Unusual Pet Care

VOLUME III

35 SPECIES: Guinea pigs, African naked mole rats, Shrews, Ring-tailed possums, Richardson's ground squirrels, Flying squirrels, Bennett's wallabies, Ring-tailed lemurs, Servals, Ocelots, Jackson's chameleons, Green anoles, Frilled lizards, African fat-tailed geckos, Tegus, Solomon Island prehensile-tailed skinks, Savannah and white-throated monitor lizards, Leopard tortoises, Hermann's tortoises, Horsfield's tortoises, Spiny softshell turtles, Milk snakes, Green tree pythons, Oriental fire-bellied toads, White's tree frogs, Tomato frogs, African clawed frogs, Betta fish, Oscar fish, Pigeons, Japanese quail, American crows, Mandarin ducks, Emperor scorpions

Unusual Pet Care
Volume III

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Guinea Pig Pet Care*



VITAL STATISTICS

Life span	4-8 years (avg 5 years in home)	Respiratory rate	42-104 breaths per minute
Adult size (body length)	12 inches (310 mm)	Heart rate	230-380 beats per minute
Adult body weight - male - female	900-1200 g 750-900 g	Blood pressure	80-94/55-58 mmHg
Body temperature	37.2-39.5°C (101.5-103°F) (rectal)	Dental formula	I 1/1 C 0/0 P 1/1 M 3/3 (all teeth open-rooted)

*Adapted from Exotic DVM Volume 10.3 © Zoolo

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Guinea pigs or cavies (*Cavia porcellus*)

Cathy Johnson-Delaney, DVM, Dipl ABVP-Avian Practice

ORIGIN

- Guinea pigs are rodents that originated from South America. They are related to the chinchilla and porcupine.
- In South America, guinea pigs are often hunted or raised for meat, but free-ranging animals are not trapped for the pet trade.
- In the United States, the guinea pig is kept as a pet and also used in research.
- There are 3 main breeds of guinea pigs: English/common (with short, straight, fine hair), Abyssinian (rough, wiry hair in rosettes or whorls), and the Peruvian (long, straight, silky hair).
- Crosses of all breeds result in a wide range of coat colors and patterns. Pet stores usually sell cross-bred animals, but hobbyists breed purebred guinea pigs for shows. There are 11 guinea pig breeds recognized in the show ring, including American/English, White-crested, Abyssinian, Peruvian, Silky and Teddy.

PET APPEAL / BEHAVIOR

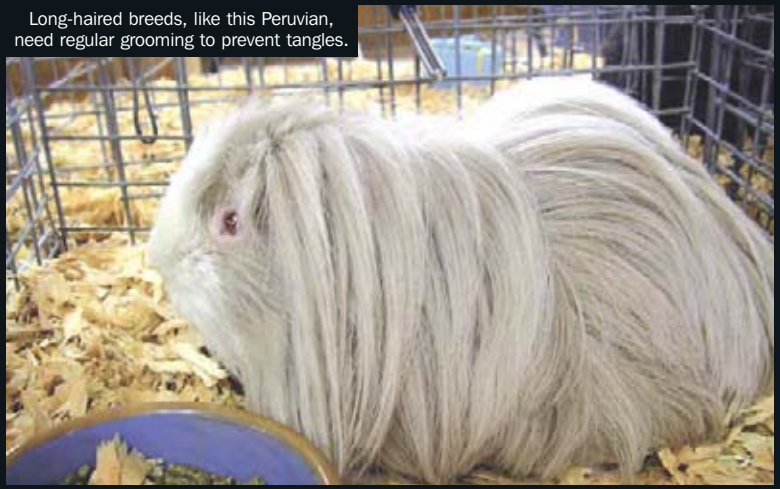
- Guinea pigs are intelligent and quiet animals that make good pets.
- They are not aggressive, preferring to flee in the face of danger rather than bite or scratch.
- They are sensitive creatures and can become panicked if startled by abrupt and loud noises.

Guinea Pigs

- Because guinea pigs are social animals, it is best to house them in pairs or trios rather that singly. As a solitary pet, it may bond closely to the owner, greeting him/her with chirps, purrs, squeaks or whistles.
- Guinea pigs can learn to get along with other family pets, e.g., cats, dogs, rabbits, but should not be housed with these and other animal species that carry *Bordetella* as a subclinical infection, as this may cause severe disease in cavies.
- In a group, they will establish a pecking order, frequently male-dominated.
- Overcrowding may incite aggression, and non-castrated males may be aggressive toward other males in the presence of females.
- Introducing a new guinea pig should be done in a neutral territory under supervision.
- Guinea pigs do not adapt well to changes in their food or environment. Hair barbering (chewing of the fur) may occur in situations of stress and overcrowding.
- Guinea pigs are most active in the morning and early evening, preferring to rest or sleep during the day.

HOUSING

- A single guinea pig may be housed in an enclosure at least 12 x 24 inches (30 x 60 cm), but the larger the space, the better. The sides of the enclosure should be at least 12 inches (30 cm) high.
- Because guinea pigs do not jump or climb, they can be housed in an open-topped pen, such as a plastic children's pool, as long as dogs or cats do not have access to it.



Long-haired breeds, like this Peruvian, need regular grooming to prevent tangles.



Because guinea pigs do not jump or climb, they can be housed in an open-topped pen.

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Hide boxes are recommended for pet guinea pigs.



A guinea pig's diet should consist of a commercial guinea pig feed and hay.



Ivan Hromanik

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Guinea Pigs

- Guinea pigs enjoy and need supervised exercise outside their enclosure.
- Like all rodents, guinea pigs explore their world through nibbling on new items; therefore, the play area should be checked for any potential hazards.
- The enclosure should offer some access to sunlight within an optimal room temperature range of 55-70°F (13-21°C).
- Shade must be available to prevent overheating, as temperatures above 80-85°F (27-29°C) may cause heat stroke. The pen should offer good ventilation.
- The best flooring is solid, covered with an abundance of dust-free bedding of shredded newspaper, composite recycled paper materials, hay or commercial bedding pellets.
- Cavies produce a lot of urine and feces. While their fecal pellets are relatively odorless, the bedding should be changed weekly at a minimum to control urine odors and prevent respiratory and skin disorders. Cavies are very sensitive to the ammonia in urine.

ENVIRONMENTAL ENRICHMENT

- Enrichment items may include toilet paper rolls, untreated cardboard boxes, paper towel rolls, hay, straw, paper bags and toys designed for large birds and cats.
- Items for chewing should be included, such as fruit tree branches.
- Guinea pigs prefer quiet environments and appreciate having a box or tunnel in which to hide and rest.

Guinea Pigs

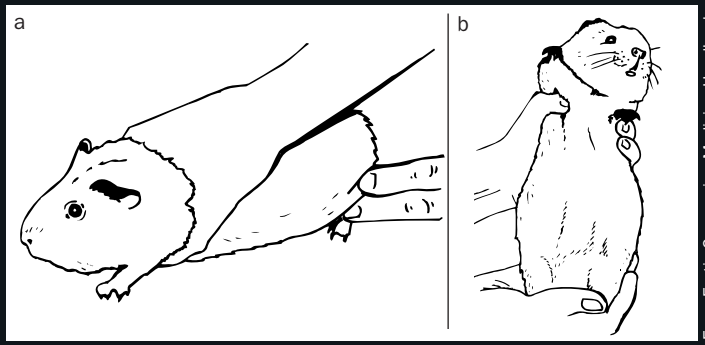
DIET

- The basic food should consist of a commercial guinea pig feed (e.g., Oxbow Cavy Cuisine,® Oxbow, www.oxbowhay.com; Nature's Promise Premium Guinea Pig Food,® ZuPreem, www.zupreem.com; Mazuri Guinea Pig Diet,® www.mazuri.com) and hay. Most commercial diets aim for approximately 20% protein and 16% fiber.
- Treats should be limited to no more than 1-2 Tbs per 24-hour period. Appropriate treats may include high fiber foods, such as alfalfa cubes or small amounts of green vegetables, carrot tops or apple.
- Unlike other animals, guinea pigs are not able to synthesize vitamin C on their own; therefore, a dietary source of vitamin C must be provided daily. Commercial pellets specially formulated for guinea pigs contain vitamin C, but the level may be affected by storage conditions or time. Daily vitamin C supplementation may be provided through ¼-½ cup cabbage or kale or a 50-mg stabilized vitamin C tablet (GTN-50, Oxbow, www.oxbowhay.com) to ensure adequate intake. Vitamin C can be administered in the drinking water, although it should not be the sole source for the cavy.
- Other nutritional supplements (e.g., HEALx Sunshine Factor or Booster, www.heal-x.com) may be beneficial.
- Cavies have sensitive intestinal tracts, and sudden alterations in diet (including even a change in food brand) may result in serious GI upset and anorexia.
- Feed bowls should be cleaned regularly as a cavy may sit in them to defecate.
- Guinea pigs usually eat at dawn or dusk and engage in cecotrophy.

HEMATOLOGIC REFERENCE RANGES	
Erythrocytes	4.5-7.0 x 10^6/mm^3
Hematocrit	37-48%
Hemoglobin	11-15 g/dl
Leukocytes	7-18 x 10^3/mm^3
Neutrophils	28-44%
Lymphocytes	39-72%
Eosinophils	1-5%
Monocytes	3-12%
Basophils	0-3%
Platelets	250-850 x 10^3/mm^3

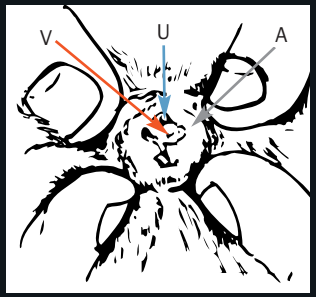
BIOCHEMISTRY REFERENCE RANGES	
Acid phosphatase	22.3-38.6 IU/L
Albumin	2.1-3.9 g/dl
Alkaline phosphatase	54.8-108 IU/L
ALT	24.8-58.6 IU/L
Amylase	237-357 SU/dl
AST	26.5-67.5 IU/L
Bicarbonate	12.8-30.0 mEq/L
Bilirubin (total)	0.3-0.9 mg/dl
BUN	9.0-31.5 mg/dl
Creatinine	0.62-2.18 mg/dl
Cholesterol	16.0-43.0 mg/dl
Calcium	8.3-12.0 mg/dl
Chloride	90-115 mEq/L
CPK	0.5-1.6 IU/L
Globulin	1.7-2.6 g/dl
Glucose	82-107 mg/dl
LDH	24.9-74.5 IU/L
Magnesium	1.8-3.0 mg/dl
Phospholipids	25-75 mg/dl
Phosphorus	3.00-7.63 mg/dl
Potassium	3.80-7.95 mEq/L
Serum lipids	95-240 mg/dl
Serum protein	4.6-6.2 g/dl
Sodium	120-146 mEq/L
Triglycerides	0-145 mg/dl
Uric acid	1.3-5.6 mg/dl

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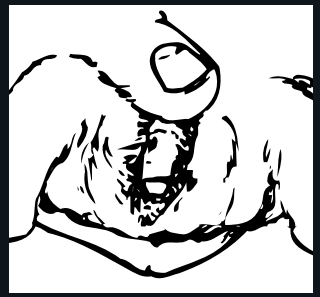


From Exotic Companion Medicine Handbook

a) The guinea pig should be restrained with one hand around the shoulders and a second hand supporting its hindquarters. b) Restraint of a pregnant guinea pig. Hand beneath rear quarters prevents struggling and supports the heavy body.



FEMALE
U = urethral orifice
V = vaginal closure membrane
A = anus



MALE
Digital pressure will protrude penis.

Harkness, Wagner, 1989 - From Exotic Companion Medicine Handbook

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Guinea Pigs

- Guinea pigs should have fresh, filtered drinking water in a water bottle at all times. The water bottle should be checked frequently because cavies like to play with the sipper tube, which may cause leakage; they even push food up into the sipper tube. Sipper tubes should be thoroughly cleaned daily (with a large pipe cleaner), and the water changed daily.
- Vitamin C administered in the drinking water may become inactivated with exposure to water, light and the metal sipper tube. For this reason, it is advisable for guinea pigs to receive vitamin C from their food or direct supplementation.

RESTRAINT

- The guinea pig should be restrained and picked up with one hand around the shoulders. As the animal is lifted clear of its cage, the hindquarters should be supported (see illustration at left).

SEXING AND REPRODUCTION

- Male guinea pigs have large scrotal sacs, and their penis can be easily extruded with gentle pressure. Females have a vaginal membrane and are usually smaller than males.
- The first breeding should take place prior to 6 months of age of the sow (prior to pelvic symphysis fusion) or the sow may have problems delivering the young (resulting in dystocia and possibly necessitating a cesarean section).
- Pregnant sows should be separated from other cavies until the litter is weaned, as adult pigs may inadvertently trample the young.

- The babies are born with full body hair, open eyes and the ability to eat solid food within the first day.

FIRST VISIT/ANNUAL EXAMINATION

- The physical examination, which should be performed every 6-12 months, would include a dental exam, evaluation of the husbandry and diet, skin and otoscopic exam, fecal flotation and direct smear. Additionally, particularly after 3 years of age, guinea pigs should be offered a geriatric screening, CBC/serum chemistry, urinalysis and radiography.

BLOOD COLLECTION

- Lateral saphenous vein: fur clipped and wet with alcohol
- Cephalic vein: use a 25-27, 23 g needle
- Jugular vein: restrain the guinea pig like a cat; if it stresses or becomes dyspneic, stop. Guinea pigs have a short right vein that may be hard to find.
- Cranial vena cava: place the cavy under sedation in a dorsal position; there is risk of subsequent traumatic bleeding into the thoracic cavity or pericardial sac.
- Cardiac puncture: this procedure requires deep sedation or anesthesia. Although large volumes can be obtained, it is usually reserved for terminal procedures during euthanasia.
- Maximum draw is 10% blood volume (7 ml/100 g BW) = 0.7 ml/100 g BW (no more than every 2 weeks. If ill, consider 0.5 ml/100 g BW maximum).
- Note: Venipuncture of multiple veins is often necessary for collection of an adequate volume of blood for analysis. It is important not to stress the cavy.

For examination, a towel should be placed on the table to provide traction and warmth for the guinea pig.



Teresa Bradley, DVM

Proper handling of guinea pigs should be demonstrated to clients, such as on this pet presented for a nail trim.



Teresa Bradley, DVM

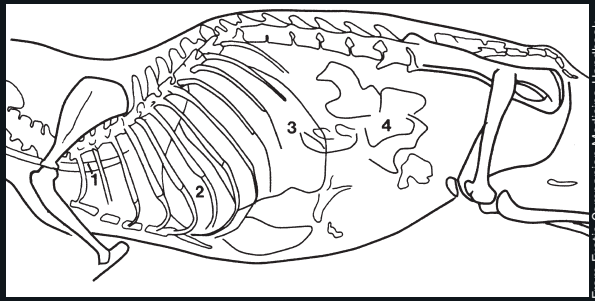
One can normally obtain 0.1-0.2 ml blood from the cephalic vein. Immobilization of the forelimb is important; avoid applying excessive negative pressure.



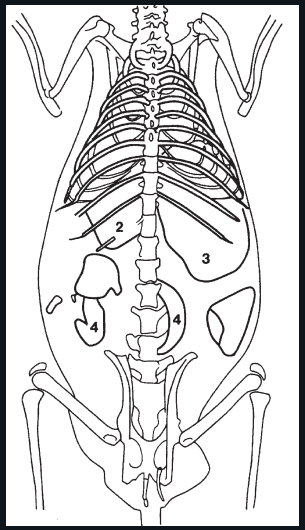
Espen Odberg, DVM

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RADIOGRAPHY*



From Exotic Companion Medicine Handbook



In a normal radiographic appearance of an adult male guinea pig, the thoracic cavity is relatively small and reveals only a few details. Lung parenchyma and vasculature are difficult to evaluate because the lungs are small and not well-aerated. Extrathoracic structures, such as ribs, sternum, spine and diaphragmatic outline, are clearly visible.

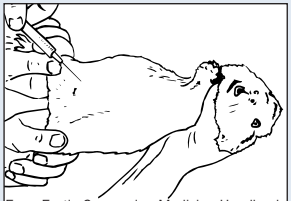
1. trachea (lateral view)
2. liver
3. stomach
4. small bowel and cecum

*From Rübel A: Atlas of Diagnostic Radiology of Exotic Pets. Schluetersche, 1991.

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Injection Sites

- Intravenous: jugular catheter, lateral, saphenous or cephalic (hard). If necessary for indwelling catheters, perform jugular cutdown (use anesthesia). If long-term IV therapy needed, install a vascular access port.
- Intramuscular: gluteal or biceps muscle
- Subcutaneous: upper back over shoulders (skin is thick and hard to penetrate with 25-ga needle or smaller)
- Intraperitoneal: hold on back with support under forelegs and hind quarters, head slightly lower than hind quarters; this allows the stomach and intestines to fall forward. Insert a 23- to 25-ga needle to the right of midline 2.5 cm in front of the pubis and direct forward at an angle of 45°. Can administer up to 15 ml.



From Exotic Companion Medicine Handbook

MOST COMMON DISORDERS

- Signs of vitamin C deficiency, such as bone and tooth abnormalities, abnormal bruises or hemorrhages
- Overgrown teeth/malocclusion
- Diarrhea/enteritis
- Anorexia/weight loss
- Pneumonia
- Pododermatitis

Guinea Pigs

- Abortion/pregnancy toxemia/dystocia
- Pregnancy-associated alopecia
- Dermatophytosis/mange dermatitis
- Arthritis/septicemia
- Bite wounds (if group housed)

ZOONOTIC POTENTIAL

- Dermatophytosis
- *Trichophyton mentagrophytes*
- Mange mites, *Trixacarus caviae*
- *Yersinia pseudotuberculosis*
- Allergic responses to allergens (e.g., hair, skin), rhinitis, rashes, asthma
- Fleas (dog and cat)
- *Salmonella* sp. (rare cavy pathogen)

THERAPY

- Sick guinea pigs stress easily and do not tolerate much handling; therefore, the emphasis in health care is on prevention of problems.
- Few antibiotics are safe to use in cavies; in particular, do not use penicillin or erythromycin.
- In general, with any disease or stress, extra vitamin C should be supplemented.
- Oral medications may be administered by syringe into the side of the mouth.
- Fluids are usually given SC via 25- to 22-ga butterfly catheter @ 100 ml/kg body weight per day divided q8-12h (25-35 ml per site).

These incisors are overgrown and demonstrate oblique malocclusion.



Mette Lybek Ruelokke, DVM

Pododermatitis is common in guinea pigs.



Joel Mills

Shown are skin lesions associated with *Trixacarus caviae* infestation.



Uwe Gille

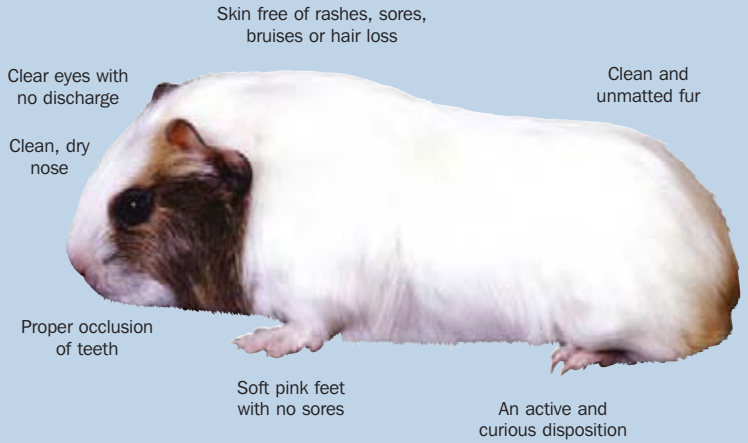
Symmetric alopecia associated with cystic ovaries is a common condition in female guinea pigs.



Nico J. Schoemaker, DVM, Dipl ECAMS, Dipl ABVP -Avian Practice

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What to Look for in a Healthy Guinea Pig



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FORMULARY

Certain antibiotics should not be used in guinea pigs because they may result in dysbiosis/enterotoxemia. Antibiotics responsible for this disruption include ampicillin, amoxicillin, streptomycin, bacitracin, cephalosporins, clindamycin, erythromycin, gentamicin, lincomycin, penicillins and tetracyclines. The antibiotics that appear least like to cause disturbances are chloramphenicol, trimethoprim/sulfonamides and fluoroquinolones. Probiotic supplements should be administered during any antibiotic treatment and continued for 5 days beyond termination of treatment, although there is some controversy regarding the benefit of this therapy.

