Program Animal Outside the Exhibit/Enclosure:
   i. Minimal handling and training techniques are used to present Program Animals to the public. Public has minimal or no opportunity to directly interact with Program Animals when they are outside the exhibit/enclosure (e.g., raptors on the glove, reptiles held “presentation style”).
   ii. Moderate handling and training techniques are used to present Program Animals to the public. Public may be in close proximity to, or have direct contact with, Program Animals when they’re outside the exhibit/enclosure (e.g., media, fund raising, photo, and/or touch opportunities).
   iii. Significant handling and training techniques are used to present Program Animals to the public. Public may have direct contact with Program Animals or simply observe the in-depth presentations when they’re outside the exhibit/enclosure (e.g., wildlife education shows).

3. Off Grounds:
   i. Handling and training techniques are used to present Program Animals to the public outside of the zoo/aquarium grounds. Public may have minimal contact or be in close proximity to and have direct contact with Program Animals (e.g., animals transported to schools, media, fund raising events).

These categories assist staff and accreditation inspectors in determining when animals are designated as Program Animals and the periods during which the Program Animal-related Accreditation Standards are applicable. In addition, these Program Animal categories establish a framework for understanding increasing degrees of an animal’s involvement in Program Animal activities.

Program animal presentations bring a host of responsibilities, including the safety and welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that make program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA’s accreditation standards require that education and conservation messages must be an integral component of all program animal presentations. In addition, the accreditation standards require that the conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, appropriate environmental enrichment, access to veterinary care, nutrition, and other related standards. In addition, providing program animals with options to choose among a variety of conditions within their environment is
essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, free-flight birds may receive appropriate exercise during regular programs, reducing the need for additional exercise. However, the institution must ensure that in such cases, the animals participate in programs on a basis sufficient to meet these needs or provide for their needs in their home enclosures; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

**Program Animal Position Statement**

_Last revision 1/28/03_  
_Re-authorized by the Board June 2011_

The Conservation Education Committee (CEC) of the Association of Zoos and Aquariums supports the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective (emotional) messages about conservation, wildlife and animal welfare.

Utilizing these animals allows educators to strongly engage audiences. As discussed below, the use of program animals has been demonstrated to result in lengthened learning periods, increased knowledge acquisition and retention, enhanced environmental attitudes, and the creation of positive perceptions concerning zoo and aquarium animals.

**Audience Engagement**

Zoos and aquariums are ideal venues for developing emotional ties to wildlife and fostering an appreciation for the natural world. However, developing and delivering effective educational messages in the free-choice learning environments of zoos and aquariums is a difficult task.

Zoo and aquarium educators are constantly challenged to develop methods for engaging and teaching visitors who often view a trip to the zoo as a social or recreational experience (Morgan and Hodgkinson, 1999). The use of program animals can provide the compelling experience necessary to attract and maintain personal connections with visitors of all motivations, thus preparing them for learning and reflection on their own relationships with nature.

Program animals are powerful catalysts for learning for a variety of reasons. They are generally active, easily viewed, and usually presented in close proximity to the public. These factors have proven to contribute to increasing the length of time that people spend watching animals in zoo exhibits (Bitgood, Patterson and Benefield, 1986, 1988; Wolf and Tymitz, 1981).

In addition, the provocative nature of a handled animal likely plays an important role in captivating a visitor. In two studies (Povey, 2002; Povey and Rios, 2001), visitors viewed animals three and four times longer while they were being presented in demonstrations outside of their enclosure with an educator than while they were on exhibit. Clearly, the use of program animals in shows or informal presentations can be effective in lengthening the potential time period for learning and overall impact.

Program animals also provide the opportunity to personalize the learning experience, tailoring the teaching session to what interests the visitors. Traditional graphics offer little opportunity for this level of personalization of information delivery and are frequently not read by visitors (Churchman, 1985; Johnston, 1998). For example, Povey (2001) found that only 25% of visitors to an animal exhibit read the accompanying graphic; whereas, 45% of visitors watching the same animal handled in an educational presentation asked at least one question and some asked as many as seven questions. Having an animal accompany the educator allowed the visitors to make specific inquiries about topics in which they were interested.
Knowledge Acquisition

Improving our visitors' knowledge and understanding regarding wildlife and wildlife conservation is a fundamental goal for many zoo educators using program animals. A growing body of evidence supports the validity of using program animals to enhance delivery of these cognitive messages as well.

- MacMillen (1994) found that the use of live animals in a zoomobile outreach program significantly enhanced cognitive learning in a vertebrate classification unit for sixth grade students.
- Sherwood and his colleagues (1989) compared the use of live horseshoe crabs and sea stars to the use of dried specimens in an aquarium education program and demonstrated that students made the greatest cognitive gains when exposed to programs utilizing the live animals.
- Povey and Rios (2002) noted that in response to an open-ended survey question (“Before I saw this animal, I never realized that . . . ”), visitors watching a presentation utilizing a program animal provided 69% cognitive responses (i.e., something they learned) versus 9% made by visitors viewing the same animal in its exhibit (who primarily responded with observations).
- Povey (2002) recorded a marked difference in learning between visitors observing animals on exhibit versus being handled during informal presentations. Visitors to demonstrations utilizing a raven and radiated tortoises were able to answer questions correctly at a rate as much as eleven times higher than visitors to the exhibits.

Enhanced Environmental Attitudes

Program animals have been clearly demonstrated to increase affective learning and attitudinal change.