DRUG	ROUTE	DOSAGE / COMMENTS
Acepromazine	IM	0.5-1.0 mg/kg
Acetylsalicylic acid	PO	50-100 mg/kg q4h
Alphaxalone/alphadolone 12 mg/ml solution	IM, IP	40 mg/kg
Aluminum hydroxide (Amphojel®)	PO	0.5-1.0 ml PRN
Amikacin	SC, IM, IV	10-20 mg/kg divided q8-12h
Aminophylline	IM	50 mg/kg PRN
Amitraz (Mitaban®) per package directions	Topical	3-6 treatments 14 days apart; CAUTION: may dilute more
Atipamezole	IM, SC	1 mg/kg
Atropine	IM, SC	0.1-0.2 mg/kg; organophosphate poisoning = 10 mg/kg SC; May cause cardiovascular irregularities
Azithromycin	PO	15 mg/kg q24h
Betamethasone	SC	0.1 mg/kg
Buprenorphine	SC	0.05 mg/kg q6-12h
Butorphanol	SC	0.4-2.0 mg/kg q2-4h
Calcium carbonate	PO	4 mg/kg q24h
Calcium EDTA	SC	30 mg/kg q12h lead chelation
Calcium gluconate	IM	100 mg/kg in dystocia, follow with oxytocin
Carbaryl 5% powder (Diryl®)	Topical	Dust lightly once weekly
Carprofen	IV, IM, SC	4 mg/kg q12-24h
Ceftiofur sodium	IM	1 mg/kg q24h
Cephalexin	IM	50 mg/kg divided q12h, use for 14 days against *Strep*
Cephaloridine	IM	10-25 mg/kg q8-24h
Cholestyramine	Water	100 mg/ml
Chloramphenicol ophthalmic ointment	Topical	q8-12h
Chloramphenicol palmitate	PO, water	5(

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DRUG	ROUTE	DOSAGE / COMMENTS
Chloramphenicol succinate	PO	30-50 mg/kg q12h
Chlopromazine	SC	25 mg/kg
Chlorpheniramine	SC	5 mg/kg q24h
Cimetidine	PO, SC, IM, IV	5-10 mg/kg q6-12h
Ciprofloxacin	PO	10-15 mg/kg q12h
Cisapride	PO	0.5 mg/kg q12h
Cyclophosphamide	IP	300 mg/kg q24h
Dexamethasone	PO, SC	0.5-2.0 mg/kg q12h
Diazepam	IM	1-2 mg/kg; calming for pruritis and post partum; 0.5-3.0 mg/kg for sedation
Diovol Plus®	PO	0.5-1 ml PRN
Diphenhydramine	IP, SC, PO	12.5 mg/kg IP; 5 mg/kg SC; 24 mg/kg PO PRN
Primidone	PO	25-50 mg/kg q12h
Dopamine	IV	0.08 mg/kg PRN
Doxapram	IM, SC, IV, IP	10-15 mg/kg; 2-5 mg/kg IV,IP
Doxycycline	PO, SC	2.5-5.0 mg/kg PO q12h; long-acting parenteral formulation: 75 mg/kg SC q7d
Enilconazole	Dip	Dilute to 0.2% solution q7d
Enrofloxacin	PO, SC, IM	5 mg/kg q12h
Ephedrine	IV, PO	1 mg/kg PRN
Epinephrine	IV	0.003 mg/kg PRN
Etomidate	IV	1 mg/kg after midazolam has taken effect
Fenbendazole	PO	20-50 mg/kg q24h x 5 days
Fentanyl (0.2 mg/ml)+ fluanisone (10 mg/ml)	IM	0.5-1.0 ml/kg
Fentanyl/droperidol (Innovar-Vet™)	IM	0.22-0.88 ml/kg, sedation, injection site inflammation at higher doses
Fentanyl/fluanisone (F) plus diazepam (D)	IM	1 ml/kg (F) + 2.5 mg/kg (D)
Fentanyl/fluanisone (F) plus midazolam (M)	IM, IP	1 part F, 1 part M, 2 parts water; 8 ml/kg - anesthesia 45-60 min duration
Flurbiprofen ophthalmic solution	Topical	1 drop each eye q12h
Furazolidone	Water	5.5 mg/ml
Furosemide	SC, IM, PO	5-10 mg/kg q12h
Glycopyrrolate	SC	0.01-0.02 mg/kg
Griseofulvin	PO	15-25 mg/kg q24h 14-28 days (can dose up to 100 mg/kg)

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DRUG	ROUTE	DOSAGE / COMMENTS
Heparin	IV	5 mg/kg PRN
Human chorionic gonadotropin	IM	1000 USP units, repeat 7-10 days
Hydralazine	IV	1 mg/kg PRN
Isoflurane	Inhalation	To effect
Isoproterenol	IM	0.05 mg/kg PRN
Itraconazole	IM	5 mg/kg q24h
Ivermectin	PO, SC	0.2-0.4 mg/kg q7d x 3 weeks or 0.5 mg/kg SC q14d (*Sarcoptes*)
Kaopectate liquid	PO	0.2 ml q6-8h per adult, symptomatically
Ketamine	IM	22-64 mg/kg
Ketamine (K) + acepromazine (A)	IM	25-55 mg/kg (K) + 0.75-3.00 mg/kg (A)
Ketamine (K) + diazepam (D)	IM	20-30 mg/kg (K) + 1-2 mg/kg (D)
Ketamine (K) + medetomidine (M)	IP	40 mg/kg (K) + 0.5 mg/kg (M)
Ketamine (K) + midazolam (M)	IM	5-10 mg/kg (K) + 0.5-1.0 mg/kg (M)
Ketamine (K) + xylazine (X)	IM	20-40 mg/kg (K) + 2 mg/kg (X)
Ketoconazole	PO	10-40 mg/kg/day x 14d
Ketoprofen	SC, IM	1 mg/kg q12-24h
Leuprolide acetate depot 30-day formulation	IM	0.2-0.3 mg/kg q28d (cystic ovaries)
Lime sulfur (2.5% solution) / dip	Topical, dip	Apply once weekly x 4-6 weeks; dilute 1:40 with water, q7d x 6 weeks
Loperamide HCL (Immodium A-D)	PO	0.1 mg/kg q8h x 3d, then q24h x 2d
Magnesium hydroxide	PO	4 mg/kg q24h
Marbofloxacin	PO, SC	3-5 mg/kg q24h
Medetomidine	IM, IP, SC	0.3-0.5 mg/kg
Meloxicam	PO, SC	0.2 mg/kg q24h
Meperidine	SC, IM	20 mg/kg q2-3h
Metoclopramide (Reglan® 5 mg/ml)	SC	0.5 mg/kg q8h, PRN
Metronidazole	PO	20-25 mg/kg q12h
Midazolam	IM, IV	0.3-0.5 mg/kg with sedative (etomidate or other) as part of pre-anesthesia
Morphine	SC/IM	2-5 mg/kg q4h
Nalbuphine	IM	1-2 mg/kg q3h
Nalorphine	IV	2-5 mg/kg narcotic reversal

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DRUG	ROUTE	DOSAGE / COMMENTS
Naloxone	IP, IV	0.01-0.1 mg/kg
Neomycin	PO	15 mg/kg q12h
Neomycin/dexamethasone/polymixin B ophthalmic drops or ointment	Topical in eye	q8-12h, may cause GI stasis
Nitrofurazone	PO	50 mg/kg q24h x 3d
Oxymorphone	SC, IM	0.2-0.5 mg/kg q6-12h
Oxytetracycline	IM	5 mg/kg q8h
Oxytocin	IM, SC	1 IU/guinea pig - if no young after 15 min of administration, perform c-section
Pentobarbital	IP	25-35 mg/kg
Phenobarbital	IP, IV	10-20 mg/kg PRN
Piperazine adipate	Water	4-7 mg/ml x 3-10d
Piperazine citrate	Water	2-5 mg/ml
Piroxicam	PO	5.7-6.0 mg/kg q12-24h
Potassium chloride	PO, IM	0.5-1.0 mg/kg q24h
Potassium citrate	PO	10-30 mg/kg q12h
Praziquantel	IM, SC, PO	5-10 mg/kg, repeat in 10d
Prednisone	PO	0.5-2.0 mg/kg
Propofol	IV	10 mg
Pyrethrin powder	Topical	Dust q7d x 3 weeks
Quinacrine HCL		75 mg/kg q8h
Selamectin	Topical	6 mg/kg
Sevoflurane	Inhalation	To effect
Sucralfate	PO	50 mg/kg q12-24h
Sulfadimethoxine	PO	10-15 mg/kg q12h
Sulfamerazine	Water	1 mg/ml
Sulfamethazine	Water	1-5 mg/ml
Sulfaquinoxaline	Water	1 mg/ml
Terbinafine	PO	10-30 mg/kg q24h x 4-6 weeks, antifungal
Tetracycline	IM, PO	5 mg/kg IM q8h, 10-20 mg/kg PO q8h, or 50 mg/kg/day PO in 3 divided doses (toxicity has been reported in guinea pigs)
Thiabendazole		

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DRUG	ROUTE	DOSAGE / COMMENTS
Thiopental	IP	20-55 mg/kg
Tiletamine-zolazepam	IM	20-40 mg/kg
Tobramycin	SC	30 mg/kg q12h
Tresaderm	Topical	1 drop per ear daily x 3-5d
Trimethoprim sulfadiazine	SC	20 mg/kg/day, 0.5 ml/kg/day
Trimethoprim 20 mg sulfamethoxazole or sulfadiazine 100 mg	PO	15-30 mg/kg q12h
Tylosin	IM, SC	10 mg/kg q24h; reported toxicity
Vitamin A	IM	50-500 IU/100 g
Vitamin B complex	SC, IM	0.02-0.2 ml/kg
Vitamin C	IM, PO, Water	10-30 mg/kg; 50 mg/kg SC, IM q24h; 200-400 mg/L water daily
Vitamin D	IM, SC	200-400 IU/kg
Vitamin E	IM	5-10 mg/kg q24h
Vitamin E-selenium (Bo-Se)	SC	0.1 ml/100-250 g
Vitamin K_1	IM	1-10 mg/kg PRN
Xylazine	IM, IP	5 mg/kg IM; 8-10 mg/kg IP
Yohimbine	IV	0.5-1 mg/kg

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African Naked Mole Rat Pet Care



Roman Klementschitz

VITAL STATISTICS

Life span	10 years (avg); up to 28 years
Body weight	30-50 g (1.0-1.8 oz) (Queens are larger and may weigh over 50 g.)
Body length	13-18 cm (5-7 inches)
Dentition	I 1/1, C 0/0, P 0/0, M 3/3 (with prominent elodont incisors)
Sexual maturity	1 year
Gestation	66-74 days
Litter size	12-27
Lactation	5 weeks

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African naked mole rats (*Heterocephalus glaber*)

Vladimír Jekl, MVDr, PhD

ORIGIN / FREE-RANGING HABITAT

- Naked mole rats are endemic to arid regions of northeastern Africa (Somalia, Ethiopia, Kenya).
- These rodents live in low-oxygen, high-carbon dioxide subterranean burrows.

SUITABILITY AS PETS

- They could be recommended only for very experienced owners because of their social life (large colonies) and specific husbandry requirements, including very large tanks.

PHYSICAL CHARACTERISTICS

- Naked mole rats are adapted to their typical burrowing lifestyle. Their body is cylindrical with the back arched dorsally over the lumbosacral region.
- The limbs are short and slender. The head is cone-shaped with prominent jaw musculature. Their eyes are tiny, and external pinnae are missing. Loose skin is brownish-pink in color.
- This species is not totally hairless—it possesses isolated tactile hairs all over the body, and whiskers are prominent around the snout.
- The animal can move its mandibular incisors independently, spreading them apart and moving them together.

African Naked Mole Rats

BEHAVIOR

- Naked mole rats are eusocial mammals that live in colonies typically comprised of 60-80 individuals.
- Each colony generally includes one breeding female (queen) and 1-3 breeding males. Only this female in a colony produces offspring. Other females within the colony are not sterile but are simply sociologically suppressed by the dominant queen.
- Other smaller males and females are the primary maintenance workers and foragers, and larger individuals defend the colony against predators and foreign rats.
- Living entirely underground, naked mole rats excavate an extensive system of tunnels with their continuously growing incisors.
- The majority of the burrow is composed of several nests and many foraging tunnels, constructed in search of an underground food.
- Free-ranging animals are active 24 hours a day.

CAPTIVE HOUSING

- Naked mole rats can be maintained in a large aquarium.
- If long plastic tubes that mimic tunnels and plastic boxes filled with wood shavings or paper towels are provided, the colony will establish a burrow system.
- Cardboard tubes, cornhusks, larger tubes, wood shavings, branches, soil or sand may be placed in tunnels to allow proper chewing and foraging behavior.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Naked mole rats have a lower metabolic rate than other Eutherian mammals and have only a very weak capacity





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for physiological thermoregulation. They regulate body temperature primarily through heat exchange by conduction.

- The preferred body/ambient temperature is 28-33°C (82.4-91.4°F).
- Humidity level should be kept at 30-50% with good air ventilation.

DIET

- These rodents are primarily herbivorous and eat a low-quality and high-fiber diet (roots and tubers), which also serves as their source of water and minerals.
- Coprophagy contributes to the high digestive efficiency.
- In captivity they will readily consume sweet potatoes, various vegetables (carrots, corn and broccoli), ground rodent pellets, tubers and fruits (apple, peach, banana and pear).

RESTRAINT

- When handling, the goal is to minimize the risk of being bitten.
- Towels, soft leather or gloves may be used for restraint.

ANESTHESIA

- Inhalant isoflurane anesthesia is recommended.
- Premedication with injectable anesthetics is used for induction. Dosages used by the author include: medetomidine (0.05-0.12 mg/kg), midazolam (0.1-0.3 mg/kg) and ketamine (3-10 mg/kg).
- Premedication with butorphanol (0.3-0.6 mg/kg IM) and then placement in an anesthetic chamber is possible.

African Naked Mole Rats

MOST COMMON DISORDERS

- *Heterocephalus* sp. are prone to *E. coli* enteral infections, which can kill an entire colony.
- This species is susceptible to incisor overgrow, especially after an incisor fracture.
- Mole rats that are seriously injured should be housed separately until recovery; however, reintroduction back into the group may be difficult.

SPECIAL CONSIDERATIONS

- It is suggested that this species uses a mechanism independent of vitamin D_3 in regulating mineral homeostasis and therefore is well adapted to an environment without sunlight.
- Intestinal calcium transport in mole rats is independent of vitamin D mediation, and no dietary vitamin D or calcium is therefore provided.

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Shrew Pet Care



VITAL STATISTICS

Life span	2 years (avg) (captivity) 3+ years reported <1 year (free-ranging)	Sexual maturity	9-10 months
		Estrus	polyestrous
Body weight	5-14 g (0.18-0.5 oz)	Gestation	19-21 days
Body size	50-82 mm (2.0-3.2 inches)	Litter size	6-7
Tail length	24-50 mm (1-2 inches)	Time to weaning	26-30 days

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Shrews (*Sorex araneus*)

Vladimír Jekl, MVDr, PhD

- Also known as Eurasian or common shrew

ORIGIN / FREE-RANGING HABITAT

- The family Soricidae is distributed worldwide, except in Australia and New Zealand. The genus *Sorex* includes common shrews of North America and Europe.
- The *S. araneus* is a terrestrial species and is commonly found in grasslands, woodlands and creek banks.

SUITABILITY AS PETS

- Shrews are very prone to stress and therefore could be recommended as pets only for very experienced owners.
- In many countries this species is protected by law.

PHYSICAL CHARACTERISTICS

- A shrew is characterized by its long flexible nose, small eyes, short legs and very dense dark brown velvety fur, which is lighter on the flanks and yellow/white on the belly.
- The tail is slightly shorter than the body.
- Scent glands, which are located on both flanks, are highly developed only in adult males.
- All 32 teeth have red-brown tips because of the deposition of iron compound. The deciduous teeth development is suppressed, so only permanent dentition erupts.
- The zygomatic bone is missing.

BEHAVIOR

- Shrews are territorial animals. Their territory is marked by the secretions of lateral skin glands.

Shrews

- Free-ranging adults live separately except during the mating season (spring, autumn).
- They can be active through the day and night, but are most active after sunset.
- They make small sleeping nests (burrows) of moss, dried leaves and grass or use the burrows of small rodents.
- Their olfactory and hearing senses are well developed.
- Shrews produce ultrasound, which is used as a primitive form of echolocation.
- Shrews do not hibernate.

CAPTIVE HOUSING

- This species can be housed in pairs.
- The substrate should consist of earth, peat and turf sods.
- Nest boxes are filled with hay, moss and/or cotton wool.
- Dried leaves, cardboard boxes, hay and grass may be provided as part of environmental enrichment.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- The preferred ambient temperature is 15-23°C (58-73°F).
- The humidity should be maintained between 50-60%.
- To maintain the cool, moist conditions preferred by shrews, the substrate should be misted with water.

DIET

- Shrews are primarily insectivorous. In nature, the shrew's diet also includes carcasses of small vertebrates.
- One recommended diet includes ox heart, cracked wheat, rolled oats, fresh chicken and raw chicken eggs with vitamin and mineral supplements. Earthworms, small slugs and snails may also be part of their diet.
- Because of a very high metabolism rate, shrews should be



Shrews have a high metabolism rate, and free-ranging shrews spend much of their time foraging for food.

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An earthworm may be part of a shrew's diet.

offered food several times a day as they eat as much as 80-90% of their weight to maintain all requirements.

RESTRAINT / ANESTHESIA

- When handling a shrew, the goal is to minimize the risk of being bitten. Towels or soft leather may be used.
- Inhalant anesthesia (isoflurane) is recommended. An anesthetic chamber or premedication with injectable anesthetics (e.g., medetomidine, midazolam, ketamine) is used for induction.

MOST COMMON DISORDERS

- Shrews suffer from skin diseases (i.e., trichophytosis).
- Intestinal parasitism (*Staphylocystis* sp., *Molluscotaenia* sp., *Longistriata* sp.) is very common.

ZOONOTIC POTENTIAL

- Shrews are reservoirs of many zoonotic parasitic (*Cryptosporidium* sp.), mycotic (*T. mentagrophytes*), bacterial (*Bartonella* sp., *Borrelia* sp., *Leptospira* sp.) and viral (tick-borne encephalitis, hantavirus) infections.

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Ring-tailed (ringtail) possums (*Pseudocheirus pereginus*)

Ariana Finkelstein, DVM

ORIGIN / FREE-RANGING HABITAT

- Distributed along the east coast of Australia and south-western Australia, Tasmania and New Guinea
- Ring-tailed possums live in woodlands, rainforests, dense scrub, eucalyptus forests, coastal shrub and suburban gardens; they are almost exclusively arboreal.

SUITABILITY AS PETS

- Ring-tailed possums require lots of attention.
- They require a large outdoor area with trees for housing.

PHYSICAL CHARACTERISTICS

- Ring-tailed possums are distinguished by their white-tipped prehensile tail, which is used for grabbing branches and nesting materials.
- They have 5 clawed toes on their hands; the first 2 are opposed; the hind feet also have 5 toes, but the only the first is opposable and it has no claw.
- Their molars have sharp ridges for grinding of leaves.
- Females have a forward-opening marsupial pouch; the mammary chain includes 4 nipples; only 2 are functional.
- Males have a bifurcated penis.

BEHAVIOR

- Ring-tailed possums are nocturnal with very good night vision; most of their activity takes place from dusk until midnight when they eat, climb and play.

Ring-tailed Possum Pet Care



VITAL STATISTICS

Life span	4-5 years in the wild up to 10-12 years in captivity	Body weight	1.5-2.5 lb (700-1200 g)
Adult size	12-14 inches (300-500 mm) body length with a tail the same length (300-350 mm)	Dental	3 pairs of upper incisors, 1 pair of lower incisors

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Ring-tailed Possums

- Free-ranging ring-tailed possums may build as many as 5 nests (dreys) in tree hollows and dense undergrowth and move often; they sleep in them during the day.
- Vocalizations include a soft, high-pitched, twittering call.
- Though generally not overly aggressive, they are territorial and usually solitary, except for small family groups.
- Occasionally, some animals will become extremely aggressive and attack intruders within their territory. Caution should be used when entering the aviary.

CAPTIVE HOUSING

- They require a large, aviary-type enclosure, preferably with large, flowering appropriate plants (some plants are highly toxic to possums) and small trees.
- An outdoor aviary is best because ring-tailed possums mark their territory, which can be rather pungent.
- Minimum recommended enclosure size is: 12 feet (3.7 m) long, 8 feet (2.4 m) high and 4 feet (1.2 m) wide.
- Nesting logs, nesting materials, climbing branches, and ropes and boxes are recommended accessories.
- Branches and thick pieces of bark may be provided for climbing and for gnawing and should be replaced regularly.

DIET

- In the wild, they are herbivorous/folivorous; their diet varies somewhat according to the range of each animal, but they mostly eat blossoms, fruits and leaves in the treetops at night (eucalyptus and acacia are preferred).
- They have extended their foods to include introduced plants, flowers and fruits, and they will also eat their own fecal pellets (coprophagia).