- Studies by Yerke and Burns (1991) and Davison and her colleagues (1993) evaluated the effect live animal shows had on visitor attitudes. Both found their shows successfully influenced attitudes about conservation and stewardship.
- Yerke and Burns (1993) also evaluated a live bird outreach program presented to Oregon fifth-graders and recorded a significant increase in students’ environmental attitudes after the presentations.
- Sherwood and his colleagues (1989) found that students who handled live invertebrates in an education program demonstrated both short and long-term attitudinal changes as compared to those who only had exposure to dried specimens.
- Povey and Rios (2002) examined the role program animals play in helping visitors develop positive feelings about the care and well-being of zoo animals.
- As observed by Wolf and Tymitz (1981), zoo visitors are deeply concerned with the welfare of zoo animals and desire evidence that they receive personalized care.

Conclusion

Creating positive impressions of aquarium and zoo animals, and wildlife in general, is crucial to the fundamental mission of zoological institutions. Although additional research will help us delve further into this area, the existing research supports the conclusion that program animals are an important tool for conveying both cognitive and affective messages regarding animals and the need to conserve wildlife and wild places.

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References


Appendix E: Developing an Institutional Program Animal Policy

Last revision 2003
Re-authorized by the Board June 2011

Rationale

Membership in AZA requires that an institution meet the AZA Accreditation Standards collectively developed by our professional colleagues. Standards guide all aspects of an institution's operations; however, the accreditation commission has asserted that ensuring that member institutions demonstrate the highest standards of animal care is a top priority. Another fundamental AZA criterion for membership is that education be affirmed as core to an institution’s mission. All accredited public institutions are expected to develop a written education plan and to regularly evaluate program effectiveness.

The inclusion of animals (native, exotic and domestic) in educational presentations, when done correctly, is a powerful tool. CEC’s Program Animal Position Statement describes the research underpinning the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective messages about conservation and wildlife.

Ongoing research, such as AZA's Multi-Institutional Research Project (MIRP) and research conducted by individual AZA institutions will help zoo educators to determine whether the use of program animals conveys intended and/or conflicting messages and to modify and improve programs accordingly and to ensure that all program animals have the best possible welfare.

When utilizing program animals our responsibility is to meet both our high standards of animal care and our educational goals. Additionally, as animal management professionals, we must critically address both the species' conservation needs and the welfare of the individual animal. Because "wild creatures differ endlessly," in their forms, needs, behavior, limitations and abilities (Conway, 1995), AZA, through its Animal Welfare Committee, has recently given the responsibility to develop taxon- and species-specific animal welfare standards and guidelines to the Taxon Advisory Groups (TAG) and Species Survival Plan® Program (SSP). Experts within each TAG or SSP, along with their education advisors, are charged with assessing all aspects of the taxons' and/or species’ biological and social needs and developing Animal Care Manuals (ACMs) that include specifications concerning their use as program animals.

However, even the most exacting standards cannot address the individual choices faced by each AZA institution. Therefore, each institution is required to develop a program animal policy that articulates and evaluates program benefits. The following recommendations are offered to assist each institution in formulating its own Institutional Program Animal Policy, which incorporates the AZA Program Animal Policy and addresses the following matters.

The Policy Development Process

Within each institution, key stakeholders should be included in the development of that institution's policy, including, but not limited to representatives from:

- the Education Department
- the Animal Husbandry Department
- the Veterinary and Animal Health Department
- the Conservation & Science Department
- the Behavioral Husbandry Department
- any animal show staff (if in a separate department)
- departments that frequently request special program animal situations (e.g., special events, development, marketing, zoo or aquarium society, administration)
Additionally, staff from all levels of the organization should be involved in this development (e.g., curators, keepers, education managers, interpreters, volunteer coordinators).

To develop a comprehensive Program Animal Policy, we recommend that the following components be included:

I. Philosophy

In general, the position of the AZA is that the use of animals in up close and personal settings, including animal contact, can be extremely positive and powerful, as long as:

1. The use and setting is appropriate.
2. Animal and human welfare is considered at all times.
3. The animal is used in a respectful, safe manner and in a manner that does not misrepresent or degrade the animal.
4. A meaningful conservation message is an integral component. Read the AZA Board-approved Conservation Messages.
5. Suitable species and individual specimens are used.

Institutional program animal policies should include a philosophical statement addressing the above, and should relate the use of program animals to the institution's overall mission statement.

II. Appropriate Settings

The Program Animal Policy should include a listing of all settings both on and off site, where program animal use is permitted. This will clearly vary among institutions. Each institution's policy should include a comprehensive list of settings specific to that institution. Some institutions may have separate policies for each setting; others may address the various settings within the same policy. Examples of settings include:

I. On-site programming
   A. Informal and non-registrants:
      1. On-grounds programming with animals being brought out (demonstrations, lectures, parties, special events, and media)
      2. Children's zoos and contact yards
      3. Behind-the-scenes open houses
      4. Shows
      5. Touch pools
   B. Formal (registration involved) and controlled settings
      1. School group programs
      2. Summer Camps
      3. Overnights
      4. Birthday Parties
      5. Animal rides
      6. Public animal feeding programs

II. Offsite and Outreach
   1. PR events (TV, radio)
   2. Fundraising events
   3. Field programs involving the public
   4. School visits
   5. Library visits
   6. Nursing Home visits (therapy)
   7. Hospital visits
   8. Senior Centers
   9. Civic Group events

In some cases, policies will differ from setting to setting (e.g., on-site and off-site use with media). These settings should be addressed separately, and should reflect specific animal health issues, assessment of distress in these situations, limitations, and restrictions.
III. Compliance with Regulations

All AZA institutions housing mammals are regulated by the USDA's Animal Welfare Act. Other federal regulations, such as the Marine Mammal Protection Act, may apply. Additionally, many states, and some cities, have regulations that apply to animal contact situations. Similarly, all accredited institutions are bound by the AZA Code of Professional Ethics. It is expected that the Institution Program Animal Policy address compliance with appropriate regulations and AZA Accreditation Standards.