Ring-tailed Possums

- Fruits, nuts, greens, oats, nectars, flower and flower petals, native vegetation (eucalyptus, acacia, gum, tea trees, she-oak, bottlebrush, grevillia and wattles) are important for a healthy life.
- A reported zoo diet consists of ground alfalfa hay, banana, carrot, celery stems, grapes, kale and primate diet.
- A feeding platform should be provided above the ground.
- They should be fed after dusk.
- Fresh water must be available at all times.

RESTRAINT

- Chemical restraint is recommended.
- Unless hand-raised, they are difficult to restrain manually.
- Thick leather gloves or a towel should be used.
- A pillowcase can be used temporarily.
- One may restrain the ring-tailed possum by the tail and around the neck behind the head.

ANESTHESIA

- Gas anesthesia is the anesthetic of choice; however, intubation is difficult and requires an endoscope or a long-bladed laryngoscope.
- Animals that are not accustomed to handling may benefit from a mild sedative administered IM prior to gas: midazolam (0.1-0.2 mg/kg) or medetomidine (0.03-0.05 mg/kg), butorphanol (0.2-0.4 mg/kg) would be safe and effective; buprenorphine (0.03 mg/kg) can also be used.
- Alternatives: Telazol (4-10 mg/kg IM or 1-3 mg/kg IV), but results are variable.
- Medetomidine (0.04 mg/kg) and ketamine (4 mg/kg IM), reverse with atipamizole (0.2 mg/kg IM) or, in combina-



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tion, medetomidine (0.2 mg/kg) / ketamine (2 mg/kg) / butorphanol (0.2 mg/kg) are also used IM.
- Propofol (6-8 mg/kg IV)

MOST COMMON DISORDERS

- Leptospirosis
- *Neospora caninum* and *Toxoplasma gondii*
- Coccidiosis
- Internal parasites (treatment with ivermectin or fenbendazole is recommended)
- *Salmonella*
- Tuberculosis
- "Swollen paw syndrome" (edema of the paws followed by ulceration, dermatitis)

ZOONOTIC POTENTIAL

- *Salmonella* and dermatophytes

SPECIAL CONSIDERATIONS

- Certain states do not allow ring-tailed possums as pets.
- The tail vein is present on the lateral aspect of the tail and is good for catheter placement and blood collection.
- The jugular vein can also be used for blood collection, but the patient needs to be anesthetized.
- Rabies vaccination should be considered in endemic areas and if housed outdoors.

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Richardson's ground squirrels (*Spermophilus richardsonii*)

Kristin Sinclair, DVM

- Also known as gopher, prairie gopher, yellow gopher, flicker tail or picket pin. There are at least 39 species of *Spermophilus* ground squirrels.

ORIGIN

- Northern United States and southern Canada

FREE-RANGING HABITAT

- Richardson's ground squirrels are found in burrows in open grasslands, pastures and cultivated areas.

SUITABILITY AS PETS

- Commercially available babies are from wild-caught pregnant females.
- These animals can be affectionate if handled gently and frequently from a young age, and the prospective owner must commit a large amount of time to this. Ultimately, they are not a domesticated animal.
- Lack of the ability to hibernate in captivity may pose a health problem.
- They can be destructive chewers; prospective owners need to squirrel-proof the cage and home.
- The Richardson's ground squirrel is litter-trainable.

PHYSICAL CHARACTERISTICS

- These squirrels are stout-bodied with a short tail; they resemble a small prairie dog.

Richardson's Ground Squirrel Pet Care



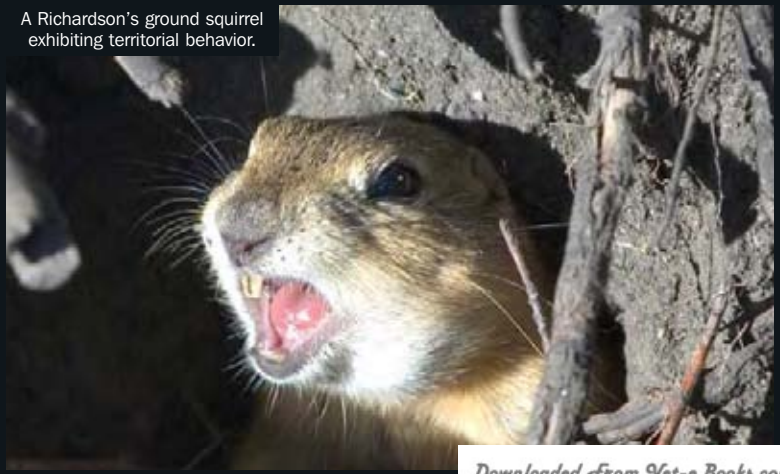
VITAL STATISTICS

Life span	4 years (avg)	Sexual maturity	11 months
Adult body weight - male	500-600 g	Litter size	6-8 offspring; 1 litter per year; second not possible if first is lost
- female	400-450 g		
Dental formula	I 1/1 C 0/0 P 2/1 M 3/3 = 22 The incisors are open rooted.	Estrus	A few hours
		Gestation	23 days (avg)

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Chuck Szmurlo



A Richardson's ground squirrel exhibiting territorial behavior.

Chuck Szmurlo

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Richardson's Ground Squirrels

- The hair coat is short and dense, ranging in color from cinnamon to pink buff on the dorsum. The underside is lighter in color, and the dorsal tail is black.

BEHAVIOR

- Free-ranging individuals hibernate for most of the year and are active from early spring to mid-to-late summer for mating and feeding. Hibernation consists of approximately 90% torpor for lengthening periods as the weather gets colder, interspersed with a few hours of warming and brief activity within hibernation burrow.
- They are considerably lighter after hibernation.
- Free-ranging female Richardson's ground squirrels maintain amicable interactions with female relatives. However, they are aggressive to non-familial females and all males aside from their brief estrus period.
- Males live singly and exhibit inter-male aggression during the breeding season.
- Vocalizations include chirps, whistles (warning calls) and growls (upset, warning noise).
- At 1 month of age the offspring emerge from maternal burrows and are able to eat solid foods.

CAPTIVE HOUSING

- A solid-bottomed wire cage suitable for a rabbit or a guinea pig would be the minimum size requirement (3 x 2 x 1.5 feet [0.9 x 0.6 x 0.5 m]).
- Substrate should be deep enough to allow burrowing and nesting; recycled paper and hay can be used.
- Some authors recommend the use of a 3-story ferret cage to mimic their natural burrow system. However, they

are not good climbers so a 3-story enclosure should be arranged so they cannot fall far from ramps or tubings.
- Ideally, they should be housed at least in pairs (sisters or females), but if housed alone, they will need regular interaction with their owner.
- Hide boxes, polyvinyl chloride (PVC) pipes buried in the substrate and chew toys are recommended.
- Ambient household temperature is acceptable, but heat extremes should be avoided (over 80°F [27°C]).

DIET

- In the wild, the Richardson's ground squirrel is primarily herbivorous/granivorous, consuming native grasses and seeds. In cultivated areas, they eat more crop foods (e.g., wheat, oats). They occasionally eat a few insects.
- Recommended foods in captivity are similar to those recommended for a prairie dog: timothy hay, herbivore pelleted diet or hay cubes (e.g., Oxbow Prairie Delight, Brisky Prairie Dog Diet) and fresh, leafy vegetables.

RESTRAINT

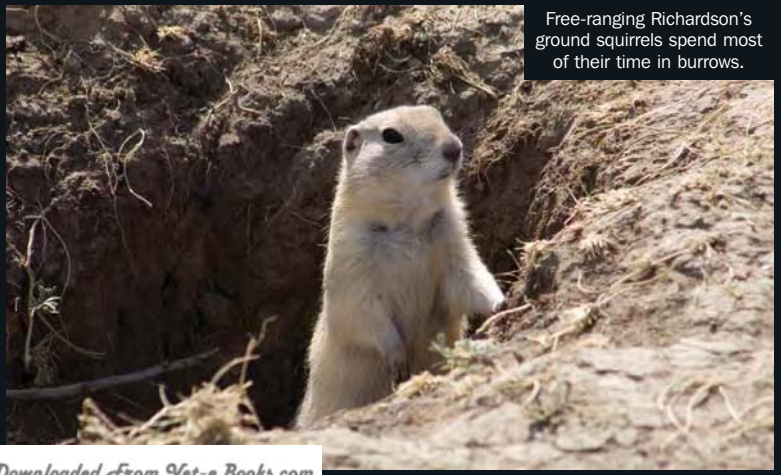
- These creatures cannot be scruffed easily.
- They may be carried and held as with a rabbit, supporting the chest in one hand and the rump with other.
- If the animal is fractious, a towel or pair of heavy gloves may be helpful.

ANESTHESIA

- Fasting is not required, because they do not vomit.
- One can extrapolate from other rodents (e.g., prairie dogs).
- Inhalation anesthesia can be used for induction and maintenance.



Male Richardson's ground squirrels often fight with other males.



Free-ranging Richardson's ground squirrels spend most of their time in burrows.

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- Ketamine (40 mg/kg) with acepromazine (0.4 mg/kg IM) has been used successfully in prairie dogs.
- Analgesics include butorphanol (2 mg/kg SC), buprenorphine (0.02 mg/kg SC) and meloxicam (0.2 mg/kg SC or PO).

MOST COMMON DISORDERS

- Ectoparasites: fleas, ticks
- Endoparasites
- Improper diet: inadequate hay intake

ZOONOTIC POTENTIAL

- Vector-borne disease, such as *Bartonella* sp.
- Colorado tick fever

SPECIAL CONSIDERATIONS

- Ownership may require a permit.
- Castration may be feasible through an intra-abdominal approach. The testicles are active for only 8 weeks after emergence from hibernation, after which they regress intra-abdominally.

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Flying squirrels (*Glaucomys* spp.)

Kristin Sinclair, DVM

- Northern flying squirrel (*Glaucomys sabrinus*)
- Southern flying squirrel (*Glaucomys volans*)

ORIGIN / FREE-RANGING HABITAT

- *Glaucomys* sp. originated in Alaska, Canada, northern United States and Appalachian and Rocky Mountains.
- They commonly inhabit boreal coniferous or mixed coniferous/deciduous forests, but they have also been found in deciduous forests in their southern range.
- They typically nest in tree cavities, woodpecker holes and bird houses and will also make nests of twigs and leaves.

SUITABILITY AS PETS

- Flying squirrels require intensive owner interaction from a young age to make acceptable pets. They can be difficult to handle as juveniles but can be tamed with patience.
- The cage and home must be squirrel-proofed, as they can be destructive chewers.

PHYSICAL CHARACTERISTICS

- The tail is long (80% of head and body length) and flat.
- Fully furred patagial folds extending between the carpus and tarsus bilaterally allow the flying squirrel to glide.

BEHAVIOR

- These squirrels are nocturnal and tend to be crepuscular (most active a few hours after dusk and before dawn).

Flying Squirrel Pet Care



A Northern flying squirrel

VITAL STATISTICS

Life span	4 years (avg) in the wild; 10-15 years in captivity.	Dental formula	I 1/1 C 0/0 P 2/1 M 3/3 = 22
Adult size	10-12 inches (26-30 cm) in length (including tail)	Litters	2 litters a year; 2-4 offspring in a litter
Body weight	90-140 g	Gestation	37-42 days
		Weaning	approximately 2 months

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A Southern flying squirrel



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Flying Squirrels

- While known for their gliding ability, they also climb branches and trees and move along the ground. Gliding distances average 65 feet (19.7 m).
- Northern flying squirrels are social animals, often found nesting in small groups (2-8 individuals in a nest). However, they are not known to form the large winter nesting groups (as many as 50 individuals) as reported for the southern flying squirrel.
- Vocalizations include warning chirps and clucks.

CAPTIVE HOUSING

- A wire mesh cage, minimum size 3 x 2 x 2 feet (90 x 60 x 60 cm), is an acceptable enclosure. The mesh should not be larger than ½" (1.27 cm).
- The squirrel should be provided with hide boxes and a nesting box affixed to the side of the cage.
- Vertical space and climbing room is important.
- Squirrels preferentially should be housed in groups or at least in pairs.
- Ambient household temperature is acceptable; if kept outdoors, shelter squirrel from extreme temperatures.
- Climbing branches and rodent chew toys should be provided. Some squirrels will use rodent exercise wheels.

DIET

- Free-ranging flying squirrels consume large amounts of fungi and lichens and some will consume tree sap.
- Recommended captive diet consists of pelleted rodent diet supplemented with approximately 10% vegetables, seeds, acorns and other nuts.
- A few insects may be offered.

RESTRAINT / ANESTHESIA

- Calmer individuals can be restrained with a hand towel or washcloth, but more fractious animals may require sedation or anesthesia for a complete examination.
- Inhalation anesthesia is recommended. The squirrel can be induced in a small chamber or a large dog anesthesia mask, and maintained via mask.

MOST COMMON DISORDERS

- Hypocalcemia, ectoparasites, self-mutilation

ZOONOTIC POTENTIAL

- There are reports of typhus fever (*Rickettsia prowazekii*) and leptospirosis associated with flying squirrels.

SPECIAL CONSIDERATIONS

- Owners may require a permit to keep this animal.
- Two subspecies are listed as endangered: *G. s. coloratus* and *G. s. fuscus* (Carolina northern flying squirrel).

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An enclosure for a flying squirrel should contain plenty of vertical space.



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Bennett's Wallaby Pet Care



VITAL STATISTICS

Life span	10-15 years	Heart rate	125-150 beats per minute
Body weight	24-59 lb (10.9-26.8 kg)	Dentition	3/1 0-1/0 2/2 4/4 x 2 32-34
- male	46 lb (20.87 kg) (avg)	Sexual maturity - female	14 months
- female	29 lb (13.15 kg) (avg)	- male	19 months
Body height	24-31 inches (61-80 cm)	Breeding	strictly seasonal
Body temperature	95-98°F (35-36.6°C +/- 1.2°C)	Gestation period	30 days
		Pouch period	7-8 months

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Bennett's wallabies (*Macropus rufogriseus*)

Ariana Finkelstein, DVM

SUBSPECIES

- Bennett's wallaby (Tasmanian) (*M. r. rufogriseus*)
- Red-necked wallaby (*M. r. banksianus*)

ORIGIN / FREE-RANGING HABITAT

- Wallabies are from Australia and New Zealand, Bass Strait islands
- Bennett's wallabies are abundant in Tasmania.
- Bennett's wallabies generally live in grasslands/open plains for feeding and brush/scrublands for cover.

SUITABILITY AS PETS

- A wallaby requires a large space for housing.

PHYSICAL CHARACTERISTICS

- It is often mistaken for a kangaroo.
- This species is brownish-gray with a light-colored ventrum and a patch of reddish-brown on the neck and shoulder.
- They have black paws and white stripes on their upper lip.
- Muscular hindquarters make them excellent jumpers.
- A tapered tail acts as a balance while they are leaping.

BEHAVIOR

- Bennett's wallabies are largely solitary but gather in loose social groups called mobs to share feeding areas.
- They will lie out in the sun and even in the rain.
- They communicate silently through movement.

- Vocalizations include a growl, hiss and chatter.
- Females have a pecking order but are generally not aggressive.
- Males tend to be aggressive to one another; often they box with their front legs and kick with their back legs.

CAPTIVE HOUSING

- A pair of Bennett's wallabies should be housed in an area large enough so they can retreat from one side of the fence to the other, feel safe and have a sheltered area for hiding.
- An area of at least 40 x 50 feet (12 x 15 m) is needed.
- The presence of grass is important for foraging and bedding.
- Fencing should be a least 5 feet (1.5 m) tall with very small openings.
- Posts should be positioned on the outside of the pen to help minimize trauma.
- A wallaby can be housed indoors for the first year, but an outside enclosure is eventually needed for space.
- Trees and bushes are recommended for shelter from heat and cold and to provide hiding places.
- A 3-sided shelter from the cold should be provided.
- Abundant shade should be available to wallabies in hot weather.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Low humidity is necessary.
- Temperature range should be above freezing but no higher than 85-92°F (30-33°C).
- Lower temperatures require heated, dry shelter with



Glen Fergus



Trisha M Shears

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appropriate bedding, and hot weather requires shade.
- In extremely cold climates, heat lamps or mats on the floor of the shelter can be used (caution with fire hazard).

ENVIRONMENTAL ENRICHMENT

- Browse should be provided; vegetables are also recommended.
- Hay nets can be used for enrichment.
- Bunched branches are recommended for hiding places.

DIET

- Wallabies are foragers, grazers and browsers by nature; therefore, grasses, greens and hay are recommended as the base diet (80%).
- A pelleted diet (10-15%) can also be fed (several commercial diets are available).
- Fruits and vegetables can be offered in moderation (e.g., dark greens, carrots, sweet potatoes, apples; avoid vegetables high in oxalate).
- A salt/trace mineral supplement and fresh water should be available at all times. The water should be covered to decrease contamination.
- The food dish or hanging feeder should be covered.
- They feed at dusk, generally grazing on grass.
- Bread may be fed as a treat or to aid in medication administration.

RESTRAINT

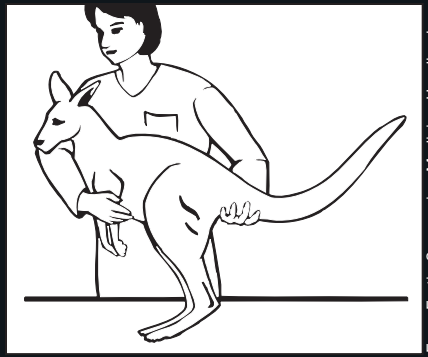
- Wallabies can be restrained by the tail and cradled if hand-raised.

Bennett's Wallabies

- If not hand-raised, hold by the tail and stand off to the side. Do not stand in front of the animal, as it can kick out and cause injury.
- A wallaby will probably need chemical restraint if not hand-raised or if they are intractable.
- They can be caught with a net and/or herded into it.
- If attempts at manual restraint fail, consider rescheduling procedure or immobilize for capture and restraint.

ANESTHESIA

- A low dose of diazepam (0.5-2 mg/kg) to relax the animal is recommended if not immobilizing completely.
- Other choices: midazolam (0.1-0.2 mg/kg) or medetomidine (0.03-0.05 mg/kg)
- Medetomidine (0.04 mg/kg up to 1 mg/kg has been reported) with ketamine (4 mg/kg IM up to 5 mg/kg); reverse with atipamizole (0.2 mg/kg IM or 5 times medetomidine dose in mg)
- Medetomidine/ketamine/butorphanol
- Telazol (5-10 mg/kg) = long recovery time; (dose range 2-30 mg/kg)
- Butorphanol (0.2-0.4 mg/kg) is safe and effective.
- Buprenorphine (0.01-0.03 mg/kg) can also be used.
- Alternatively, propofol (6-8 mg/kg IV) can be administered as a sole agent or after midazolam (reduce dose of propofol to 4 mg/kg); should be given slowly and the animal observed for apnea.
- All injectable drugs can be supplemented with gas anesthesia.
- Intubation is difficult and requires an endoscope or a long-bladed laryngoscope.



From Exotic Companion Medicine Handbook

The wallaby's front legs are restrained with one hand and the tail is controlled with the other hand, in effect tipping the animal off balance to prevent use of its powerful hindlimbs.



Glen Fergus

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Bennett's Wallabies

MOST COMMON DISORDERS

- Tetanus
- *Toxoplasma gondii* leading to sudden death
- Trauma
- Lumpy jaw (an inaccurate term used to describe chronic alveolar abscesses or facial exostosis in herbivores): bacterial abscesses are best prevented by improving husbandry and decreasing stress
- Stress/capture myopathy
- Gastritis in macropods is commonly associated with coccidia and nematodes.
- Parasites: especially strongyloides. A routine deworming program is important; behavior changes should be monitored as a sign of a problem; ivermectin is recommended annually
- Coccidiosis, often causing fatal enteritis
- Dermatophytosis - *Trichophyton mentagrophytes*
- Hand-reared macropods sometimes have candidiasis, bacterial pneumonia, cloacal prolapses.
- Tuberculosis is a concern outside of Australia.

VACCINES

- Vaccinate joeys for tetanus and then repeat every 5 years; equine vaccine is acceptable (doses of 0.25-0.5 ml have been anecdotally reported as safe).
- Clostridial vaccination should be considered, based on potential disease risk, but skin abscesses are a potential side effect of the vaccine.
- Rabies vaccination should be considered in endemic areas and if housed outside.

SPECIAL CONSIDERATIONS

- Neutering is recommended prior to 8 months of age (prior to puberty).
- Certain states do not allow Bennett's wallabies as pets.
- The tail vein is present on the lateral aspect of the tail; good for catheter placement and blood drawing.
- Jugular vein can also be used for blood collection, but patient needs to be anesthetized.
- Physical examinations, with complete immobilization, should include: complete blood count, chemistry, toxoplasmosis titers and dental exam.
- Fecal flotation and direct wet mounts every 3 months are recommended.