IV. Collection Planning

All AZA accredited institutions should have a collection planning process in place. Program animals are part of an institution's overall collection and must be included in the overall collection planning process. The AZA Guide to Accreditation contains specific requirements for the institution collection plan. For more information about collection planning in general, please see the Collection Management pages in the Members Only section.

The following recommendations apply to program animals:

1. Listing of approved program animals (to be periodically amended as collection changes). Justification of each species should be based upon criteria such as:
   - Temperament and suitability for program use
   - Husbandry requirements
   - Husbandry expertise
   - Veterinary issues and concerns
   - Ease and means of acquisition / disposition according to the AZA code of ethics
   - Educational value and intended conservation message
   - Conservation Status
   - Compliance with TAG and SSP guidelines and policies

2. General guidelines as to how each species (and, where necessary, for each individual) will be presented to the public, and in what settings

3. The collection planning section should reference the institution's acquisition and disposition policies.

V. Conservation Education Message

As noted in the AZA Accreditation Standards, if animal demonstrations are part of an institution's programs, an educational and conservation message must be an integral component. The Program Animal Policy should address the specific messages related to the use of program animals, as well as the need to be cautious about hidden or conflicting messages (e.g., "petting" an animal while stating verbally that it makes a poor pet). This section may include or reference the AZA Conservation Messages. Although education value and messages should be part of the general collection planning process, this aspect is so critical to the use of program animals that it deserves additional attention. In addition, it is highly recommended to encourage the use of biofacts in addition to or in place of the live animals. Whenever possible, evaluation of the effectiveness of presenting program animals should be built into education programs.

VI. Human Health and Safety

The safety of our staff and the public is one of the greatest concerns in working with program animals. Although extremely valuable as educational and affective experiences, contact with animals poses certain risks to the handler and the public. Therefore, the human health and safety section of the policy should address:

1. Minimization of the possibility of disease transfer from non-human animals to humans, and vice-versa (e.g., handwashing stations, no touch policies, use of hand sanitizer)

2. Safety issues related to handlers' personal attire and behavior (e.g., discourage or prohibit use of long earrings, perfume and cologne, not eating or drinking around animals, smoking etc.)

AZA's Animal Contact Policy provides guidelines in this area; these guidelines were incorporated into accreditation standards in 1998.
VII. Animal Health and Welfare

Animal health and welfare are the highest priority of AZA accredited institutions. As a result, the Institutional Program Animal Policy should make a strong statement on the importance of animal welfare. The policy should address:

1. General housing, husbandry, and animal health concerns (e.g. that the housing and husbandry for program animals meets or exceeds general AZA standards and that the physical, social and psychological needs of the individual animal, such as adequate rest periods, provision of enrichment, visual cover, contact with conspecifics as appropriate, etc., are accommodated).
2. Where ever possible provide a choice for animal program participation, e.g., retreat areas for touch tanks or contact yards, evaluation of willingness/readiness to participate by handler, etc.)
3. The empowerment of handlers to make decisions related to animal health and welfare; such as withdrawing animals from a situation if safety or health is in danger of being compromised.
4. Requirements for supervision of contact areas and touch tanks by trained staff and volunteers.
5. Frequent evaluation of human / animal interactions to assess safety, health, welfare, etc.
6. Ensure that the level of health care for the program animals is consistent with that of other animals in the collection.
7. Whenever possible have a “cradle to grave” plan for each program animal to ensure that the animal can be taken care of properly when not used as a program animal anymore.
8. If lengthy “down” times in program animal use occur, staff should ensure that animals accustomed to regular human interactions can still maintain such contact and receive the same level of care when not used in programs.

VIII. Taxon Specific Protocols

We encourage institutions to provide taxonomically specific protocols, either at the genus or species level, or the specimen, or individual, level. Some taxon-specific guidelines may affect the use of program animals. To develop these, institutions refer to the Conservation Programs Database.

Taxon and species -specific protocols should address:

1. How to remove the individual animal from and return it to its permanent enclosure, including suggestions for operant conditioning training.
2. How to crate and transport animals.

Situation specific handling protocols (e.g., whether or not animal is allowed to be touched by the public, and how to handle in such situations)

1. Guidelines for disinfecting surfaces, transport carriers, enclosures, etc. using environmentally safe chemicals and cleaners where possible.
3. Limitations and restrictions regarding ambient temperatures and or weather conditions.
4. Time limitations (including animal rotation and rest periods, as appropriate, duration of time each animal can participate, and restrictions on travel distances).
5. The numbers of trained personnel required to ensure the health and welfare of the animals, handlers and public.
6. The level of training and experience required for handling this species
8. The use of hand lotions by program participants that might touch the animals

IX. Logistics: Managing the Program

The Institutional Policy should address a number of logistical issues related to program animals, including:

1. Where and how the program animal collection will be housed, including any quarantine and separation for animals used off-site.
2. Procedures for requesting animals, including the approval process and decision making process.
3. Accurate documentation and availability of records, including procedures for documenting animal usage, animal behavior, and any other concerns that arise.
X. Staff Training

Thorough training for all handling staff (keepers, educators, and volunteers, and docents) is clearly critical. Staff training is such a large issue that many institutions may have separate training protocols and procedures. Specific training protocols can be included in the Institutional Program Animal Policy or reference can be made that a separate training protocol exists.

It is recommended that the training section of the policy address:

1. Personnel authorized to handle and present animals.
2. Handling protocol during quarantine.
3. The process for training, qualifying and assessing handlers including who is authorized to train handlers.
4. The frequency of required re-training sessions for handlers.
5. Personnel authorized to train animals and training protocols.
6. The process for addressing substandard performance and noncompliance with established procedures.
7. Medical testing and vaccinations required for handlers (e.g., TB testing, tetanus shots, rabies vaccinations, routine fecal cultures, physical exams, etc.).
8. Training content (e.g., taxonomically specific protocols, natural history, relevant conservation education messages, presentation techniques, interpretive techniques, etc.).
9. Protocols to reduce disease transmission (e.g., zoonotic disease transmission, proper hygiene and hand washing requirements, as noted in AZA's Animal Contact Policy).
10. Procedures for reporting injuries to the animals, handling personnel or public.
11. Visitor management (e.g., ensuring visitors interact appropriately with animals, do not eat or drink around the animal, etc.).

XI. Review of Institutional Policies

All policies should be reviewed regularly. Accountability and ramifications of policy violations should be addressed as well (e.g., retraining, revocation of handling privileges, etc.). Institutional policies should address how frequently the Program Animal Policy will be reviewed and revised, and how accountability will be maintained.

XII. TAG and SSP Recommendations

Following development of taxon-specific recommendations from each TAG and SSP, the institution policy should include a statement regarding compliance with these recommendations. If the institution chooses not to follow these specific recommendations, a brief statement providing rationale is recommended.
Appendix F: Small Carnivore Medical Management Guidelines

Small Carnivore Medical Management Guidelines

Introduction: The classification “small carnivore” encompasses an extensive variety of animals. The following recommendations include those for Procyonidae, Viverridae, and Mustelidae. A number of individual species may already have medical programs thoroughly outlined by veterinary advisors and these should be reviewed and followed when they vary from the general guidelines below. Species with individual programs include North American river otters (Lontra canadensis), Asian small-clawed otters (Aonyx cinerea), black-footed ferrets (Mustela nigripes), and red pandas (Ailurus fulgens). A list of veterinary advisors may be found at www.aazv.org.

Pre-shipment: The goals of pre-shipment planning and examination are to ascertain the animal’s health before, during, and after shipment and to protect the animal collection at the receiving institution. In order to do this, communication between sending and receiving institutions is critical. Ideally, this communication should occur directly between veterinary staffs at the two institutions to minimize confusion or delays. It is recommended that:

- Records on the animal being shipped should be forwarded to the receiving institution in advance of the pre-shipment examination.
- The receiving institution should promptly advise the sending institution of any specific testing and health requirements after review of the records.
- After the pre-shipment examination has been completed, the sending institution should discuss any concerns with the receiving institution and forward copies of the examination and test results.
- Any problems that may compromise an animal, such as parasitic or bacterial infections, should be addressed and resolved prior to shipment.
- The pre-shipment examination should ideally occur within 60 days of the shipment unless interstate shipping requirements or receiving institution requests differ.
- The sending institution should check with the state veterinary office of the receiving institution’s state for any testing requirements that may be additional/different than the institutional requirements (www.usda.aphis.gov).
- A current diet sheet for the animal should be forwarded so that dietary items may be obtained in advance of the animal’s arrival.

Records: It is recommended that a standardized, typed (not hand-written) form of record keeping be used. MedARKS (International Species Information Systems (ISIS), 12101 Johnny Cake Ridge Rd., Apple Valley, MN 55124-8151) is used by a majority of institutions and enables a more consistent transfer of data. When transferring data, both hard copies and disk should be provided to the receiving institution if MedARKS is available. Medical records should be as complete as possible, including:

1. Medical history
2. Identification (current ARKS record, transponder numbers, tattoos, etc.)
3. Clinical notes (including exam findings, diagnoses, vaccination history, etc.)
4. Parasitology
5. Anesthesia
6. Clinical pathology
7. Treatments (current medications, recent treatments, etc.)
8. Pathology
9. Reproductive status (contracepted, cycle details or abnormalities, etc.)
10. Nutritional information (nutritional deficiencies, supplements, allergies, etc.)
11. Behavioral/social group notes (social traumas, aggression, training for medical procedures, etc.)
12. Any pertinent group history should be included as well, especially if there is a history of infectious disease within the group or exhibit.

13. As small carnivores are prone to dental disease, a thorough history of dental problems and, preferably, a dental chart noting extractions, root canals, problems, etc. is recommended.

**Identification:** All individuals should be permanently identified prior to shipment. Transponder chips are recommended as a primary method, tattooing may be done in addition (males should be tattooed on the inner right thigh and females on the inner left). Two main brands of transponders are used and recommended: 1) Trovan®, (InfoPet Inc., 415 W. Travelers Trial, Burnsville, MN 55337-2548); and 2) AVID® (Avid, 3179 Hamner Ave., Norco, CA 91760). Chip type and implantation site may be specifically recommended based on the species (e.g., bridge of nose for otters) or even sex (e.g., AVID behind right ear for male black-footed ferrets), otherwise the general standard of over the back between the scapulae to the left of the midline should be applied.

**Genetic Materials Banking:** Prior to shipping, it is recommended that genetic materials be banked. This may provide positive identification should there ever be any question regarding an animal’s identity (e.g. transponder loss or breakage). In addition, the materials may serve as a future resource for research. Methods are detailed at the end of this Appendix.