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HEMATOLOGIC REFERENCE RANGES	
Band neutrophils	0.099 $10^3/mm^3$ ± 0.306
Basophils	0.019 $10^3/mm^3$ ± 0.055
Eosinophils	0.103 $10^3/mm^3$ ± 0.114
HCO^3	24.5 mEq/L ± 0.7
Hematocrit	45.5% ± 7.0
Hemoglobin	16.4 g/dl ± 2.1
Iron	196 mg/dl ± 75
Lymphocytes	3.452 $10^3/mm^3$ ± 1.690
Monocytes	0.157 $10^3/mm^3$ ± 0.189
Neutrophils	2.187 $10^3/mm^3$ ± 1.252
Platelets	224 $10^3/mm^3$ ± 119
RBC	5.21 $10^6/mm^3$ ± 0.64
MCH	31.5 mmg ± 1.9
MCHC	36.1 g/dl ± 2.6
MCV	87.1 m^3 ± 7.2
WBC	5.864 $10^3/mm^3$ ± 1.873

BIOCHEMISTRY REFERENCE RANGES	
BUN	24 mg/dl ± 5
Calcium	10.1 mg/dl ± 0.9
Chloride	97 mEq/L ± 5
Cholesterol	83 mg/dl ± 29
CK (CPK)	1083 IU/L ± 1466
Creatinine	1.2 mg/dl ± 0.3
Glucose	117 mg/dl ± 35
Magnesium	1.78 mg/dl ± 0.75
Phosphorus	6.8 mg/dl ± 2.0
Potassium	4.5 mEq/L ± 0.7
Sodium	141 mEq/L ± 5
Triglycerides	56 mg/dl ± 30
Uric acid	0.5 mg/% ± 0.5

ISIS Physiological Data Reference Values August 1996

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Ring-tailed Lemur Pet Care



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Ring-tailed lemurs (*Lemur catta*)

Michelle L. Campbell-Ward, BSc, BVSc (Hons I), DZooMed (Mammalian), MRCVS

ORIGIN / FREE-RANGING HABITAT

- South and southwestern Madagascar
- Deciduous forests, closed canopy gallery forests, arid bush/forest; an atypical mountain population has also been described.

SUITABILITY AS PETS

- Generally unsuitable; should be kept only by experienced persons who have sufficient time and knowledge to care for them appropriately.
- As for other primates, it is challenging to meet physical and behavioral needs in the captive setting.
- Ring-tailed lemurs are extremely active and can be destructive. They need spacious enclosures.
- Their highly social nature means that they are best housed in pairs or preferably a small group.
- While they have many endearing traits when young, as they become sexually mature, pet lemurs tend to develop a behavioral repertoire that is unacceptable to their owners. This frequently results in abandonment.

PHYSICAL CHARACTERISTICS

- Gray-brown to rosy-brown back and rump; lighter limbs and belly; extremities white; top of head, rings about eyes and muzzle black; black and white banded tail
- Short, dense coat

Ring-tailed Lemurs

- Quadrupedal gait
- Digits end in pads; nails rather than claws (except for the 2nd toe which has a grooming claw)
- The lower incisors and canines protrude forward, forming a “comb” that is used for grooming.
- Males have a horny spur on each wrist that they use to pierce tree branches before scent-marking them.

BEHAVIOR

- Diurnal
- Largely arboreal but do spend approximately one-third of their time on the ground.
- Highly social and vocal with distinct dominance hierarchies within groups; social bonds are established and reinforced by grooming.
- Adult females are dominant over males.
- Basking and huddling behavior is related to energy conservation (prosimians have a lower metabolic rate compared to other primates).
- Olfactory communication is important; facilitated via scent glands on wrists and chest; secretions may be rubbed on the tail and flicked at an opponent.
- The tail and facial expressions are used to communicate.

CAPTIVE HOUSING

- Enclosure needs to be large enough to allow for exercise yet be secure and easy to clean.
- Minimum requirement (indoor): 161 ft^2 (15 m^2), height 8.2 ft (2.5 m)
- Minimum requirement (outdoor): 431 ft^2 (40 m^2), height 8.2 ft (2.5 m)



Enclosures need to be large and varied to encourage exercise and normal behavior.

Udo Schröter

VITAL STATISTICS

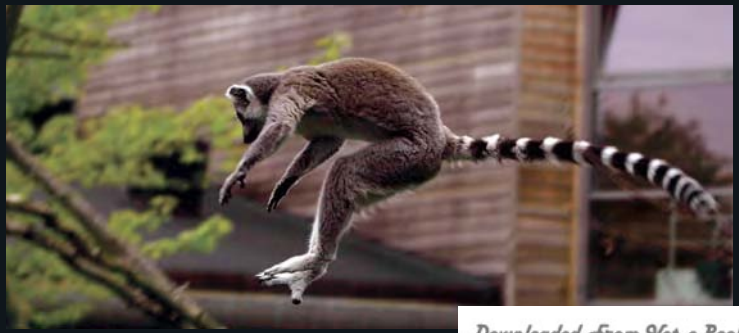
Life span	25+ years	Head/body length	15-18 inches (39-46 cm)
Adult weight	5.0-7.7 lb (2.2-3.5 kg) Males and females are similar in size.	Tail length	22-25 inches (56-63 cm)
		Dental formula	I 2/2 C 1/1 P 3/3 M 3/3 = 36

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A group of ring-tailed lemurs demonstrates their typical huddling behavior. The individual on the far right is basking.

Lemurs are agile creatures as demonstrated by this individual's leaping between branches.



lene Thyssen, o://commons.wikimedia.org/wiki/User:Malene

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Ring-tailed Lemurs

- Grass cover, bushes, live and dead trees and climbing frames are appropriate in the enclosure.
- Adequate shelter for protection from weather extremes should be provided in outdoor enclosures.
- Vertical and horizontal climbing places should be provided.
- Also necessary are horizontal benches or platforms large enough to allow groups to sit together.
- Nest boxes should be provided in the upper part of the enclosure.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Temperature: 64-75°F (18-24°C) (group size may affect requirement for heating/cooling in indoor areas)
- Moderate humidity: 30-70%
- Indoor areas need to be well ventilated (10-15 air changes per hour)
- Photoperiod: 12 hours day; 12 hours night

ENVIRONMENTAL ENRICHMENT

- Enrichment is essential to meet ethological and psychological needs comprising the following components: social (group housing), structure (access to varied indoor and outdoor enclosures where appropriate), foraging opportunities (e.g., provision of browse), novel items/scents introduced at regular intervals to stimulate exploratory behavior (e.g., puzzle feeders, toys, ropes, autoclaved animal products (e.g., hair, skin) and training (e.g., crate training).

DIET

- In the wild, they are herbivorous/folivorous, but will eat bark, sap, flowers, occasional insects/small vertebrates.

- In captivity, nutritionally complete primate pellet/biscuit, browse and fresh produce should be provided.
- For groups, it is necessary to ensure multiple feed sites to avoid competition for highly sought after dietary items.

RESTRAINT

- Physical restraint is possible and straightforward.
- To prevent being bitten, the person restraining the animal should place a gloved hand around the neck and under the jaw.

ANESTHESIA

- Isoflurane or sevoflurane by mask/chamber induction then via endotracheal tube for maintenance
- Ketamine (5 mg/kg) and medetomidine (0.05 mg/kg) IM; reverse with atipamizole
- Ketamine (3 mg/kg), medetomidine (0.04 mg/kg) and butorphanol (0.4 mg/kg) IM; reverse with atipamizole and naloxone
- Medetomidine (0.04 mg/kg), butorphanol (0.4 mg/kg) and midazolam (0.3 mg/kg) IM; reverse with atipamizole, naloxone and flumazenil
- Ketamine (10 mg/kg) IM followed by diazepam (0.5-2.5 mg/kg) IV
- Tiletamine/zolazepam (3-5 mg/kg) IM

MOST COMMON DISORDERS

- Trauma; minor wounds heal rapidly, often without treatment.
- Bacterial gastrointestinal infections, e.g., *Salmonella* sp., *Campylobacter* sp. and *Yersinia enterocolitica*



Ring-tailed lemurs are largely arboreal and therefore require both horizontal and vertical climbing opportunities.

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In mixed sex groups, careful consideration should be given to the potential for successful breeding and therefore to population expansion.

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Ring-tailed Lemurs

- Gastrointestinal parasitism, e.g., *Giardia, Trichomonas, Entamoeba, Balantidium* spp., ascarids, *Strongyloides* sp.
- Toxoplasmosis (often presents as acute death)
- Dental calculus/periodontitis
- Obesity
- Bacterial pneumonia (especially if kept in substandard, stressful conditions)
- Hemochromatosis (common in lemurs fed a lot of citrus fruits; the high vitamin C content facilitates absorption of iron from the gut)
- Sterile pleural effusions are reported: cause unknown
- Renal disease in geriatric individuals
- Epilepsy
- Diabetes

VACCINES

- Rabies vaccination and the administration of tetanus toxoid may be considered if the risk of either disease is considered high. No other vaccines are given routinely.

ZOONOTIC POTENTIAL

- *Shigella*
- *Salmonella*
- *Campylobacter*
- *Entamoeba*
- *Balantidium*
- *Giardia*
- *Strongyloides*
- *Trichuris*
- Infections via bite wounds
- Tuberculosis (incidence low)

SPECIAL CONSIDERATIONS

- There are state/international differences regarding the legality of keeping captive primate species.
- New animals destined to be introduced to a pre-existing group should undergo a period of quarantine for a minimum of 30 days.
- Intradermal tuberculin testing should be carried out during quarantine and/or opportunistically.
- Regular fecal examinations for parasites are recommended for all captive ring-tailed lemurs (every 6-12 months; more frequently if a known parasite burden exists).
- Lemurs fed a commercial primate diet do not require additional vitamin/mineral supplementation; oversupplementation may result in iron overload.

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Veterinary examination of a ring-tailed lemur is performed to assess the likely cause of a right fore limb lameness. The handler wears gloves and uses light physical restraint while the veterinarian palpates the injured limb.



Michelle L. Campbell-Ward

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Serval Pet Care



VITAL STATISTICS

Life span	15-20 years	Body length	28-40 inches (70-100 cm) (head and body)
Body weight	20-40 lb (10-20 kg)	Tail length	8-16 inches (28-40 cm)
Body height	15-25 inches (45-62 cm) (at shoulder)	Sexual maturity	1½-2 years

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Servals (*Leptailurus serval*)

Carol Lynn Yeisley, VMD

- There are 14 recognized sub-species, but most may be geographical populations and not true genetic subspecies.

ORIGIN / FREE-RANGING HABITAT

- Sub-saharan Africa; small populations in southwest and north Africa
- Well-watered savannahs, ranging from open plains grasslands, alpine grasslands, woodland savannahs, dense forest areas along waterways and rarely into arid areas.

SUITABILITY AS PETS

- Servals have been kept in captivity for hundreds of years but are still wild animals and maintain many instincts.
- Servals are very active and require more attention and socialization than most domestic cats.
- They can become aggressive and territorial and can inflict injury with their teeth and claws.
- They are not recommended for households with small children or other pets.
- They may be litter-trained.
- The serval has been bred with the domestic cat to form the savannah breed.

PHYSICAL CHARACTERISTICS

- Slender animal with long legs and fairly short tail
- Tall oval ears are set close together.
- The fur is usually boldly spotted black on tawny. White fur with silvery gray spots has been seen only in captivity.
- Melanism is known to exist in this species.

Servals

BEHAVIOR

- Primarily crepuscular (active at dawn and dusk), but nocturnal activity is common.
- Activity in the wild often correlates with the main activity period of available prey in the area.
- They are mostly solitary animals and are generally highly territorial. Territorial spray-marking is a common behavior.
- Predatory behavior in captivity is normal, including stalking, pouncing, leaping, batting and clapping at “prey” items.
- Servals may become aggressive once they are sexually mature, especially if not well-socialized as kittens.
- Vocalizations may include a growl, hiss, purr and a cry.
- Servals can climb and swim.

CAPTIVE HOUSING

- Local regulations may have specific requirements for housing.
- Minimum enclosure requirements are at least 4 feet (wide) x 10 feet (long) x 6 feet (high) (1.2 x 3 x 1.8 m).
- Chain link or welded wire at least 14-gauge or thicker should be used; a secure top is a must.
- A concrete floor is necessary outdoors to prevent escape.
- At least 2 litter pans of appropriate size need to be provided and cleaned daily.
- A water area (i.e., small pool for wading) is recommended.
- Many pet servals are housed indoors similarly to domestic house cats.
- A den area for sleeping should be provided.
- Pet servals should be acclimated to carriers for transport to veterinary hospitals in case of emergency.



Lukáš Mi och



Cédric Gravelle

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Servals

- Compared to other exotic felines, servals require minimal special care and can be housed outdoors even in colder climates, provided that a warm nest box is available.

ENVIRONMENTAL ENRICHMENT

- In captivity, scratching, chewing and biting may become a problem, so items appropriate for these activities should be provided to curb these behaviors.
- Hollow logs, pools, scratching posts, climbing areas and shelves are all appropriate.
- Appropriately-sized toys may be used.

DIET

- Free-ranging diet consists of various small prey, primarily rodents, and also birds, reptiles (especially frogs), fish and insects.
- In captivity, some servals will readily eat commercial carnivore diets (e.g., Mazuri Exotic Feline® or ZuPreem Exotic Feline Diet®) or may eat one of a variety of raw food or whole food diets.
- Some servals have been successfully maintained on high quality commercial pet cat food diets.
- The diet must be animal protein-based and nutritionally complete and balanced. The calcium to phosphorus ratio is very important (Ca:Phos = 1-1.5:1).
- Raw food and whole food diets need to be obtained from reputable sources to assure quality.

RESTRAINT / ANESTHESIA

- Adult servals may be difficult to restrain and handle without sedation.

Servals

- Anesthetic protocols are the same as for aggressive feral cats.
- There are anecdotal reports from practitioners of concerns regarding use of ketamine and Telazol in servals.
- Isoflurane and sevoflurane can be used.

MOST COMMON DISORDERS

- Metabolic bone disease
- Intestinal foreign body obstruction
- Cruciate ligament rupture
- Feline hyperesthesia syndrome
- Intestinal parasitism
- Ectoparasitism
- Dermatophytosis
- Obesity
- Dental diseases
- Traumatic injury

VACCINES

- Vaccinations with appropriate feline vaccines should be determined by the attending veterinarian.
- Protocols generally follow that of domestic cats starting at 6-8 weeks.
- Killed virus vaccines are recommended, e.g., Fel-o-Vax feline vaccines (Fort Dodge Animal Health) and IMRAB rabies vaccine (Merial).

ZOONOTIC POTENTIAL

- Rabies
- Dermatophytosis (ringworm)
- Scabies



Steve Juvetson

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- Toxoplasmosis
- Ascaridiasis
- Potential complications to the human victim of scratches or bites.

SPECIAL CONSIDERATIONS

- The serval is listed in CITES Appendix 2 (not currently threatened with extinction but may become so unless trade is closely controlled).
- Ownership of a serval may require a permit, depending on the locale, and may be illegal in some areas.
- Pet serval owners must also check for insurance and liability issues.
- Because the serval is not a domestic cat, rabies vaccines may be unrecognized by health officials in cases of human exposure—consult local regulatory authorities.
- Heartworm, intestinal parasite preventives and flea and tick control, as for domestic cats, are recommended.
- There are varied opinions on spay/neutering and declawing of pet servals, but generally these are recommended for household pets.

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Ocelots (*Leopardus pardalis*)

Lesa Longley, MA, BVM&S,
DZooMed (Mammalian), MRCVS

- Also known as jaguatirica (Brazil) or manigordo (Costa Rica)

SUBSPECIES

- *L. p. pardalis* (Amazon Rainforest)
- *L. p. aequatorialis* (northern Andes and Central America)
- *L. p. albescens* (Mexico, southwestern Texas)
- *L. p. melanurus* (Venezuela, Guyana, Trinidad, Barbados, Grenada)
- *L. p. mitis* (Argentina, Paraguay)
- *L. p. nelsoni* (Mexico)
- *L. p. pseudopardalis* (Colombia)
- *L. p. puseaus* (Ecuador)
- *L. p. sonoriensis* (Mexico)
- *L. p. steinbachi* (Bolivia)
- Most ocelots in captivity are of unknown or hybrid ancestry.

ORIGIN / FREE-RANGING HABITAT

- Arizona to North Argentina
- Wide spectrum, preferably with dense vegetative cover. Mainly forest and steppe habitats at elevations above 1,200 m (4,000 ft). Range 18 km² (7 square miles).
- There is declining population in the wild. The ocelot is on CITES Appendix 1 list and is protected across most of its range. Previously classed as IUCN Red List "vulnerable" when hundreds of thousands were killed for their fur, it now has a status of "least concern."

Ocelot Pet Care



Marwell Zoological Park

VITAL STATISTICS

Life span	7-10 years (free-ranging), up to 20 years (captivity)	Sexual maturity	female 18-22 months male from 2½ years
Body weight	11-16 kg (24-35 lb)	Estrus	approx. 5 days with a cycle around 25 days
Body length	65-97 cm (25-38 inches) (head and body)	Gestation	70-85 days
Tail length	27-40 cm (10-16 inches)	Litter size	1-4 kittens

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A kitten ocelot with its mother



Marwell Zoological Park

Elevated platforms or large trees are necessary in the enclosure



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Ocelots

- Current risks are mainly due to deforestation, road traffic accidents and attack by domestic dogs. The Texas ocelot (*L. p. albescens*) is still classed as "endangered."

SUITABILITY AS PETS

- Ocelots are not recommended as pets.
- Although some sources describe ocelots as docile, they are still wild animals and may be aggressive and territorial. Teeth and claws are their chief weapons.

PHYSICAL CHARACTERISTICS

- Ocelots have black stripes (head, neck and tail), rosettes (body) and spots (limbs) with brownish eyes.
- The base coat color varies depending on the habitat: it is ochre-yellow to orange-yellow in forested areas and grayer in arid scrubland.
- A large white spot is located on the caudal surface of each pinna.

BEHAVIOR

- Ocelots are mostly terrestrial but are excellent climbers and swimmers.
- They are mainly nocturnal, resting in trees or dense bush for most of the day.
- They can be highly vocal, e.g., when anticipating food.
- The anal region may be rubbed on the ground after defecating to scent mark. Excessive disinfection and removal of scent marks in captivity may cause stress.
- Threat postures include scraping with the hind feet or standing with the back slightly arched and the tail base raised but the tip lowered.

Ocelots

- Stereotypic pacing may be seen in enclosures with design problems, e.g., where a dead end is present.
- Sub-adults up to 2 years old may be accepted within adult ranges; thereafter they are strongly territorial and usually solitary (only meeting to mate).

CAPTIVE HOUSING

- A minimum area of 25 m^2 (270 ft^2) per animal is required with 2-3 times this space for breeding. The enclosure needs to be quiet and secluded for breeding.
- Ocelots are highly arboreal, and the enclosure should be >2.4 m (8 ft) high with trees/poles for exercise.
- Housing must prevent escape by climbing, leaping or swimming across barriers. The perimeter should be checked frequently for points of weakness. Entrances should be double-gated to reduce risk of escape.
- Natural substrates with some flexibility (e.g., marine plywood or strong plastic) are preferable to concrete.
- Pest control is needed, e.g., to prevent feral cats.
- Ocelots should be protected from temperature extremes.

ENVIRONMENTAL ENRICHMENT

- A complex environment should be provided, with various levels and surfaces, vegetation and elevated platforms.
- Hiding places provide areas of security (e.g., shrubbery).
- A hide box with straw or hay bedding should be provided.
- Novel objects will stimulate explorative behavior, e.g., sticks, rawhide chews, cardboard boxes, lavender, cut leafy branches or paper bags.
- Juveniles will hunt invertebrates attracted by rotting logs or rocks.



A young ocelot at Alameda Park Zoo in Alamogordo, New Mexico.



A large pipe with straw bedding makes a good hide box for an ocelot.

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Ocelots are carnivorous and whole carcasses of small mammals are used as their primary diet.

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Ocelots

- Hunting behavior may be stimulated by varying food and feeding sites, e.g., in branches or cage wire, in a pipe or wrapped in paper bags or cardboard boxes.
- Socialization with a conspecific (e.g., young animals or adults for breeding) should be gradual and monitored.
- Operant conditioning may be used to stimulate animals and assist in management procedures.

DIET

- Ocelots are carnivorous; natural prey species include small mammals, reptiles and birds.
- The captive diet may be whole carcasses (e.g., rats, mice, rabbits, chicks, pigeons, quail and pheasants), a commercial meat-based complete diet (e.g., Dallas Crown Inc., www.dallascrown.com) or kibble (e.g., Mazuri Diets, www.mazuri.com and IAMS, www.iams.com).
- A reliable source for meat (no road kill) should be used.
- Food must be removed from an enclosure before spoilage.
- Feline spongiform encephalopathy has been reported in an ocelot, and many countries recommend not to feed certain bovine material (e.g., brain) to felids.