**Examination:** Ideally, the pre-shipment examination should occur at least two weeks prior to shipment. This enables the animal to fully recover from anesthesia and respond to any vaccinations or treatments given. There is also time for test results to be forwarded to the receiving institution. With most small carnivores, crating does not require the use of an anesthetic, so this guideline should not be a hardship with appropriate planning. A complete pre-shipment examination should include the following, and results should be documented in the record (photo documentation of specific problems may be valuable):

1. **Physical exam**
   a. Body weight and body condition scoring (assessment scaled 1–5 or 1–10)
   b. Heart rate, respiratory rate, body temperature, hydration status
   c. Oral exam: including dental chart documentation. Any problems should be noted and addressed if possible. Dental cleaning and polishing should be completed if necessary.
   d. Ophthalmologic exam
   e. Ear exam: appropriate diagnostics should be completed if there is any indication of problems. Cleaning and treatment should be done if necessary.
   f. Auscultation
   g. Abdominal palpation
   h. Assessment of genitalia, including rectal palpation in both sexes if of a size to permit safely
   i. Skin/coat assessment: any problems should be worked up with appropriate diagnostics.
   j. Feet/nails

2. **Verification of transponder or tattoo (placement/replacement if necessary)**

3. **Sample Collection**
   a. Blood
      • CBC
      • Serum chemistry panel
      • Heartworm antigen: recommended if housed outside as many small carnivores are susceptible to heartworm
      • Serum banking (receiving institution may request serum as well)
      • Genetic materials banking
      • Research requests, if any
b. Urine
   • For standard urinalysis, via cystocentesis
   • If there are current/historical urinary tract problems, cultures should be submitted

c. Fecal
   • Two negative fecals, one week apart, should be obtained prior to shipment
   • Fresh direct and float or sedimentation should be completed
   • Acid fast staining – if there is a history/indication of cryptosporidiosis
   • Culture should be submitted if requested or if there is any history or indication of infectious bacterial disease (e.g., salmonellosis)

d. Genetic materials
   • Blood
   • Skin
   • Hair

4. Radiographs
   a. Chest and abdominal survey radiographs should be completed
   b. Any problems (e.g., previous fractures, renal calculi, etc.) should be documented
   c. Ideally, a duplicate set of radiographs should be made to go with the animal to the new institution. This is especially important if there is a problem that is going to need follow-up. A duplicate set can be made by placing two layers of film in the cassette prior to exposing, though this is does not provide as good quality films as having copies made. Alternatively, digital images of the radiographs can be made though quality is not always optimum for interpretation.

**Vaccinations:** Vaccinations should be current or updated before the animal is shipped. Once again, if there is a veterinary advisor or husbandry manual available for the specific species, review this information in the references or contact the advisor if there are questions. Specifics regarding type/lot of vaccine and site of injection should be recorded in the animal’s record. Most recommendations are not based on scientific studies done on the specific species.

1. Canine Distemper
   a. PUREVAX® Ferret Distemper Vaccine (Merial Ltd., 3239 Satellite Blvd., Duluth, GA 30096) is a monovalent recombinant canary pox vectored vaccine. It has been used in a number of small carnivores with minimal adverse effects and development of titers, which appear to be protective (see www.aazv.org for recommendations based on Dr. Montali’s study). A 1 ml (IM) dose should be given at the following frequency:
      • Vaccinated adults: annually
      • Unvaccinated adults: two vaccinations 3-4 weeks apart, then annually
      • Juveniles: three vaccinations, every three to four weeks from 8 to 16 weeks of age (e.g., 8, 12 and 16 weeks)

2. Parvovirus
   a. Parvocine® (Biocor Animal Health Inc., 2720 North 84th Street, Omaha, NE 68134) is a killed univalent parvovirus vaccine. A 1 ml (IM) dose should be given at the same frequency listed for canine distemper

3. Leptospirosis
   a. If leptospirosis has been diagnosed or is endemic in the area, a killed bacterin could be used, though most of these are currently in combination vaccines.

4. Rabies
a. Only a killed rabies vaccine product should be used. Though it is recommended, use of rabies vaccines in these species will be extra-label and will not be considered protective in the event of a bite.

b. Imrabo® 3 (Merial Ltd., 3239 Satellite Blvd., Duluth, GA 30096) is a killed rabies vaccine that has been used extensively in small carnivores without apparent adverse effects. A 1ml (IM) dose should be given once at 16 weeks of age, and then annually.

c. PUREVAX® Feline Rabies (Merial Ltd., 3239 Satellite Blvd., Duluth, GA 30096) is a live canarypox vectored, nonadjuvanted recombinant rabies vaccine that is currently being used at some institutions for small carnivores. A 1ml (IM) dose should be given once at 8 weeks (or older), and then annually.

5. Feline Panleukopenia
   a. AAZV’s Infectious Disease Notebook notes that some small carnivores are susceptible to feline panleukopenia and should be vaccinated and many small carnivores have been vaccinated with a combination product in the past. However, a number of veterinary advisors do not recommend vaccination for red pandas and black-footed ferrets. Veterinary advisor recommendations should be followed primarily.
   b. If there is significant risk of exposure to feline panleukopenia (e.g., feral cat population), vaccination should be considered.
   c. FPV-1® Feline Panleukopenia Vaccine (Biocor Animal Health Inc., 2720 North 84th Street, Omaha, NE 68134) is a new non-adjuvanted, killed vaccine. This vaccine has been shown to be safe in pregnant domestic cats A 1ml (SQ) dose should be given at the following frequency:
      - At least two vaccines three weeks apart at/after 12 weeks of age. If started before 12 weeks, give a third vaccine – then annually.

6. Titer Evaluations
   a. Distemper, parvovirus, and leptospiral titers can be evaluated by submitting serum to: Cornell Diagnostic Laboratory, College of Veterinary Medicine, Cornell University, Upper Tower Road, Ithaca, NY 14851-0786, Ph: 607-253-3900

Transport: With the wide variety of species included within “small carnivore,” only general recommendations will be provided.

1. Crates should be designed so that the animal can assume normal postures, including turning around. IATA recommendations should be followed. Crates should be of impervious materials as many small carnivores are diggers or chewers and this will allow for proper disinfection as well. Some small carnivores are considered “injurious species” (e.g., meerkats) and are required to be double crated for shipment.

2. Animals should be crated individually to avoid aggression.

3. Animals should only be shipped when the weather is appropriate at all points along the shipping route. Unplanned delays and errors should be considered as possibilities and risky shipments (e.g., too hot at site of layover) should be rescheduled. This may be true even for counter-to-counter shipments.

4. Appropriate temperature ranges will vary by species, but a “safe” window would be between 10–23.8° C (50–75° F) for most small carnivores.

5. Methods of providing visual access and water to the animal should be addressed. The crate should otherwise be secure from tampering.

6. Most small carnivores will not require anesthesia for crating. In the event that anesthesia is required, the animal should be fully recovered (standing and stable) prior to shipping. Ideally, an inhalant or reversible anesthetic should be used in these cases.

Quarantine: Quarantine is the next step in assuring the health of the new arrival and the protection of the animals already in the collection. General quarantine guidelines have been outlined by AAZV and AZA. It is critical that protocols be developed and followed.
1. Length – minimum of 30 days for small carnivores

2. Examination
   a. Visual exam should be performed upon arrival, preferably at uncrating. A body weight can easily be obtained at this time as well (in the crate).
   b. Ideally, a physical exam should be completed during the third week of the quarantine. This allows the animal to adjust to the environment and dietary changes and allows test results to come back before the end of quarantine.
      • Physical exam, verification of ID, sample collection, and radiographs should be completed as detailed for pre-shipment.
      • Repeating this work will provide a baseline for the animal at the new institution (especially for radiographs), allow any problems to be rechecked, and potentially reveal new problems that may have developed during the stress of shipment and quarantine.
      • Vaccinations should have been given during pre-shipment if needed, but, if not, should be given during quarantine before exposure to a new environment.

3. Fecals
   a. A minimum of three (3) consecutive negative fecals (fresh direct and float or sedimentation), each one week apart, should be obtained before clearing from quarantine.
   b. Appropriate treatment for any parasites should be administered while in quarantine and three negative fecals should be obtained post-treatment.
   c. Cultures and special stains should be repeated during this time if there has been a history of infectious disease in this animal or its previous group. In the event of an infectious bacterial intestinal disease (e.g., salmonellosis), it is recommended that repeated cultures be submitted (three per week) in order to identify or document the condition.

4. Nutrition
   a. Most diets are not going to be identical from one institution to the next. It is recommended that the sending institutions diet be obtained in advance of the animal’s arrival. This enables the receiving institution to provide a familiar diet to the animal upon arrival and for the first week of quarantine. The sending institution may want to send some of the regular diet with the animal.
   b. After the first week of quarantine, if the animal is doing well, the new diet should slowly be introduced. If this is done at a rate of approximately 25% of new diet exchanged for old per week, the animal should be converted to the new diet by the end of quarantine and should avoid any problems associated with dietary change.

Preventive Health: In order to appropriately ensure the health of small carnivores, it is recommended that a physical examination take place on a routine basis. The following is recommended for a routine exam:

1. Physical exam: as detailed in pre-shipment
2. Verification of identification
3. Sample collection
   a. Blood
      • CBC/chem. panel
      • HW antigen
      • Serum banking
      • Research requests
- Viral titers: as there is little information about vaccine titer levels in many of these species, it is suggested that titers be run opportunistically and documented as to time from vaccination(s), route, vaccine product and titer level. See above for information on obtaining titers.
  
  b. Urine: as detailed in pre-shipment
  
  c. Fecals: should be submitted at a minimum of annually; twice annually is recommended
  
  d. Genetic materials should only need to be collected once if preserved properly.

4. Radiographs: chest and abdomen minimally (this is especially important for monitoring renal calculi in otters)

5. Vaccination: as detailed above

**Miscellaneous:** Ideally, weights should be recorded monthly (accomplished with the aid of training). In areas where the animal is housed outside and heartworm is endemic, ivermectin at 0.006mg/kg orally once a month may be used for prevention. This dose has been used safely and effectively in a number of small carnivores. Reports of disease issues, adverse drug reactions, etc. should be reported to the veterinary advisor or TAG on an annual basis, in addition to submission of necropsy reports.

**Necropsy:** All small carnivores that die should receive a thorough necropsy in a timely manner. This will help establish cause of death, provide valuable insight into the health of the collection, and help protect the other animals in the social grouping by delineating any immediate concerns. A complete report, including histopath and test results, should be submitted to the veterinary advisor on an annual basis.

1. Blood: serum banking
2. Radiographs post-mortem
3. External exam, including weight and description of condition of body
4. Internal exam
   a. A detailed written report should be completed.
   b. Cultures should be submitted, if indicated
   c. Photo documentation, if possible
   d. Submission of a representative sample of all lesions AND routine tissues:

   - Skin, muscle, sciatic nerve, bone (femur), tongue, salivary gland, eye, brain, pituitary, trachea, thyroid, parathyroid, thymus, esophagus, lymph nodes (thoracic and abdominal), lung, bronchus, heart, aorta, liver, gall bladder, diaphragm, spleen, pancreas, stomach, duodenum, jejunum, ileum, ileocolic jxn, colon, adrenal, kidneys, bladder, ureter, urethra, reproductive organs.