RESTRAINT

- Small individuals (<10 kg, 22 lb) may be netted for short procedures, e.g., injections.
- A squeeze cage is useful for larger animals, or darting equipment may be used to administer drugs for chemical immobilization.

ANESTHESIA

- Ocelots should be fasted for 12 hours prior to anesthesia

to reduce the risk of emesis and aspiration during induction and recovery.

- Anesthetic protocols are similar to aggressive domestic cats, e.g., ketamine +/- benzodiazepine or α2-agonist (the latter may be reversed with atipamezole). Intravenous propofol can be used to top-off anesthesia.
- Oxygen supplementation should be provided and intubation performed where possible. Gas agents (i.e., isoflurane, sevoflurane) are used to prolong anesthesia.

MOST COMMON DISORDERS

- Nutritional secondary hyperparathyroidism/metabolic bone disease (>1% dietary calcium is necessary to prevent deficiencies)
- Dental disease
- Osteoarthritis and pad ulceration (especially on concrete substrate)
- Trauma (e.g., digits caught in small mesh)
- Obesity
- Gastrointestinal foreign bodies
- Infectious agents (as for domestic cats): viral (e.g., rhinotracheitis, calicivirus), bacterial (e.g., *Helicobacter*), fungal (e.g., dermatophytosis), parasites (e.g., ascarids, heartworm, fleas and ticks)

VACCINES

- Risk assessment should be performed by a veterinarian.
- Extralabel use of felid vaccines is possible, but it is advisable to use killed virus vaccines, e.g., Fel-o-Vax feline vaccines (Fort Dodge Laboratories Inc., www.wyeth.com/divisions/fort_dodge.asp) and IMRAB



Ana Cotta

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rabies vaccine (Merial, www.merial.com). Boosters are given only after antibody titers have been ascertained.

ZOONOTIC POTENTIAL

- Similar to domestic cats, e.g., rabies, dermatophytosis, toxoplasmosis, ascaridiasis.

SPECIAL CONSIDERATIONS

- Surgical neutering (i.e., castration or ovariohysterectomy) is recommended in preference to chemical contraception for animals not intended for breeding.
- Endoparasite control is based on regular fecal screening.
- Most medications, including ecto- and endoparasite control, are used as for domestic cats.
- A permit may be required to keep an ocelot in captivity.
- The AB blood group system in cats requires donor and recipient to be cross-matched before transfusions or blood products are administered.

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Jackson's chameleons (*Chamaeleo jacksonii*)

Jennifer Franklin, DVM

SUBSPECIES

- Jackson's chameleon (*C. j. jacksonii*)
- Dwarf Jackson's chameleon (*C. j. merumontanus*)
- Yellow-crested Jackson's chameleon (*C. j. xantholophus*)

ORIGIN / FREE-RANGING HABITAT

- East Africa (Kenya and Tanzania)
- These arboreal species prefer humid, cooler regions, especially altitudes over 3000-5000 m (1.8 miles)

SUITABILITY AS PETS

- Not a beginner lizard but can be maintained and bred in captivity with proper care.

PHYSICAL CHARACTERISTICS

- Individuals have a sawtoothed-shaped dorsal ridge and no gullar crest.
- The length of the tongue is 1.5 times the length of the body.
- They can independently focus their eyes and have 360° vision.
- There is an accessory lung lobe in the ventral cervical region just cranial to the pectoral girdle.
- Males have 3 brown horns that develop around 4 months of age.
- Females generally have no horns.

Jackson's Chameleon Pet Care



VITAL STATISTICS

Life span	5-10 years
Body weight	25-35 g
Body size	12 inches (30 cm)

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Female Jackson's chameleon



Male chameleons fighting

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Jackson's Chameleons

- Normal coloring is bright green but can change depending on mood, health and temperature.
- Juveniles are light brown and turn bright green at maturity (4-5 months of age).

BEHAVIOR

- Jackson's chameleons are less territorially aggressive than most chameleons but tend to live singly in the wild.
- Female gives birth to live offspring (8-30 young) after 5-6 months' gestation.

CAPTIVE HOUSING

- Mature males should not be housed together, and most prefer to be solitary in the wild.
- Enclosures should be as large and tall as possible and made with screen sides for optimal ventilation (plastic-coated screening or PVC mesh is recommended over metal screening).
- Glass aquariums are not unacceptable enclosures as they do not provide ventilation, have a tendency to collect mold and are generally not large enough.
- Jackson's chameleons generally will not drink from bowls but capture water droplets from leaves.
- Newspaper or soil can be used as substrate.
- They are generally believed to benefit from UVA and UVB light exposure during daylight hours.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Daytime temperature: 75-78°F (25°C) with basking area about 85°F (29°C) and nighttime temperature: 61°F (16°C)
- Humidity 50-80%

- Humidity should be maintained with an in-cage rain, drip or automatic misting system as manual misting may not provide enough moisture for adult chameleons. Adults run the risk of developing kidney failure from chronic low-level dehydration from inadequate misting.
- All misting systems must be kept very clean. Monthly disinfection with bleach is recommended (dilution of 1 part bleach to 32 parts water) for at least 15-20 minutes with a thorough rinsing.

ENVIRONMENTAL ENRICHMENT

- Sturdy climbing branches and ample hiding places must be provided.
- Live plants (i.e., pothos, ficus, hibiscus, schefflera) help maintain humidity and provide climbing/hiding places.

DIET

- Free-ranging chameleons eat hundreds of species of insects and invertebrates (i.e., snails and spiders). Some chameleons may also eat flowers, leaves and fruit.
- A variety of small soft-bodied insects (e.g., crickets, flies, butterflies, mealworms, waxworms, superworms) should be offered.
- All prey should be dusted with calcium powder.
- Keeping the chameleon well-hydrated by providing drinking water in an appropriate misting system is very important.
- Feed adults every other day; juveniles daily.

RESTRAINT

- Support body weight, and do not restrain using tail.



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Jackson's chameleon shedding



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Jackson's Chameleons

- Minimize handling to reduce stress.
- The majority of an examination can be done with the individual sitting on a branch.
- A towel can be placed over the head to reduce stress in some individuals.

ANESTHESIA

- Response to any medication is dependent on environmental temperature.
- Premedicate with butorphanol (2 mg/kg SC/IM)
- NSAIDs: ketoprofen (2 mg/kg SC/IM q24h); carprofen (2-4 mg/kg q24h PO/SC/IM); meloxicam (0.2 mg/kg q24h PO/IM)
- Induction: Telazol (2-6 mg/kg IM); DKT IM: ketamine (4-10 mg/kg) + butorphanol (0.5-1 mg/kg) + Domitor (40-150 mcg/kg); propofol (3-5 mg/kg IV)
- Maintenance: propofol CRI (0.3-0.5 mg/kg IV)
- Endotracheal intubation is relatively easy; the glottis is located at the base of the tongue. Use uncuffed tube.
- Surgical plane of anesthesia: righting reflex absent, palpebral absent, corneal reflex present

MOST COMMON DISORDERS

- Metabolic bone disease
- Hyperkeratosis
- Dermatomycosis
- Dehydration
- Gout
- Hypovitaminosis A
- Pinworms (*Oxyurids* sp.)

ZOONOTIC POTENTIAL

- *Salmonella*
- *Campylobacter*
- Zygomycoses

SPECIAL CONSIDERATIONS

- The subcutaneous (SC) route of drug administration is not as reliable or predictable as intramuscular (IM) or intravenous (IV).
- IM injections are administered in the front limbs.
- IV access: ventral coccygeal vein or ventral abdominal vein

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A feral Jackson's chameleon from a population introduced to Hawaii in the 1970s.

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Green Anole Pet Care



Paul Hirst

VITAL STATISTICS

Life span	3-5 years (avg)
Body weight	3 g (avg)
Body size	5-8 inches (13-20 cm)
Sexual maturity	1 year
Breeding season	April through July

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Green anoles (*Anolis carolinensis*)

Carol Lynn Yeisley, VMD

- Also known as Carolina anole, American anole and red-throated anole

ORIGIN / FREE-RANGE HABITAT

- Southeastern United States, introduced into Hawaii
- Tropical, arboreal

SUITABILITY AS PETS

- These are a good lizard for novices, although their quick movements and nervous nature may make them difficult for young children who want to try to handle them.
- They do not require a very large area, so most households can find the space to provide an appropriate set up.
- The cost of care and maintenance for an anole is the same as for a more expensive lizard, but many people may not be willing to invest properly in the care of such an inexpensive species.

PHYSICAL CHARACTERISTICS

- The green anole's body is green unless the animal is stressed, sick or cold, in which case the color may change to a dull brown.
- The male has a pink dewlap that can be extended from the chin as a courtship or territorial display.
- Males have a larger dewlap than females.
- Males generally have enlarged anal pores compared to the females; the hemipenile bulge is not always obvious.

Green Anoles

BEHAVIOR

- Diurnal activity
- Males are territorial and may display with head bobbing and colorful throat fanning.
- Anoles are agile active lizards, climbing plants and chasing prey during the spring and summer but are generally less active in the autumn and winter.
- Anoles periodically shed their skin as snakes and other lizards do.
- Their tails will detach with mild force/restraint; although the missing tail will regenerate, it will not look or function like the original.
- Their eyes move independently of one another.

CAPTIVE HOUSING

- Tropical vivarium set-up is best.
- Minimum size recommendation: 36 x 24 x 12 inches (90 x 60 x 30 cm)
- Enclosures should be made with screen sides for optimal ventilation (plastic-coated screening or PVC mesh is recommended over metal screening).
- Glass aquariums are not unacceptable enclosures as they do not provide ventilation, have a tendency to collect mold and are generally not large enough.
- Green anoles may be housed in a community set-up with 1 male to 4 females. Housing more than 1 male in an enclosure risks territorial aggression.
- Basking area with infrared or heat-emitting bulb is needed, as is full-spectrum lighting.
- A drip system to provide drinking water is preferable to a bowl.



Anole lizard displaying its dewlap.



If the green anole's body is brown, the animal may be stressed, sick or cold.

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A tropical vivarium with live plants is the best enclosure.



Anole eating a dronefly.

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Green Anoles

- Substrate will vary depending on whether or not live plants or artificial plants are used to create the vivarium, but care must be taken to remove areas of mold growth or decaying organic material.
- Commercial reptile bedding, various mulches, terrarium soils can all be used in the viviarium.
- Sand and gravel are not recommended.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Daytime temperature range is 74-86°F (23-30°C).
- Night temperatures can drop to 68°F (20°C).
- Adequate humidity is essential (60-70%).
- Mist spraying daily usually provides adequate humidity.

ENVIRONMENTAL ENRICHMENT

- Hiding areas, such as plants or commercial reptile hiding sites, should be provided.
- Real or artificial plants, objects to climb and an area suitable for basking are important for enrichment.

DIET

- Green anoles are insectivores, eating primarily small to medium live insect food.
- They should be fed at least twice a week, with 2 or more insects per lizard per feeding.
- A small number of surplus insects may be kept in the vivarium, but in a community set-up it is best to observe that each lizard has a chance to get adequate insects.
- Crickets should be either appropriately gut-loaded or dusted with supplements prior to feeding.
- Waxmoth larvae, grasshoppers, centipedes and spiders may be fed.

RESTRAINT / ANESTHESIA

- Care must be used to prevent injury and stress.
- Protocols used for the green iguana can be extrapolated to the small size of the anole.
- One example of injectable anesthesia might be a ketamine (5 mg/kg) / diazepam (0.5 mg/kg) combo that is carefully diluted to facilitate accurate dose administration IM followed with isoflurane if needed.
- Isoflurane anesthesia may be induced via mask.

MOST COMMON DISORDERS

- Intestinal foreign bodies
- Intestinal impaction
- Traumatic injury - both from aggression and handling (vulnerable to fracture of legs and tail while handling)
- Intestinal parasitism
- Ectoparasites
- Malnutrition (especially in communal tank settings)
- Metabolic bone disease
- Stress-related disorders (brown skin color is a sign)

ZOONOTIC POTENTIAL

- *Salmonella* and *E. coli* as with other reptiles.

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Broad leaf plants should be provided for climbing and jumping.



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Frilled Lizard Pet Care



Tim Vickers

VITAL STATISTICS

Life span	up to 20 years
Body weight	up to 1 lb (0.5 kg)
Body length	18-28 inches (46-71 cm) including the tail
Frill span	up to 12 inches (30 cm) when extended

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Frilled lizard (*Chlamydosaurus kingii*)

Jennifer M. Periat, DVM

*Also known as frilled dragon, frilled neck lizard

SUBSPECIES

- Visual differences in locales suggest that there may be more than one species or subspecies, although this has not been determined.

ORIGIN / FREE-RANGING HABITAT

- Northern Australia and southern New Guinea
- Sub-tropical to semi-arid grassy woodlands and forests

PHYSICAL CHARACTERISTICS

- Males are larger than females.
- Size varies with locale; Australian specimens are larger than those from New Guinea.
- The very distinctive large frill around the neck lies like a cape over the shoulders when the lizard is relaxed and extends when alarmed.
- Frilled lizards have long limbs and a long tail.
- They are gray-brown in color with a pattern down the back and tail.
- Their mucous membranes and tongue are bright pink or yellow.

BEHAVIOR

- Frilled lizards are diurnal and arboreal.
- They can do well housed in groups, but males should be separated to prevent fighting.

Frilled Lizards

- They are known for bipedal locomotion when running.
- Males will headbob and frill at females; females will move their head in a slow circle.
- Many pet frilled dragons are tame and rarely display their frill.

CAPTIVE HOUSING

- Hatchlings and juveniles can be housed in 10-20 gallon (38-76 L) tanks.
- A 3 feet x 2 feet x 4 feet tall (0.9 m x 0.6 m x 1.2 m) enclosure is the minimum size recommended for 1 adult.
- Newspaper or paper towel is suitable substrate.
- Water should be provided in a container large enough for the lizard to soak in.
- UVB lighting is recommended.
- A hiding place should be provided.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Basking spot should be about 100°F (38°C).
- The cooler part of the tank should be 70-80°F (21-27°C).
- Nighttime temperatures should not drop below 65°F (18°C).
- Humidity should be 55-65%; higher humidity levels may contribute to respiratory problems.

ENVIRONMENTAL ENRICHMENT

- Branches in various sizes are important for climbing and basking.
- Feeder insects should be offered to provide exercise and enrichment.



Miklos Schibema



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Frilled Lizards

DIET

- Frilled lizards are omnivores, although they are primarily insectivores/carnivores.
- They eat mostly insects, such as crickets, cockroaches, superworms, mealworms and silkworms.
- Insects should be gut-loaded and dusted with calcium prior to feeding.
- Vegetables and fruits, such as dark leafy greens, squash, berries and banana, may be offered, although not all frilled dragons will consume these items.
- Pinky mice may be offered occasionally.

RESTRAINT

- The entire body weight must be supported.
- One hand may be used to restrain the front limbs against the animal's body and the other hand to support the pelvic limbs.
- Most frilled lizards are not prone to biting.

ANESTHESIA

- Baseline blood work is recommended before anesthesia.
- Premedication: butorphanol (0.5-2.0 mg/kg IM) or buprenorphine (0.005 to 0.02 mg/kg IM) 20-30 minutes prior to induction.
- Induction may be performed with propofol (5-10 mg/kg IV) or gas (5% isoflurane) using a face mask or induction chamber.
- Tracheal intubation is relatively easy; use a non-cuffed tube and maintain with isoflurane.
- Body temperature may be maintained with a warm air blanket or circulating water blanket.

- Vital parameters, such as respiration and heart rate, must be monitored during anesthesia. A Doppler or pulse oximeter is useful for monitoring heart rate.
- It may be necessary to mechanically breathe for the patient.
- NSAIDs: meloxicam (0.2-0.4 mg/kg q24h PO, IM) or carprofen (1-4 mg/kg q24h PO, IM).
- Other anesthetic protocols are available and can be tailored to best fit the needs of the patient.

MOST COMMON DISORDERS

- Respiratory infection
- Intestinal parasites
- Nutritional metabolic bone disease
- Ectoparasites
- Dystocia

ZOONOTIC POTENTIAL

- *Salmonella, E. coli* and *Camplyobacter* are possible, as with other reptiles.

SPECIAL CONSIDERATIONS

- Imported animals may have disorders, such as parasitism and dehydration, and may be difficult to acclimate.

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Tim Vickers

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African Fat-tailed Gecko Pet Care



Michele Buono, DVM

VITAL STATISTICS

Life span	10-18 years (captivity)
Body length	
male	25 cm (10 inches) (avg) up to 30 cm (12 inches)
female	20-22 cm (8-9 inches)

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African fat-tailed geckos (*Hemitheconyx caudicinctus*)

Michele Buono, DVM

ORIGIN / FREE-RANGING HABITAT

- West Africa, from Nigeria west to Senegal
- Fat-tailed geckos use savannahs, rocky hillsides, dry open woodland and river edges as habitats.
- Their habitat is dry and arid, although they will spend most of their time in a dark, humid hiding place.

SUITABILITY AS PETS

- The fat-tailed gecko is a shy and relatively docile animal.
- A new owner may cause the animal some distress, but upon becoming accustomed to its owner, the fat-tailed gecko is usually content to rest on a hand or arm.

PHYSICAL CHARACTERISTICS

- The most notable feature is the large, thick tail (used for fat storage).
- Like other geckos of the Eublepharidae family, such as leopard geckos (*Eublepharis macularius*), they have moveable eyelids. They also have vertical pupils, and they lack adhesive lamellae.
- The normal coloring consists of brown and tan stripes. The underbelly is usually a pale pink or off-white color.

SEXING AND REPRODUCTION

- The male has 2 pronounced hemipenal bulges and pre-anal pores in a “V” shape just above the vent. Females do not have the hemipenal bulges and pre-anal pores.

African Fat-tailed Geckos

- Breeders raise their geckos individually and place a male and female together after a period of 2 months' brumation. When they are first brought together, the male may seem to be aggressive toward the female, by biting her on the neck. If she is not receptive, she will bite back. The male will also shake the tip of its tail quickly.
- Up to 4 weeks after a successful mating, the female will lay her first clutch of eggs. Each clutch consists of 2 white oval eggs (although only a single egg may be laid by a young female).
- Fat-tailed geckos can lay 8 clutches a year at 2-4 week intervals.
- The incubation temperature controls the sexual differentiation of the hatchlings. At cool temperatures, mostly females are produced; at intermediate temperatures mostly males are produced; and at higher temperatures, females are again the dominant sex.
- The eggs will hatch in 35-100 days, depending on the temperature.

BEHAVIOR

- Fat-tailed geckos are nocturnal and terrestrial.
- Although fat-tailed geckos may be more shy and potentially tame than leopard geckos, adults may be aggressive with humans and bite as a form of defense.
- After introduction into a new terrarium, they need time to acclimate (weeks to months); manipulating the animals during this period is very stressful. One should take this process slowly by placing a hand in the terrarium and waiting until the gecko voluntarily walks upon the hand.

The most notable feature is the large, thick tail; however, some species of banded geckos (*Coleonyx* sp.) also have "fat" tails.



Michele Buono, DVM

H. caudicinctus is a member of the Eublepharidae family, often called the "eyelid geckos," with eyelids that can close. All other geckos have eyelids that are fused open.



Michele Buono, DVM

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Males, like this one shown, have a “V”-shaped row of enlarged pre-anal pores and 2 hemipenal bulges at the base of the tail.

Michele Buono, DVM

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African Fat-tailed Geckos

CAPTIVE HOUSING

- For a single gecko the minimum tank dimensions are 60 x 30 x 40 cm (12 x 24 x 16 inches).
- Good ventilation is necessary; height is not as important.
- Commercial reptile bedding, carpet, newspaper or paper towels can be used as substrate. Sand should be avoided as it may be ingested and cause impaction.
- An appropriate light cycle with a little over 12 hours of “daylight” must be provided. Seasonal changes in the length of daylight may be offered, especially if a breeding program is planned.
- Fat-tailed geckos need a hide box shelter; because they are nocturnal, they need to retreat from bright lights.
- Fat-tails do not require a cage mate, but up to 5 females can be housed in the same cage as 1 male.
- Males should not be housed together because they will fight with the possibility of serious injury or death.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- The daytime temperature gradient should be 29-32°C (85-90°F) but can drop to 24-27°C (75-80°F) at night.
- Under-tank heating is preferred, although a heat lamp (a nocturnal bulb works well) can be used. UV lighting does not appear to be necessary.
- Humidity should be quite high (over 50%) and maintained by misting the enclosure several times a week and providing a shallow water dish at all times. A humidity retreat is also a good idea (e.g., a small container with damp spaghum moss inside).
- Hides, logs, cork bark pieces, rocks, and plants should be provided.