   - It is recommended that a pathologist familiar with non-traditional species be used for histopathology.

   - Reproductive organs should be submitted to: Dr. Linda Munson, Dept. of VM-PM1, Haring Hall, School of Veterinary Medicine, University of California, Davis, CA 95616 as a standing request.

   e. Frozen set of tissues: heart, liver, kidney, brain, serum, lesions.

   f. Any stones (urooliths, renoliths, etc.) should be submitted for analysis to: Minnesota Urolith Center, Dept. of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Minnesota, 1352 Boyd Avenue, St. Paul, MN 55108.

**Methods for Banking Genetic Materials:** Avoid contamination of genetic samples; wear gloves, clean equipment, etc. The protocols are listed in preferential order:

1. Whole Blood
   a. Minimum required volume: 0.05 ml (1 drop)
   b. Lysis buffer (all ingredients may be obtained from Sigma)
      
      0.1 M Tris-HCl (pH 8.0) (bring to pH with HCl)
      0.1 M EDTA (pH 8.0) (bring to pH with NaOH)
Red Panda (*Ailurus fulgens*) Care Manual

0.1 M NaCl
2% (w/v) SDS (sodium dodecyl sulfate)

c. **Protocol**
   - Draw blood; if anti-coagulant is needed, heparin is preferable, but EDTA is acceptable
   - Mix 1:1 with buffer (a little more buffer is acceptable) in cryovial
   - Label with Animal, ID#, Date, Institution, Sample type (e.g. whole blood with heparin in lysis buffer)
   - Freeze at -70°F

2. **Tissue Biopsies (skin with dermis or muscle)**
   a. Minimum required volume: at least this “•” big. Maximum required volume: piece(s) should be no larger than 0.4 cm³, section if necessary
   b. Place in cryovial
   c. Label with Animal, ID#, Date, Institution, Sample type
   d. Freeze **immediately** at -70°F

3. **Hair**
   a. Minimum required amount: 1 follicle; 10-20 preferred. Follicles **must** be attached.
   b. Place follicle ends in a cryovial; with sterile scissors cut follicles into vial. Always use gloves when handling the hairs.
   c. Label with Animal, ID#, Date, Institution, Sample type
   d. Freeze **immediately** at -70°F
Appendix G: AZA Small Carnivore TAG Necropsy Protocol

AZA Small Carnivore TAG Necropsy Protocol

I. Recommended Fixed Tissues. In addition collect a sample of any lesion. Fix in 10 parts10% neutral buffered formalin to 1 part tissues, samples should be no thicker than 1 cm, and should be fixed for at least 72hrs to ensure adequate fixation.

1. Trachea
2. Lung (several sections including a large airway) Skin
3. Pulmonary/Hilar lymph node
4. Heart (left and right ventricle, septum & atrium
5. Aorta
6. Thymus (if present)
7. Esophagus (2 cm long cross section)
8. Stomach (2 cm long portion of cardia, fundus, and pylorus)
9. Duodenum, jejunum, & ileum (2 cm long cross section)
10. Cecum
11. Colon (2 cm long cross section)
12. Rectum
13. Liver
14. Spleen
15. Mesenteric lymph node
16. Kidneys (cortex and medulla in section)
17. Adrenal (cross section with cortex and medulla)
18. Urinary bladder
19. Prostate
20. Testes (with epididymis)
21. Female reproductive tract (fix whole - leave ovaries attached to uterus, longitudinal incisions in horns)
22. Skeletal muscle (hindlimb)
23. Tongue (cross section including both mucosal surfaces)
24. Salivary gland
25. Peripheral lymph node (popliteal or prescapular)
26. Bone marrow (2 cm of opened rib or femur – with marrow exposed)
27. Throids/parathyroids
28. Brain (if possible whole)
29. Pituitary
30. Both eyes

II. For neonates also collect placenta and fetal membranes and umbilicus/umbilical area

For aborted fetuses and stillbirths, freeze stomach contents and placenta

Necropsy Exam:

1. Estimate stage of gestation.
2. Measure the Crown to Rump Length: from the highest point on the skull (external occipital protuberance) to the base of the tail.
3. Note gross appearance of placenta and if it’s complete.
4. Examine for congenital abnormalities: limb deformities, cleft palate, hernias, hydrocephalus, etc.
5. Check if lungs were inflated: pink or dark red color; sink or float in formalin.
6. Observe if the ductus arteriosus is contracted and if the foramen ovale is closed.
7. Determine if suckling has occurred: check stomach for milk curds; and note amount, viscosity and color of upper and lower GI tract contents.

III. Shipping & Contact Information

Histopathology for the species managed under small carnivores should be submitted to the service the institution regularly uses (in-house, Northwest ZooPath, etc).
## AZA Small Carnivore TAG Necropsy Form

### Institution/Owner

**Address**

**City State Zip**

**Country**

### Veterinarian

**Pathologist/Prosector**

**Phone# ( )**

**Fax# ( )**

### I. Historical Data

(Attach additional sheets as needed & attach pertinent medical records.)

**Species:**

**Stud Book#**  
**ISIS#**

<table>
<thead>
<tr>
<th>Stud Book#</th>
<th>ISIS#</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Age/Birth date:**

(Circle) Actual or Estimated

<table>
<thead>
<tr>
<th>Sex</th>
<th>Weight:</th>
<th>Acquisition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>kg</td>
<td>Captive Born or Wild Captured</td>
</tr>
<tr>
<td>F</td>
<td>(circle) actual or estimated</td>
<td></td>
</tr>
</tbody>
</table>

**Date & Time of death**

**post mortem interval**

**hrs**

**Site/enclosure**

1. Was animal euthanized? (Circle) Y or N  
   If so, what method?

2. Member of group? (Circle) Y or N  
   Number in group _____  
   # sick _____  
   # dead _____

3. Vaccinations:

   Additional History: (Signs, stress factors, previous disease, treatments, pertinent feed or feed additives, time period animal was on premises, clinical lab results).
II. Gross Necropsy Examination
Under appropriate sections, use “NE” for not examined or WNL if no abnormalities are present.

1. External & General Exam (postmortem condition, nutritional status, muscling, subcutaneous fat, skin, eyes, ears, nose, body orifices).


3. Body Cavities (thoracic/abdominal cavities, amount of adipose, presence of fluids/exudates, negative pressure in chest).

4. Respiratory System (pharynx, larynx, nasal passages, trachea, bronchi, lungs, hilar lymph nodes).

5. Hemic-Lymphatic System (spleen, lymph nodes, thymus)

6. Cardiovascular System (pericardium, heart: valves & chambers, aorta, large vessels

7. Digestive System (Mouth, teeth, esophagus, stomach, intestines, liver, pancreas, mesenteric lymph nodes). **Neonates**: is milk present in the stomach?.

8. Urinary System (kidneys, ureters, bladder, urethra

9. Reproductive System (ovaries, oviducts, uterus, cervix, vagina, mammary glands, placenta/fetuses, testes, penis, accessory sex glands).

10. Endocrine System (thyroids, parathyroids, adrenals, pituitary, pineal gland-if found

11. Nervous System (brain, meninges/dura mater, spinal cord, peripheral nerves
III. Summary Gross Diagnoses

IV. Ancillary Laboratory Test Results
(Cytology, urinalysis, fluid/serum analysis, microbiology, parasitology, serology, toxicology, virology, or others; attach reports as necessary).
Appendix H: Instructions for Measuring Body Size in Relation to Weight

To calculate “ideal” red panda weights:

First get your panda’s body length measurement: Measure from the tip of the nose to the base of the tail. What you do is get a measuring tape, start at the nose then run the tape with your hand over the head then down the spine to the base of the tail (the easiest way to judge the base of the tail is to lift the tail straight up then place the measuring tape at the 90 degree curve point). See Figure A below.

Second get your panda’s girth measurement: wrap the measuring tape around the torso just behind the front legs, tighten the tape until the fur is flattened but not any tighter. See Figure B below.

With these measurements, calculate the volume of a cylinder:

\[
\text{Circumference} = 2 \pi r \\
\pi = 3.14 \\
\text{Volume} = \pi r^2 \times \text{length}
\]

**Example Panda Weight Calculation:**

Girth (circumference) – 33 cm
Length (tip of nose to base of tail) – 65 cm

Calculate the radius by solving for “r”

\[
33 \text{ cm} = 2(3.14)r \\
33 \text{ cm} = (6.28)r \\
33 \text{ cm}/6.28 = r \\
r = 5.25 \text{ cm}
\]

Then plug “r” into the volume formula:

\[
\text{Volume} = (3.14)(5.25)^2(65.\text{ cm}) \\
= 5625
\]

Take the volume number and then plug it into the Figure C “Red Panda Body Condition; Relationship between Body Volume and Mass” into the “volume (cc)” horizontal line and go up the chart until you reach the straight diagonal line, go across to the mass (g) line to get an estimate of your panda’s best weight. This is an estimate only and should be tempered with common sense and your experience with red pandas and what is a good weight for them.

You can also plug in the length measurement into Figure D “Relationship between body length and mass” to find “ideal” weight, but the masses obtained using only length and not girth may not be as accurate as the method using both length and girth.
Figure A. Red panda body length measurement
Photo Credit: Sandy Helliker

Figure B: Red panda body girth measurement
Photo Credit: Sandy Helliker
Figure C. Relationship between body volume and mass. (Glass and Kohn, unpublished)
Figure D. Relationship between body length and mass. (Glass and Kohn, unpublished)
## Appendix I: Cub Feeding Chart

### Red Panda Cub Hand Rearing Feeding Schedule (Glass, unpublished)

<table>
<thead>
<tr>
<th>Days from Birth</th>
<th>% of Body Wt. To Feed</th>
<th>Formula Concentration</th>
<th>Feedings per Day</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 4</td>
<td>30%</td>
<td>7%</td>
<td>8 x daily</td>
<td></td>
</tr>
<tr>
<td>5 to 8</td>
<td>30%</td>
<td>10%</td>
<td>8 x daily</td>
<td></td>
</tr>
<tr>
<td>9 to 14</td>
<td>30%</td>
<td>12%</td>
<td>7 to 8 x daily</td>
<td></td>
</tr>
<tr>
<td>15 to 20</td>
<td>25%</td>
<td>15%</td>
<td>7 x daily</td>
<td></td>
</tr>
<tr>
<td>21 to 27</td>
<td>25%</td>
<td>18%</td>
<td>6-7 x daily</td>
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## Red Panda (Ailurus fulgens) Care Manual

### Association of Zoos and Aquariums

#### Daily Feeding Quantities Based on a Percentage of Red Panda Body Weight

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### Red Panda (Ailurus fulgens) Care Manual

#### Daily Feeding Quantities Based on a Percentage of Red Panda Body Weight

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