African Fat-tailed Geckos

DIET

- Fat-tailed geckos may be fed primarily crickets and mealworms, although adults may be offered the occasional superworm or waxworm. Pinkie mice may also be provided once a month.
- Prey should be gut-loaded prior to feeding and dusted with a mineral/vitamin supplement containing calcium.
- Adults are fed every 2-3 days; juveniles every 1-2 days.
- The gecko can be fed all it will eat within 15 minutes (or approximately 3-5 crickets). Uneaten crickets should be removed, as they may stress the animal.
- Drinking water should be available in a shallow dish.

RESTRAINT

- Gentle restraint is recommended during an examination, and the whole body must be supported in a hand.
- Excessive pressure on the tail must be avoided.

ANESTHESIA

- A fat-tailed gecko may be placed in a small plastic bag with 5% isoflurane or sevoflorane for 20-30 minutes and then intubated. It is helpful during intubation of a fat-tailed gecko to exteriorly elevate the throat with a finger to better view and stabilize the trachea.
- An injectable protocol for a small lizard has been reported but has not been used by the author: ketamine (30-50 mg/kg IM) or propofol (10 mg/kg IV).

MOST COMMON DISORDERS

- Internal parasites (oxyurids, coccidia and flagellates; clinical signs sometimes suggest cryptosporidia).





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- Shedding problems (related to low humidity and the absence of a humid hidebox; the retained shed is usually associated with extremities, such as the toes and the tail, which may lead to constrictions, necrosis and loss of toes or a portion of the tail. Shed retained around the eyelids may contribute to conjunctivitis.)
- Female reproductive disorders (very common and often related to a husbandry error, such as absence of a suitable nesting place).
- Metabolic bone disease (MBD - it is necessary to feed invertebrates a high quality, balanced diet with a calcium and vitamin D supplement to improve the calcium-to-phosphorus ratio of dietary intake. Clinically, MBD in fat-tailed geckos is expressed as swelling and soft mandibular and maxillary bones and fractures or abnormal anatomy of long bones).
- Substrate impaction

ZOONOTIC POTENTIAL

- *Salmonella*, as with other reptiles.

SPECIAL CONSIDERATIONS

- The fat-tailed gecko is equipped with the natural defense of being able to lose its tail when attacked by a predator. The tail is also where it stores fat, an important energy reserve. The gecko should not be handled by the tail.

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Tegus (*Tupinambis* sp.)

Jennifer M. Periat, DVM

SUBSPECIES

- Argentine black and white tegu, giant tegu and blue tegu (all believed to be *T. merianae*)
- Argentine red tegu (*T. rufescens*)
- Colombian black and white tegu or gold tegu (*T. teguixin*)

ORIGIN/FREE-RANGING HABITAT

- South America, specifically Argentina and Columbia
- Mountain and forest areas of the Amazon basin

SUITABILITY AS PETS

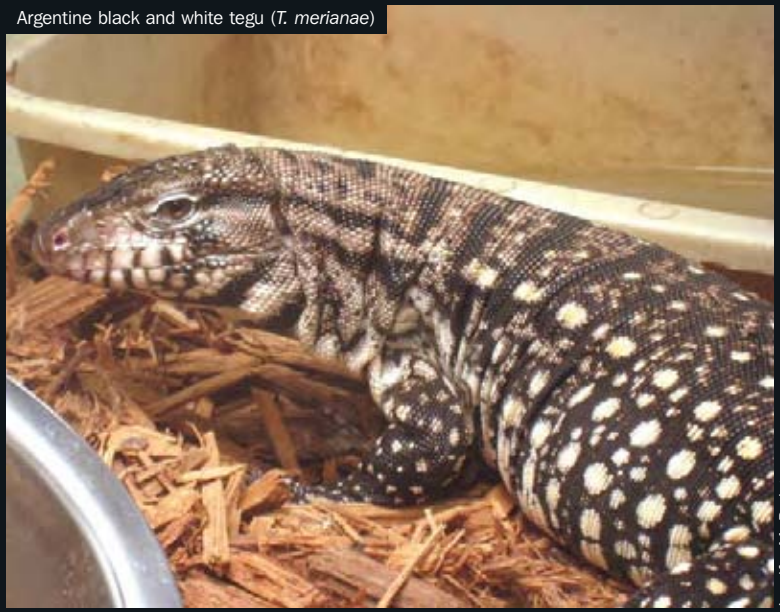
- While not considered a beginning lizard due to the large size and temperament of some species, tegus can be rewarding to keep when properly cared for.

PHYSICAL CHARACTERISTICS

- Tegus are similar in build to monitor lizards.
- Males have much larger heads and jowls as well as an enlarged, thickened scale on either side of the vent.
- Their bodies have unique, smooth scaling.
- The color and pattern vary by species: the Argentine and Colombian black and whites both have a distinct pattern of stripes and dots, which are more distinct in the Argentine species.
- Hatchling Argentine black and white tegus have some green coloration.

Tegu Pet Care

Argentine black and white tegu (*T. merianae*)



Jennifer M. Periat

VITAL STATISTICS

Life span	8-12 years	
Body length	Argentine tegus	up to 4.5 ft (1.4 m) including tail; the red tegu is largest of this species
	Colombian tegu	up to 3 ft (0.9 m), including tail; males are larger than females.

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Argentine red tegu (*T. rufescens*)

Stephanie Beiser



Colombian black and white tegu or gold tegu (*T. teguixin*)

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Tegus

BEHAVIOR

- Tegus are diurnal and terrestrial.
- Colombian tegus are known to be the most aggressive, while the other species tend to be more tame and easier to handle.
- All species can display aggressive feeding behavior.
- It is not recommended to house males together as fighting may occur.
- If given the opportunity, tegus frequently burrow.
- Many tegus will slow down and even hibernate in the winter months.

CAPTIVE HOUSING

- Hatchlings can do well for a short period of time in a 20-gallon (75 L) aquarium; however, they will outgrow this quickly.
- Adults should be housed in a custom-built enclosure that is 6 x 3 x 2 ft (1.8 x 0.9 x 0.6 m); height is less significant.
- Cypress mulch or similar is ideal for substrate so the tegu can burrow and humidity can be maintained (avoid corn cob, gravel and small wood chips due to ingestion risk).
- Fresh water should be available at all times, preferably in a container large enough for soaking.
- A hiding place should be provided on each end of the temperature gradient, and the mulch in the hide should be kept slightly damp.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- The basking spot should be about 110°F (43°C).
- The cooler part should be approximately 75°F (24°C).

Tegus

- Supplemental heat is not generally needed at night.
- UVB lighting is recommended.
- Humidity should be 60-70% to help prevent shedding problems.

ENVIRONMENTAL ENRICHMENT

- Mulch substrate enables the tegu to burrow and dig.
- Hides and logs for climbing provide enrichment and aid in shedding.
- Tegus can be offered feeder insects, which may provide some exercise and enrichment, although larger animals may not be interested in such small food items.

DIET

- Tegus are carnivorous, although some species will also accept fruit (e.g., strawberries, melon, tomatoes, banana) in small amounts.
- Juvenile animals should be offered feeder insects (e.g., crickets, cockroaches, superworms, mealworms) and, once they are large enough, pinky mice.
- Adult animals should be fed appropriately-sized feeder rodents.
- Variety is important; many tegus will accept fish (tilapia, catfish), cooked eggs, supplemented ground turkey and feeder chicks.
- Feeding live rodents is not recommended due to the risk of injury to the tegu.
- Feeding in a separate enclosure is often recommended to reduce aggressive feeding behavior and avoid substrate ingestion.

A tegu hatching



Bobby Hill

Juvenile tegus



Bobby Hill

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Jennifer M. Periat

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Tegus

RESTRAINT

- With docile individuals, minimal restraint with one hand on the neck and shoulders and the other hand supporting the pelvis and hind limbs may be all that is needed.
- More aggressive animals may require towel restraint; the handler must be cautious to avoid being bit, scratched with claws or whipped with the tail.
- Some tegus may require chemical restraint in order for a full physical exam to be performed.

ANESTHESIA

- Baseline blood work is recommended before anesthesia, if possible.
- Premedication: butorphanol (0.5-2.0 mg/kg IM) or buprenorphine (0.005-0.020 mg/kg IM) 20-30 minutes prior to induction.
- Induction may be performed with propofol (5-10 mg/kg IV) or gas (5% isoflurane) using a face mask or induction chamber.
- Tracheal intubation is relatively easy; use a non-cuffed tube and maintain with isoflurane.
- Body temperature may be maintained using a warm air blanket or circulating water blanket.
- Vital parameters, such as respiration and heart rate, should be monitored during anesthesia. A Doppler or pulse oximeter is useful for monitoring heart rate.
- It may be necessary to mechanically breathe for the patient.
- NSAIDs may include meloxicam (0.2 to 0.4 mg/kg q24h PO, IM) or carprofen (1-4 mg/kg q24h PO, IM).

- Other anesthetic protocols are available and can be tailored to best fit the needs of the patient.

MOST COMMON DISORDERS

- Dermatitis/dysecdysis, resulting in lost toes, tail tips and infection
- Cloacal prolapse
- Intestinal parasites
- Ectoparasites
- Nutritional metabolic bone disease
- Dystocia/egg yolk coelomitis

ZOONOTIC POTENTIAL

- *Salmonella, E. coli* and *Camplyobacter* are possible, as with other reptiles.

SPECIAL CONSIDERATIONS

- The ability to house and care for such a large lizard is an important factor to consider before obtaining a tegu.
- Tegus have quite voracious appetites and can be expensive to feed.

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Stephanie Beiser



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Solomon Island Prehensile-tailed Skink Pet Care



Tim Vickers

VITAL STATISTICS

Life span	15-20 years in captivity (avg)	Body weight	8-10 pounds (3.7-4.5 kg)
Body length	28-30 inches (71-76 cm)		

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Solomon Island prehensile-tailed skinks (*Corucia zebrata*)*

*Also known as monkey-tailed skink

Kenneth Harkewicz, VMD

COMMON SUBSPECIES

- The most common of the subspecies is *C. z. zebrata*.
- As of 1997, a second subspecies was described: *C. z. alfredschmidt*.

ORIGIN/FREE-RANGING HABITAT

- Tropical montane rainforests of any of the 10 islands of the Solomon Islands in the South Pacific
- These skinks are almost completely arboreal, residing mainly in strangler fig trees (*Ficus watkinsiana*).

SUITABILITY AS PETS

- A prehensile-tailed skink is better suited for the intermediate to advanced hobbyist.

PHYSICAL CHARACTERISTICS

- The overall color is either black to olive or green-yellow to pale green depending on the locale collected. The body may have transverse stripes.
- The ventrum of the skink is cream to light green in color.
- *C. z. alfredschmidt* have yellow eyes, while the nominate species, *C. z. zebrata*, have olive-green eyes.
- The prehensile tail is typically two times the body length; it holds the skink's body weight as it maneuvers in trees.
- Prehensile-tailed skinks have long, very sharp nails to aid in climbing.

Solomon Island Prehensile-tailed Skinks

BEHAVIOR

- *Corucia zebrata* are generally nocturnal but will bask during the day under heat sources or the sun.
- These skinks are shy by nature and often remain hidden in shelter during the daytime hours.
- If hand-raised and handled frequently, they will often tolerate handling and become unafraid of human activity.
- Fighting may occur if adult males are housed together or if a new individual is introduced into an enclosure.

CAPTIVE HOUSING

- They do best housed individually in an enclosure.
- A captive enclosure should measure at least 4 ft (1.2 m) long by 2 ft (0.6 m) wide by 4 ft (1.2 m) high.
- Circulation of air is important for this species, so at least 2 sides of the enclosure should be partially screened. The screening must be heavy enough to support the skink and allow for free movement.
- A low wattage heat source (50-75 watt depending on the size of the enclosure) is necessary as is a mid-range full spectrum light source.
- Substrate should be one that holds moisture and allows for high humidity. Orchid bark or coconut coir makes a good choice as a substrate.
- A water bowl with 2-4 inches (5-10 cm) fresh water should be available at all times.

ENVIRONMENTAL TEMPERATURE /HUMIDITY

- Daytime temperature should be 82-90°F (27.7-32.2°C).
- Nighttime temperature can drop to 70-75°F (21-24°C).
- Cage relative humidity should be approximately 70-75%.





Olaf Leillinger

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A water bowl should be available at all times.



Hiding places are essential to relieving stress of prehensile-tailed skinks.



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- Humidity may be maintained by spraying the enclosure several times daily or using a commercial humidifier.

ENVIRONMENTAL ENRICHMENT

- Live, nontoxic plants help raise humidity, provide visual barriers and may be consumed by the skinks.
- Pothos, hibiscus, scheffelera and ficus trees or plants make good choices and are all nontoxic if ingested.
- Branches of various diameters are necessary to provide climbing areas for the skinks.
- Artificial “jungle vines” are readily used by the animal.
- A hiding spot, such as a hollow log, can be placed off the floor to provide daytime shelter and a sleeping area.

DIET

- *Corucia zebrata* are primarily herbivorous. They will eat insects and snails but may develop digestive problems or metabolic disorders if these are a large part of the diet.
- The vegetable-to-fruit ratio should be about 80:20. If the skinks are offered too much fruit, they will eat these food items in preference to the more nutritious vegetables.
- Vegetable food items include mustard greens, collard greens, kale, bok choy, endive, turnip greens, spinach, winter and summer squash, carrot (shredded) and cooked sweet potatoes.
- Suggested fruits include apple, pear, plum, kiwi, papaya and peach.
- Pothos plants, grown in the enclosure, are readily eaten.
- Juveniles are fed daily; adults are fed every other day.
- Being nocturnal, food items are best offered at night.
- Noneaten food items should be removed each morning.

Solomon Island Prehensile-tailed Skinks

RESTRAINT

- Prehensile-tailed skinks are large, heavy-bodied animals. Their bite can be quite painful and cause serious injury.
- These skinks may have very sharp long claws with which they may scratch and possibly cause infection. Keeping nails short with a nail clipper or Dremel®-type grinding device helps to prevent injury and infection.
- Prehensile-tailed skinks should not be grasped or restrained by their tail, as this may result in injury.
- Skinks are best held in a soft towel or restrained with heavy gloves to prevent injury to the handler. They should be supported under the abdomen so they feel secure.

ANESTHESIA

- Butorphanol (1.0-1.5 mg/kg SC, IM) may be used to premedicate the skink.
- Propofol (5-10 mg/kg IV) may be used for either induction or short surgical procedures; accessing the tail vein with a butterfly catheter produces best results.
- A tiletamine/zolazepam mixture (3-5 mg/kg SC, IM) may be used for short surgical procedures or induction.
- Prehensile-tailed skinks may be maintained on gas anesthesia once they are intubated with either isofurane (1-3%) or sevoflurane (4-6%). They may also be masked down with either inhalant at a higher percentage flow.
- The animal should be confirmed as fully sedated prior to intubation to prevent a biting injury to the handler. A mouth gag may be fashioned from a plastic hypodermic needle sleeve cut at one end to the proper length.
- The surgical plane of anesthesia may be assessed by a lack of righting response or palprebral reflex.





This prehensile-tailed skink was anesthetized using isoflurane via mask and then intubated.

Kevin Wright, DVM

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MOST COMMON DISORDERS

- Metabolic bone disease (due to a lack of adequate calcium in the diet and/or insufficient exposure to full spectrum UVB light)
- Necrosis of digits or tail tip secondary to a poor shed (The dried retained skin on these body parts acts like a tourniquet, cutting off blood supply to the affected area. A gentle teasing off of the dead skin with a thumb forceps post-shed will help prevent this from occurring. The humidity must be increased to ensure a good shed.)
- Bite wounds and secondary abscessation or infection
- Internal and external parasites
- Dystocia in gravid females (skinks are born live)
- Ingested shed skin (a normal occurrence)
- Yolk sac infections in newborns
- Stomatitis

ZOONOTIC POTENTIAL

- *Salmonella* and *Campylobacter* may be acquired via a fecal/oral route from skinks. Hands must be washed after handling and skinks must be kept away from human food.

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Savannah and white-throated monitor lizards (*Varanus* sp.)

Niklos Weber, DVM, Dipl ABVP-Avian Practice,
Dipl ABVP-Canine and Feline Practice

- Savannah (Bosc's) monitor (*Varanus exanthematicus*)
- White-throated monitor (*Varanus albigularis albigularis*)

SUBSPECIES

- There are a number of subspecies of *Varanus*; exactly how many is controversial. The white-throated monitor was considered a subspecies of the savannah monitor until 1989 when it was identified as a separate species.

ORIGIN/FREE-RANGING HABITAT

- Savannah and white-throated monitors are native to grassland areas of central to southern Africa.
- Savannah monitors live in tropical savannahs that experience seasonal monsoons with periods of drought.
- White-throated monitors live in tropical savannahs, steppes and woodlands. They can be arboreal or terrestrial.

SUITABILITY AS PETS

- Monitor lizards are generally not a good choice for first time reptile keepers.
- Monitors are capable of becoming tame with effort, but grow large and require a correspondingly large habitat.
- If obtained when they are older, they have the potential to be skittish.
- If provoked, monitors may fight aggressively with their claws and tail.

Savannah and White-throated Monitor Lizards Pet Care



George Chernilevsky

VITAL STATISTICS

Life span	up to 10-12 years	
Body weight	white-throated monitors	up to 20 lb (10 kg)
Body length	savannah monitors	up to 2.5-4.0 ft (0.8-1.3 m)
	white-throated monitors	up to 4-6 ft in length (1.3-2.0 m)

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Savannah monitor
(*Varanus exanthematicus*)



White-throated monitor
(*Varanus albigularis albigularis*)



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Savannah and White-throated Monitor Lizards

PHYSICAL CHARACTERISTICS

- Both the savannah and white-throated monitors are typically brown, black and grey with paler spots.
- The stocky savannah monitor is considered a medium-sized monitor with a wide head and short neck and tail.
- Besides being smaller than white-throated monitors, savannah monitors have larger osteoderms, and their nostrils are located closer to the end of the snout.
- The white-throated monitor is large and muscular with a domed head and strong, thick legs and tail. It has very sharp claws on the front legs for digging and climbing, and the tail is somewhat prehensile.

BEHAVIOR

- Monitors are considered to be intelligent reptiles.
- They can be quite aggressive when cornered or if another monitor invades their territory; they are especially aggressive during the spring breeding season.
- Savannah monitors are active during the day and may hide in their burrows if it gets too hot.
- White-throated monitors are active during the day during the wet season (January-February). During the dry season (July-December), they fast due to the lack of prey.

CAPTIVE HOUSING

- Adult monitors should be housed in a large, solidly built enclosure at a minimum size of 4 x 8 x 4 ft (L x W x H) (1.3 x 2.6 x 1.3 m); a room with vertical space is best.
- The enclosure must be secure because monitors can escape easily.
- The floor may be wood, concrete or glass covered with

brown paper, newspaper or paper towels for easy cleaning.

- An area of deep substrate for digging and burrowing must be available; this may consist of soil, cypress mulch or small grade (orchid) bark to reduce dust.
- Monitors need a large shallow water pan for soaking; this will need frequent cleaning as they may defecate in it.
- Supplemental ultraviolet light (UVA/UVB) is recommended.
- Enclosures should include rock features or a hide box for cover and rocks and branches for climbing.

ENVIRONMENTAL TEMPERATURE/HUMIDITY

- The hot end of the cage should be 90-100°F (32-38°C) with a basking spot that exceeds 110°F (43°C); the cool end should be 75-80°F (24-27°C).
- Humidity should be fairly high without being wet: 70-80% with good ventilation is appropriate.

DIET

- Savannah monitors are carnivores and thrive on a rodent diet, although they primarily eat invertebrates in the wild.
- White-throated monitors eat a large number of small reptiles and birds in the wild.
- Young monitors can be fed crickets and pinkies.

RESTRAINT

- Monitors can bite and scratch but are usually calm for typical veterinary procedures. If they move excessively, they can be restrained like an iguana, with the front legs held back along the body and the rear legs along the tail.
- The tail whip of white-throated monitors is the hardest of any monitor, so it is best to restrain the tail.

Enclosures for monitors should include rocks for cover and basking and rocks and branches for climbing.



An area of deep substrate for burrowing must be available.



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An obese savannah monitor with distension of “abdomen” and stoutness of tail base.



Stephen Hernandez-Divers

Monitors use their forked tongues constantly to sense the environment, more so when they are eating.



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ANESTHESIA

- Anesthesia in monitors is similar to that of other reptiles, e.g., premedication with butorphanol, induction with isoflurane or sevoflurane by chamber or mask and maintenance with gas anesthesia via endotracheal tube.
- Reptiles should be housed in their optimal temperature zone during induction, anesthesia and recovery.
- Preoperative blood work should be performed and IV or intraosseous fluids given during anesthesia.
- Intermittent positive pressure ventilation should be performed 4-6 times/min at a pressure below 12 cm H_2O.

MOST COMMON DISORDERS

- Parasites (especially wild-caught monitors)
- Obesity (monitors eat voraciously when food is available)
- Gastrointestinal foreign bodies
- Trauma
- Metabolic bone disease
- Respiratory infections

ZOONOTIC POTENTIAL

- *Salmonella*, as with any reptile.

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Leopard tortoises (*Geochelone pardalis*)

Jennifer Mosier, DVM

ORIGIN / FREE-RANGING HABITAT

- Arid grassland savannahs of Africa from the Sudan south to the Cape Province of South Africa

SUITABILITY AS PETS

- Wild-caught leopard tortoises suffer from stress and many diseases; therefore, captive-bred animals are best.
- It is a generally docile species and breeds well in captivity.

PHYSICAL CHARACTERISTICS

- The leopard tortoise is large and uniquely marked, with primarily a yellow carapace and high contrast black markings.
- The carapace is relatively highly domed, with a height usually greater than half its width.

SEXING AND REPRODUCTION

- Free-ranging leopard tortoises are not sexually mature until 12-15 years of age, although captive-raised individuals may mature by age 6.
- Males have a longer and thicker tail than females.
- Mature adult females have more elongated rear claws than males.
- The female lays a clutch of 5-18 eggs.

BEHAVIOR

- Leopard tortoises are solitary animals in the wild; therefore, they can be aggressive if housing is overcrowded or

Leopard Tortoise Pet Care



Chris Eason

VITAL STATISTICS

Life span	up to 100 years
Body weight	18 kg (40 lb)
Body length	40-50 cm (16-18 inches) (avg); up to 81 cm (32 inches)

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Muhammad Mahdi Karim



Leopard tortoises can be aggressive if housing is overcrowded. Males should be housed separately.

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there is a limited food supply or a large difference in size among individuals housed together.

- This terrestrial tortoise typically spends time divided between roaming and grazing and burrowing.
- It does not hibernate in the wild.

CAPTIVE HOUSING

- Outdoor pens are strongly recommended if possible. Pens need to be predator proof and provide shelter and shade. The perimeter must be buried deep enough to prevent digging out underneath.
- Indoor habitats should be a minimum of 120 cm x 240 cm (4 x 8 feet) for a single adult. The combined carapace area for all individuals in the enclosure should not be more than 25% of the enclosure's area.
- Males should not be housed together because of their tendency to spar for territory and breeding rights.
- Food, water and nesting containers should be sunken flush with the bottom of the enclosure to allow access.
- The ideal substrate is grass hay. Sand may be used, but sand impactions from ingestion are a risk. Soil and mulch may retain moisture and are not recommended.
- Large spaces with planted grasses are necessary for natural grazing, and arid grassy areas with dry sandy spaces for basking are required.
- Sunken ponds that are large enough to allow soaking but shallow enough to prevent drowning are needed.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Recommended daytime temperatures are 28-30°C (82-86°F) with a basking area of 32°C (90°F); nighttime temperatures are 24°C (75°F).

Leopard Tortoises

- Low humidity (40-70%) is important for respiratory health.
- A UVB source is necessary for vitamin D_3 synthesis.

DIET

- Leopard tortoises are herbivorous. The diet should consist of high-fiber, low-protein and high-calcium sources, which may be obtained with a variety of grasses including dandelions and succulents (planted live grasses are preferred over cut purchased grasses).
- Plants high in oxalates should be limited.
- Fruit should be avoided.
- Small amounts of leafy greens, sliced carrots, cucumbers, pumpkin and squash may be offered twice weekly.
- Formulated diets (e.g., Mazuri Tortoise Diet, www.mazuri.com) may be used. Rabbit pellets may be fed if necessary, but dog or cat kibble should be avoided due to the high levels of protein.
- Adults are fed 2-3 times per week, hatchlings fed daily.

RESTRAINT

- An individual may be held by its shell in the middle of the body.
- The head and front limbs may often be exteriorized by pressing the hind limbs into the shell; the hind limbs may be exteriorized by pressing the front legs inside.
- If the tortoise is uncooperative, chemical restraint may be necessary for an examination and diagnostic sampling.

ANESTHESIA

- Butorphanol (IM) may be used for premedication.
- Analgesia may be achieved with butorphanol, buprenorphine and/or ketoprofen, but more information is needed.



Free-ranging leopard tortoises spend most of their time roaming and foraging.

Ryan Harvey



Juvenile leopard tortoise

Stephen J. Hernandez-Divers

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Charles J. Innis, VMD



Charles J. Innis, VMD

A normal (top) and a "pyramided" (bottom) tortoise.

- Induction with propofol is preferred when IV access is available.
- A combination of ketamine, medetomidine and butorphanol IM can also be used.
- Chamber or mask induction with inhalants is not recommended due to their prolonged breath holding.
- Maintenance may be accomplished via inhalants after endotracheal intubation with an uncuffed tube. Take care to intubate the bronchus, as they have a short trachea.

MOST COMMON DISORDERS

- Pyramiding of carapace (metabolic bone disease)
- Diarrhea (secondary to improper diet)
- Muscle atrophy and joint problems due to lack of exercise
- Runny nose syndrome (from high humidity)
- Aural abscess
- Internal parasites
- Chronic eye infections (hypovitaminosis A)
- Shell rot
- Trauma

ZOONOTIC POTENTIAL

- *Salmonella*, as with other reptiles.

REFERENCES AND FURTHER READING

1. Mader D (ed): Reptile Medicine and Surgery 2nd ed. Saunders Elsevier, 2006.
2. McArthur S, Wilkinson R, Meyer J: Medicine and Surgery of Tortoises and Turtles. Blackwell Publishing, 2004.
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Hermann's tortoises (*Testudo hermanni*)

Jennifer Mosier, DVM

COMMON SUBSPECIES

- Western Hermann's tortoise (*T. h. hermanni*)
- Eastern Hermann's tortoise (*T. h. boettgeri*)

ORIGIN / FREE-RANGING HABITAT

- *T. h. hermanni* is found in eastern Spain, southern France, the Baleares Islands, Sardinia, Corsica and Tuscany
- *T. h. boettgeri* is found in Croatia, Romania, Macedonia, Bulgaria, Albania and Greece
- Mediterranean oak forest with arid, rocky hill slopes and scrubby vegetation

PHYSICAL CHARACTERISTICS (WESTERN)

- Highly arched shell with intense yellow coloration against a dark background.
- Underside has 2 connected black bands along the central seam.
- Coloration of head is olive/yellow with dark patches. Most have a characteristic yellow fleck on the cheek.
- Tail in males is larger than in females and has a spike.

PHYSICAL CHARACTERISTICS (EASTERN)

- Most have an arched, rounded carapace.
- Underside almost always solid in color with separate, isolated black patches on either side of central seam.
- Head is brown to black with fine scales.
- Limbs have 5 claws, which are darkly colored at the base.

Hermann's Tortoise Pet Care



Richard Mayer

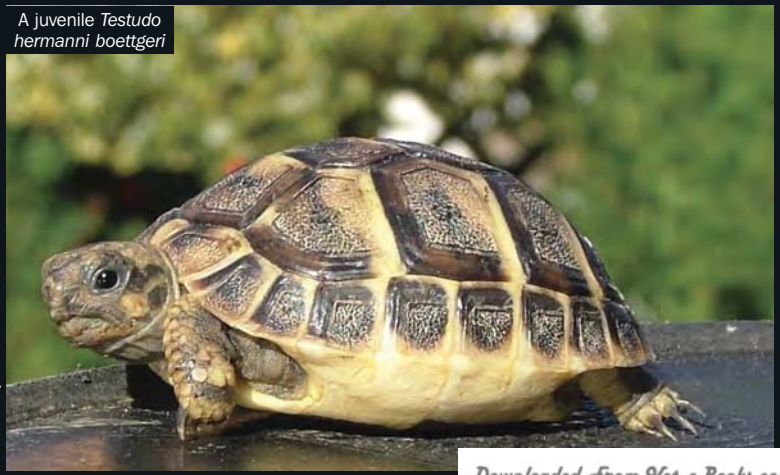
VITAL STATISTICS

Life span	70-100 years	
Body weight		
	Western:	2-5 lb (1-2 kg)
	Eastern:	7-9 lb (3-4 kg)
Body size	Western:	3-7 inches (7-18 cm)
	Eastern:	up to 11 inches (28 cm)

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Testudo hermanni hermanni *Testudo hermanni boettgeri*





A juvenile *Testudo hermanni boettgeri*

Richard Mayer

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Hermann's Tortoises

- Hindlegs are noticeably thicker than forelegs.
- Females have much smaller tail spikes than males.

BEHAVIOR

- Most active in the early morning and late afternoon.
- Males will fight with each other and should not be housed together.
- Ideal group consists of 1 male with 2-3 females of similar size.
- Generally docile, but can be aggressive towards significantly smaller individuals.
- Free-ranging tortoises hibernate; individuals dig a shelter and sleep for 4-5 months.

CAPTIVE HOUSING

- Outdoor housing is preferred, if possible.
- Must have shelter available, and at least part of pen should be placed in a very sunny area.
- Shelter should be made of wood to keep humidity low.
- Dirt/soil is the best substrate to allow burrowing and temperature regulation.
- Indoor housing must be large enough to allow roaming.
- UVA and UVB lighting are essential and should be checked regularly to maintain UVB levels.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Daytime temperature: 80-86°F (27-30°C)
- Basking temperature: 90-95°F (32-35°C)
- Nighttime temperature: 65-70°F (18-21°C)
- Hibernation temperature should be maintained around 50°F (5°C) and not permitted to fall below zero.

Hermann's Tortoises

DIET

- Hermann's tortoises are herbivores. A variety of mixed leafy greens/grasses should be the majority of the diet.
- They need a high-fiber, low-protein and calcium-rich diet.
- Fruits should be given only in very small amounts, as they are high in sugar and can cause digestive problems.
- High-protein diets (e.g., dog food) can lead to renal failure or urinary bladder stones.
- Adding a calcium and vitamin D_3 supplement can be beneficial: daily for young; weekly for adults.

RESTRAINT

- Most individuals will retract their head within the carapace when handled. In order to examine the head, you can try pushing the hind limbs into the inguinal fossa, tipping the tortoise downward, or using sedation.

ANESTHESIA

- Local anesthesia: bupivicane (1-2 mg/kg)
- Premedicate with butorphanol (2 mg/kg SC/IM)
- NSAIDs: ketoprofen (2 mg/kg SC/IM q24h); carprofen (2-4 mg/kg q24h PO/SC/IM); meloxicam (0.2 mg/kg q24h PO/IM)
- Induction: Telazol (2-6 mg/kg IM); DKT IM: ketamine (4-10 mg/kg) + butorphanol (0.5-1.0 mg/kg) + Domitor (40-150 mcg/kg); propofol (3-5 mg/kg IV)
- Maintenance: propofol CRI (0.3-0.5 mg/kg IV)
- Endotracheal intubation is relatively easy; glottis located at the base of the tongue. An uncuffed tube is used.
- Surgical plane of anesthesia: righting reflex absent, palpebral absent, corneal reflex present



A female Hermann's tortoise with eggs.

Richard Mayer



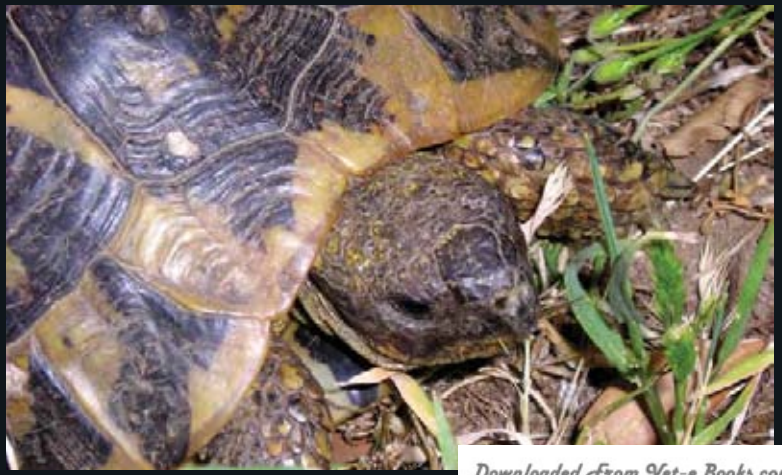
A *T. hermanni* hatchling emerges from an egg.

Berthold Werner

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Massimo Lazzari



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Hermann's Tortoises

MOST COMMON DISORDERS

- Upper respiratory infections
- Pneumonia
- Stomatitis
- Osteodystrophy
- Diarrhea (ascarids common)
- Aural abscesses

ZOONOTIC POTENTIAL

- *Salmonella*
- *Campylobacter*
- *Zygomycoses*

SPECIAL CONSIDERATIONS

- Considered a beginner turtle.
- SC route of administration of drugs is not as reliable or predictable as IM or IV.
- IM injections should be in front limbs.
- IV access: ventral coccygeal vein or jugular vein.
- Listed as Near Threatened IUCN classification.
- Care should be used when mixing species of tortoises (e.g., Western and Eastern Hermann's tortoises) in the same enclosure due to transmission of parasites.

REFERENCES AND FURTHER READING

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Horsfield's (Russian) tortoises (*Testudo horsfieldii*)

Jennifer Mosier, DVM

COMMON SUBSPECIES (DEBATED)

- *T. h. horsfieldii*
- *T. h. kazachstanica*
- *T. h. rustamovi*

ORIGIN / FREE-RANGING HABITAT

- Afghanistan to northwestern China
- Dry areas with sparse vegetation

SUITABILITY AS PETS

- A generally hardy species.
- Its small size makes it a reasonable choice for captivity.

PHYSICAL CHARACTERISTICS

- The shell is generally greenish-brown to black, fading to yellow between the scutes with a yellowish-brown body.
- They have highly developed claws and 4 toes on each foot.
- The carapace is rounded and "stocky."
- This is a sexually dimorphic species: females are slightly larger and have flared scutes on their shells; males have a longer tail, which is usually tucked to the side, and smooth scutes.

BEHAVIOR

- They are avid burrowers, decent climbers and persistent escapers.
- In the wild, they hibernate in the winter months.

Horsfield's Tortoise Pet Care



Richard Mayer

VITAL STATISTICS

Life span	50-100 years
Body size	5-8 inches (12-20 cm)
Sexual maturity	10 years
Breeding season	spring

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Horsfield's Tortoises

- Russian tortoises generally do not mix well with other species of tortoise.
- Males can be highly aggressive and should be housed separately to prevent fighting, especially during the spring.

CAPTIVE HOUSING

- Outside housing is best if temperatures allow.
- If temperatures fall below 40°F (4°C), they should be housed indoors.
- Enclosure walls need to be at least 12 inches (30 cm) below ground and at least 12 inches (30 cm) above ground to prevent escape.
- Lighting must provide UVA and UVB.
- Substrates range from soil to newspaper and wood shavings and should be deep enough to allow for normal burrowing behavior.
- Hide spots and cover from sun need to be available.
- A low pan should be available for soaking and drinking.
- Outdoor pens in areas of high rainfall must ensure proper drainage of the enclosure.
- Glass is not ideal for tortoise enclosures. The animal is stressed and may be injured by attempting to go through it repeatedly. Also glass tends to increase humidity too high as well as limit air circulation.
- A 50-gallon opaque Rubbermaid™ storage container is inexpensive, easy to clean and an adequate size for 1 tortoise.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Daytime temperatures should be 70-80°F (21-27°C) with a basking area of 85°F (30°C).

Horsfield's Tortoises

- Nighttime temperatures can be 65-75°F (18-24°C).
- Humidity must be kept relatively low (no higher than 70%).

DIET

- Horsfield's tortoises are herbivores. A variety of mixed leafy greens/grasses should be the majority of the diet.
- They need a high-fiber, low-protein and calcium-rich diet.
- Fruits should be given only in very small amounts, as they are high in sugar and can cause digestive problems.
- High-protein diets (e.g., dog food) can lead to renal failure or urinary bladder stones.

RESTRAINT

- Most individuals will retract their head within the carapace when handled. In order to examine the head, you can try pushing the hind limbs into the inguinal fossa, tipping the tortoise downward or using sedation.

ANESTHESIA

- Local anesthesia: bupivicane (1-2 mg/kg)
- Premedicate with butorphanol (2 mg/kg SC/IM)
- NSAIDs: ketoprofen (2 mg/kg SC/IM q24h); carprofen (2-4 mg/kg q24h PO/SC/IM); meloxicam (0.2 mg/kg q24h PO/IM)
- Induction: Telazol (2-6 mg/kg IM); DKT IM = ketamine (4-10 mg/kg) + butorphanol (0.5-1.0 mg/kg) + Domitor (40-150 mcg/kg)
- Propofol (3-5 mg/kg IV)
- Maintenance: propofol CRI (0.3-0.5 mg/kg IV)
- Endotracheal intubation is relatively easy; the glottis is located at the base of the tongue. Use uncuffed tube.

Testudo horsfieldii rustamovi



Massimo Lazzari

A Horsfield's tortoise burrowing in wood chips.



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A Horsfield's tortoise with spurs.





Massimo Lazzari

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Horsfield's Tortoises

- Surgical plane of anesthesia: righting reflex absent, palpebral absent, corneal reflex present

MOST COMMON DISORDERS

- Metabolic bone disease
- Pneumonia
- Renal failure
- Bladder stones
- Eye infections
- *Hexamita parva* (renal/urinary parasite)

ZOONOTIC POTENTIAL

- *Salmonella*
- *Campylobacter*
- Zygomycoses

SPECIAL CONSIDERATIONS

- Healthy adults benefit from hibernation during the winter.
- SC route of administration of drugs is not as reliable or predictable as IM or IV.
- IM injections should be in front limbs.
- IV access: ventral coccygeal vein or jugular vein.

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Spiny softshell turtles (*Apalone spinifera*)

formerly *Trionyx spiniferus*

Filipe Martinho, DVM

SUBSPECIES

- Seven recognized subspecies, distinguished primarily by geography, not physical appearance: Gulf Coast (*A. s. aspera*), black (*A. s. ater*), Texas (*A. s. emoryi*), Guadalupe (*A. s. guadalupensis*), western (*A. s. hartwegi*), pallid (*A. s. pallida*) and eastern (*A. s. spinifera*)

ORIGIN / FREE-RANGING HABITAT

- Midwestern and southeastern United States, southern Canada and northeastern Mexico with isolated populations in the southwestern United States.
- Spiny softshell turtles are found in slow-moving rivers and lakes. Their numbers are threatened by pollution, shoreline development and over-harvesting.

SUITABILITY AS PETS

- Softshell turtles' large size, particular husbandry requirements and aggressive behavior would exclude it from most pet owners.
- These turtles can inflict scratches and a painful bite in self defense.

PHYSICAL CHARACTERISTICS

- Softshell turtles have flat, round shells that lack bony scutes and are covered with thick leathery skin.
- The marginal scutes are absent or strongly reduced,

Spiny Softshell Turtle Pet Care



VITAL STATISTICS

Life span	up to 50 years in captivity
Body length	12-45 cm (5-18 inches) in carapace length Males are smaller than females.

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allowing some flexibility of shell edges. The plastron is cartilaginous or partly ossified. These adaptations allow them to swim and move at increased speed.

- The head is narrow with a long snout with the nostrils opening at its end. The neck is rather long but can be completely withdrawn into the shell.
- The feet are broadly webbed and paddle-like, and only the three inner digits have nails.
- The front edge of the spiny softshell turtle is usually covered with tubercles.
- The overall color of the shell is olive or grayish-brown with darker spots and a cream border. The plastron is usually much lighter colored and unmarked.

SEXING AND REPRODUCTION

- Males have longer and thicker tails. The coloring is more contrasting, and the shell has a rougher texture. The shell of females is smoother with blotches rather than spots.
- Mating takes place underwater, and females can lay 1-2 clutches of 4-30 eggs in sand during the spring with eclosion taking place in late summer or autumn.

BEHAVIOR

- Spiny softshell turtles are an aquatic species and spend a lot of time underwater, usually buried in the mud/sand.
- They are very fast swimmers and are agile on land.
- They bask along the water edges or on top of logs.
- In shallow water they can extend their necks to the water surface for breathing, but softshell turtles are also capable of some gas exchange at the pharyngeal and cloacal mucosa, allowing them to extract oxygen from

water and stay underwater for extended periods.
- The northern populations are active from April to September but the southern ones are active year-round.

HOUSING

- Because of their aggressive behavior, spiny softshell turtles should be housed alone in large aquariums. Extra space is necessary if housed as breeding pairs.
- This species is highly aquatic and should be housed in a large aquarium (100-200 L [26-53 gal] tank for one adult) with a small terrestrial area for basking (a piece of cork bark or a large log or tree root will do nicely).
- A water depth of 20-30 cm (8-12 inches) is adequate.
- Water quality is very important. The water should be changed frequently to remove food remnants and other waste, and pH should be kept slightly acid (6.0-6.5).
- This enclosure should be maintained as a freshwater aquarium with appropriate filtering system.
- Water temperature should be 22-27°C (72-80°F).
- The bottom of the tank can be barren, but ideally there should be a 2-5 cm (0.8-2.0 inches) layer of fine sand so the animals can bury themselves in the substrate.
- The basking area should allow the turtle to get completely out of the water and be exposed both to ultraviolet (UVB) and incandescent lighting.
- Aquarium plants can be used as decorative items but they can be easily uprooted or eaten by some animals.

DIET

- Their natural diet, which is mainly carnivorous, consists of invertebrates (e.g., earthworms, snails, crustaceans,



Filipe Martinho, DVM



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insects), fish, amphibians and their larvae and occasionally, plant matter.

- Usually, softshell turtles are eager eaters and readily take pelleted food, minces of raw meat and fish, snails, minnows and other small fish, shrimp, earthworms and almost any animal prey that they can swallow.
- Pelleted food will not foul the water as quickly as other food items, and live prey, especially wild-caught fish and snails, can transmit some pathogens to the turtle.
- The diet should be supplemented with daily calcium and weekly vitamins.

RESTRAINT

- Although most chelonian species are gentle and don't pose many difficulties in handling and restraint, softshells, especially adult individuals, are more aggressive and frequently bite when handled. In these cases, they should be handled by the lateral or caudal margins of the shell. Even when handled this way, some turtles can stretch their long necks and bite a distracted handler.

ANESTHESIA

- In the author's experience, the best anesthetic protocol is propofol (10-14 mg/kg IV) given alone or followed by endotracheal intubation and isoflurane. Even when propofol is used alone, because of the induced apnea, all individuals should be intubated and maintained under oxygen and assisted ventilation (2-4 breaths/minute).
- A number of different tranquilizers and other injectable anesthetics have been used in reptiles, but their effects are usually erratic and tend to prolong anesthetic recovery.

MOST COMMON DISORDERS

- Spiny softshell turtles can suffer from the same health problems that afflict other chelonian species, e.g., malnutrition, metabolic bone disease and bacterial infections.
- Because of their aggressive behavior, it is common to see bite wounds and other trauma in individuals kept in pairs or small groups.
- Softshell turtles are very prone to skin trauma and infections, which frequently develop into deeper or systemic infections. These conditions arise as a result of a number of predisposing factors, such as improper husbandry (low water temperature, high pH, poor water quality, abrasive sand or substrate) and malnutrition.

ZOONOTIC POTENTIAL

- Aquatic turtles have been associated mostly with transmission of *Salmonella* spp. and other enteric bacteria.
- Other pathogens that can be transmitted are *Aeromonas* spp., *Campylobacter* spp. and *Mycobacterium* spp.
- Good husbandry and nutrition and appropriate hygiene measures after handling turtles and their enclosures make transmission highly improbable.

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Milk Snake Pet Care



Edward J. Wozniak, DVM, PhD

Common milk snake subspecies include the Mexican milk snake (*L. t. annulata*).

VITAL STATISTICS

Life span	15 years (avg), up to 30 years
Body weight	up to 1.8 kg (4 lb))
Body length	35-135 cm (13-53 inches)

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Milk snakes (*Lampropeltis triangulum*)

Filipe Martinho, DVM

COMMON SUBSPECIES

- There are 25 subspecies; some have a strikingly different appearance.

ORIGIN / FREE-RANGING HABITAT

- Southeastern Canada to Ecuador
- Milk snakes can be found in a variety of habitats, ranging from temperate to tropical forests, prairies, semi-deserts, mountains to farmland and suburban areas, from sea level to around 2740 m.
- Milk snakes get their name because they were often found in barnyards and were erroneously accused of drinking milk from cows.

SUITABILITY AS PETS

- Milk snakes are considered a “beginner’s snake” because they are fairly docile and nonvenomous.

PHYSICAL CHARACTERISTICS

- Milk snakes have 3 pattern types: tri-colored rings of white/yellow, black and red/orange; light tan, gray with dark red/brown dorsal and lateral spots; and all black. The black milk snake (*L. t. gaigeae*) starts out tri-colored but loses its pattern after 1-2 years.
- Many natural variations of pattern and color have been produced in captivity.
- The color pattern of certain milk snakes can be distinguished from the venomous coral snake (*Micrurus*

spp.) by a slightly different pattern: in milk snakes, red bands are bordered by black bands while in coral snakes, red bands are bordered by white ones.

SEXING AND REPRODUCTION

- Males usually have longer tails with a thicker base than females, but the best method of sexing them is by cloacal probing (males have 7-10 ventral scales and females have 1-2).
- Mating takes place in the spring, and a clutch of 2-17 eggs is laid in June-July.

BEHAVIOR

- Milk snakes are nocturnal and will hide during the day.
- Milk snakes should be housed individually because they may engage in cannibalistic behavior.

CAPTIVE HOUSING

- With the exception of lids to prevent escape and individual housing, milk snakes require quite simple conditions in captivity.
- The size of the terrarium should be proportionate to the length of the snake; while hatchlings can be housed in a 40 L (10.5 gal) capacity terrarium, adults should have a 120 L (32 gal) capacity enclosure.
- As substrate, it is possible to use paper towels (the simplest and most hygienic option), Astroturf® carpets, clean and dried sand, untinted aspen shavings (cedar and redwood are toxic) or sterile potting soil. Substrate should be changed every 6 months.
- Rocks, logs, pieces of bark and safe nontoxic materials are necessary for hiding and aiding in skin shedding.

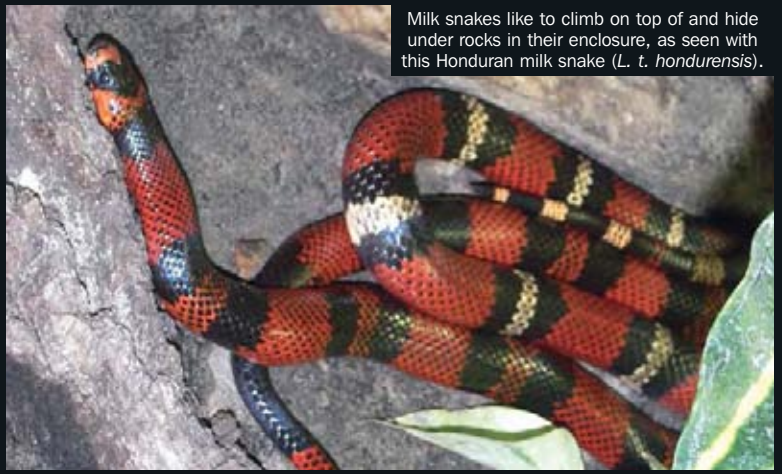


Common milk snake subspecies include the Sinaloan milk snake (*L. t. sinaloae*).



Common milk snake subspecies include the Eastern milk snake (*L. t. triangulum*)

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Milk snakes like to climb on top of and hide under rocks in their enclosure, as seen with this Honduran milk snake (*L. t. hondurensis*).



Common milk snake subspecies include the Campbell's milk snake (*L. t. campbelli*).

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ENVIRONMENTAL TEMPERATURE / HUMIDITY

- The temperature should range between 25-30°C (77-86°F). A hot spot of around 38-40°C (100-104°F) under a heat lamp should be turned off at night. Under-the-tank heating pads or cables can be safely used for maintaining temperature.
- Milk snakes should be housed in fairly dry environments.
- As with all reptiles maintained in captivity, milk snakes require unfiltered UVB light exposure.

DIET

- Milk snakes eat primarily other snakes and reptiles and their eggs, small mammals and birds and, occasionally, insects and earthworms.
- Captive-bred milk snakes readily accept appropriately sized mice, which should be presented dead to avoid bite trauma from prey.
- Earthworms and small lizards may also be offered.
- Usually there is no need to supplement the snake's diet with calcium or vitamins because they ingest whole prey. Nevertheless, it is a good idea to offer an adequate diet to prey animals or gut-load them.
- The water bowl should be changed daily.

RESTRAINT

- Milk snakes are usually quite docile and don't mind being handled, although some individuals may defecate when manipulated.
- As with all snakes, the head should be grasped with one hand to prevent biting, while the other hand supports the rest of the body.

ANESTHESIA

- In the author's experience, the best anesthetic protocol is propofol (10 mg/kg IV) given alone or followed by endotracheal intubation and isoflurane.
- Even when propofol is used alone, because of the induced apnea, all individuals should be intubated and maintained under oxygen and assisted ventilation (2-4 breaths/minute).
- A number of different tranquilizers and other injectable anesthetics have been used in reptiles, but their effects are erratic and tend to prolong anesthetic recovery.

MOST COMMON DISORDERS

- Dysecdysis
- Dystocia
- Ecto- and endoparasites
- Bacterial infections
- Fungal and/or bacterial dermatitis, which can progress to deeper infections or sepsis

ZOONOTIC POTENTIAL

- Snakes have been associated mostly with transmission of *Salmonella* spp. and other enteric bacteria to man, but also *Cryptosporidium* spp. and some pentastomids.
- May act as reservoir host for Western Equine Encephalitis.

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This Nelson's milk snake (*L. t. nelsoni*) is considered an albino milk snake.



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Green Tree Python Pet Care



A 4-year-old, 950-g male from the lineage of Sorong/Papua New Guinea/Dallas Zoo

Jeffrey S. Stillie

VITAL STATISTICS

Life span	10-20+ years
Body size	4-6 feet (1.2-1.8 m) (avg)
Body weight	
Male	900-1200 g (avg) (2.0-2.5 lb)
Female	1000-2000 g (avg) (2.2-4.4 lb)

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Green tree pythons (*Morelia viridis*)

Jeffrey S. Stillie, DVM

- Also known as chondro (for former genus *Chondropython*)

ORIGIN / FREE-RANGING HABITAT

- New Guinea, Indonesia and Australia
- Rainforest; primarily arboreal but can be occasionally found prowling the forest floor at night

PHYSICAL CHARACTERISTICS

- Adults are usually green, but many individuals will exhibit varying degrees of blue, yellow, white and black.
- All hatchlings are yellow or red but undergo a phenomenal ontogenic color change between 6-12 months of age.
- Have broad heads with heat-seeking labial pits.
- Streamlined bodies compliment the arboreal nature.
- Very long teeth
- Prehensile tails
- Females are generally larger than males.
- Males generally have more developed spurs and produce sperm plugs. Males probe deeper than females.
- Sex deterimination by probe depth: male 9-10; female 2

BEHAVIOR

- Nocturnal; generally sit coiled on a branch during the day.
- Often quite docile with routine handling.
- Solitary: males may combat during the breeding season and inflict serious wounds on one another.
- Caudal luring (using tail to attract prey)

Green Tree Pythons

CAPTIVE HOUSING

- Vertical space is necessary due to arboreal nature, but horizontal space is essential for exercise and maintaining an appropriate thermal gradient.
- House individually in a well-ventilated enclosure that can hold adequate humidity.
- Minimum cage size for an adult male: 24 x 24 x 24 inches (61 x 61 x 61 cm); adult female: 36 x 24 x 24 inches (91 x 61 x 61 cm)
- Hatchlings adapt better / feed sooner if kept in smaller enclosures.
- Full-spectrum lighting with a 12-hour photoperiod is recommended.
- Basking area at one end of enclosure is necessary to achieve thermal gradient (accomplished with heat panel, ceramic heat emitter or nocturnal reptile light).
- Newspaper is a good overall substrate because it is sanitary, readily available, easy to clean and can collect fecal specimens. Drawbacks include its decreased ability to hold humidity (requires more frequent misting), and the newspaper ink may discolor the specimen.
- Cypress mulch holds humidity well and is not prone to molding if it is properly aerated; it can aid in ecdysis and is aesthetically pleasing. (In its natural environment, the green tree python, as with other snakes, will inadvertently ingest foreign material, which normally passes the gastrointestinal tract without complication. However, care should be taken when feeding, as this could be a potential foreign body if ingested.)
- A large water dish should be included in enclosure.
- Mist 1-2 times daily depending on ventilation.



An unsexed, 10-month-old, red neonate that has yet to start its ontogenic color change.

Jeffrey S. Stillie



An unsexed, 11-month-old, yellow neonate that is starting its ontogenic color change.

Jeffrey S. Stillie

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Green tree python eggs nearing their hatch date. The dimpling is visible on some of the eggs. Red baby pipping on day 52 post lay.



Jeffrey S. Stillie

Green tree python eating a rodent.



Jens Raschendorf

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ENVIRONMENTAL TEMPERATURE / HUMIDITY

- A thermal gradient of 75-90°F (24-32°C) should be maintained, although most individuals prefer temperatures of 81-85°F (27-29°C).
- Humidity >60% (good ventilation must be ensured).

ENVIRONMENTAL ENRICHMENT

- Numerous well-secured, removable, horizontal perches (wood or PVC) should be provided; size should vary, but correlate with the largest diameter of the snake's body.
- Silk or live plants (e.g., pothos) provide a sense of security, aid in ecdysis, plus help maintain humidity.

DIET

- Free-ranging specimens consume frogs, lizards, birds and rodents.
- Captive specimens thrive on frozen/thawed or fresh/killed rodents. (Live prey items may bite or injure snake.)
- Food items should be offered with 12-inch (30 cm) or longer hemostats.
- Neonates should be fed every 5-7 days.
- Adults should be fed every 7-10 days.
- Seasonal anorexia in males may persist for 6+ months.
- Some individuals drink from a water dish while others prefer drinking the water droplets that accumulate on their body post-misting.

RESTRAINT

- Minimal restraint is recommended with docile specimens.
- Aggressive pythons may be grasped with a firm but gentle hand at the base of the neck, while supporting the body

with the opposite hand.

- Green tree pythons may be difficult to remove from a resting perch and may become agitated or injured with forceful removal. Easily removable perches facilitate extraction from enclosure, allowing minimal disturbance to the snake, as both perch and snake are removed from the enclosure in a single motion.

ANESTHESIA

- Prior to anesthesia: evaluate vital parameters for baseline (heart rate, respiratory rate); assess fluid, nutritional and thermal status; perform preanesthetic blood profile (PCV/total solids easily performed in-house), if possible.
- Premedications ease induction and are likely to provide analgesic properties: butorphanol (1-4 mg/kg IM) or buprenorphine (0.005-0.01 mg/kg IM).
- Premedication is recommended 20-30 minutes prior to induction.
- Induce with inhalant agent: isoflurane (5%) + oxygen via face mask or induction chamber.
- Alternatively, induce with injectable: propofol (3-5 mg/kg IV) in ventral tail vein.
- Maintenance of inhalation anesthesia using a precision vaporizer allows for better control of anesthetic depth: isoflurane/oxygen via uncuffed endotracheal tube; nonrebreathing system (O_2 flow rate 300-500 ml/kg/min); intermittent positive pressure ventilation (IPPV): 4-6 breaths per minute; manual or mechanical ventilator; pressure <12 cm H_20.
- Maintain temperature with circulating warm water blanket, warm air blanket or heating pad (with caution to





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Frank Wouters

guard against thermal burns).
- Hypercapnia stimulates increased respiration.
- When anesthesia is discontinued, let snake breathe room air, and decrease frequency of IPPV to hasten recovery.

MOST COMMON DISORDERS

- Dysecdysis (difficulty in or failure to shed)
- Internal/external parasites (especially imported animals)
- Respiratory infections
- Cloacal prolapse
- Vertebral kinks secondary to inappropriate handling
- Dystocia

ZOONOTIC POTENTIAL

- *Salmonella* (as per any reptile)
- Pentastomiasis

SPECIAL CONSIDERATIONS

- Green tree pythons can inflict serious bites.
- They are highly alert at night; may instinctively strike.
- Do not sex neonates less than 1 year of age by probing or attempt manual popping of hemipenes as it may result in vertebral kinking and probe-induced injury to the snake's delicate anatomy.

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Oriental fire-belly toads (*Bombina orientalis*)

Filipe Martinho, DVM

ORIGIN / FREE-RANGING HABITAT

- Eastern China, North and South Korea, southeastern Russia
- In its natural home range, it is a common species with diurnal and semi-aquatic habits, inhabiting slow-moving or still waters surrounded by forests or moors.

SUITABILITY AS PETS

- Fire-belly toads are one of the most common anurans kept in captivity worldwide because of their small size, interesting behavior and simple husbandry.
- Oriental fire-belly toads are quite hardy.
- They are often called the “beginner’s amphibian.”

PHYSICAL CHARACTERISTICS

- The ventral region is bright red (hence the common name) with dark blotches and white spots, and the dorsum is brown or bright green, depending on the population, with darker blotches and numerous small tubercles.
- Males are usually smaller than females, have small skin tubercles on the first and second digits of the front legs (used to grasp the female during courtship), and are the only ones that vocalize (resembling a short pipping sound).
- The pupil is vertical or heart-shaped.
- Only the hind feet are webbed.

Oriental Fire-belly Toad Pet Care



VITAL STATISTICS

Life span	14 years (avg), up to 20 years
Body weight	28-56 g (1-2 oz)
Body size	1.5-2.3 inches (4-6 cm) snout to vent
Sexual maturity	5 years

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Mark Pellegrini

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Oriental Fire-belly Toads

BEHAVIOR

- Free-ranging fire-belly toads hibernate from September/October to April/May in groups of 2-6; they hide under rocks, vegetation or decomposing wood.
- The breeding period starts around May and lasts until September, although there is no peak of reproductive activity, and the eggs are laid gradually during this period.
- Although their skin produces a number of toxic and irritating substances, as most amphibians do, they are prey of a number mammals and birds.
- When threatened, they exhibit a characteristic display, exposing the bright red and dark belly, announcing their toxicity to a potential predator. This behavior is usually lost in captive-bred individuals.

CAPTIVE HOUSING

- Oriental fire-belly toads should be housed in small groups of equal-sized individuals in an aqua-terrarium with 1/3 to 1/4 land area.
- A 24 x 12 x 12 inch (60 x 30 x 30 cm) aquarium can house up to 4 adult toads, although a larger area is more desirable.
- The bottom surface can be bare or covered with fine river sand.
- The water should be filtered (a mechanic filter for fresh-water fish is suitable) and free of chlorine, chloramines and heavy metals; it should be changed every 1-2 weeks.
- Although the ultraviolet (UV) needs of most amphibian species are still unknown, it is best to provide some kind of artificial UV lighting to help prevent calcium-related nutritional disorders.

Oriental Fire-belly Toads

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Temperature should be 71-79°F (22-26°C); values over 84°F (29°C) should be avoided.
- At night, temperature can be decreased a few degrees, and drops up to 61°F (16°C) are usually well tolerated.
- An enclosure kept at room temperature needs no additional heat.

ENVIRONMENTAL ENRICHMENT

- Rocks, driftwood and other suitable material, covered with moss or live plants, can be used as a land area, assuring some hideouts for the animals.
- There should also be abundant aquatic and floating plants in the aquatic area, which the animals use as support while on the water.

DIET

- Adults and terrestrial juveniles feed on invertebrates, including insects and other arthropods, snails and worms.
- Adult toads can be fed 2-3 times a week with a variety of invertebrates (earthworms, snails, slugs, silkworms, wax moths, mealworms and other appropriately-sized prey).
- Items high in fat, such has wax moths and flour beetles, should be fed sparingly.
- If flour beetles are fed, only those that have recently shed their skin should be offered (to prevent gastro-intestinal blockage), and their heads should be crushed prior to feeding to prevent digestive wall trauma from their mouth armour.
- All food prey should be gut-loaded or lightly dusted with vitamins and calcium.



Eigenes Werk

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Mark Pellegrini

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- Wild-caught prey may also be fed but can potentially introduce pathogens or toxins.
- Terrestrial juveniles should be fed daily with appropriately-sized prey (chopped earthworms, white worms, small silkworms or fruit flies).

RESTRAINT

- Fire-belly toads should be handled with slightly moist, talc-free latex gloves, not only to minimize contact with the animals' defensive skin secretions but also to reduce trauma to their delicate skin.
- They should be grasped around the forelegs or with a loose grip around the whole body.
- Small individuals and tadpoles can also be examined while inside transparent plastic containers or plastic bags filled with water.

ANESTHESIA

- Amphibians can be anesthetized with baths of a buffered tricaine methanosulfonate (MS-222) solution. The concentration of MS-222 can range from 0.2 g/L for tadpoles to 1 g/L for adults; induction time is about 30 minutes.
- The ideal anesthetic plane is characterized by loss of righting and corneal reflexes and abdominal erythema.
- Deeper planes of anesthesia can be achieved by longer baths; the animal loses its withdrawal reflex while maintaining a visible heartbeat.
- After reaching the desired anesthetic plane, the animal should be placed in a container with well-oxygenated water.
- At the end of the procedure or to remove excess MS-

222, the animal should be rinsed with clean water.

- Isoflurane can also be delivered at 5% saturation via anesthetic chamber. A small volume of water should be placed inside the chamber to minimize dehydration. Induction takes 5-20 minutes and recovery less than 100 minutes.

MOST COMMON DISORDERS

- Malnutrition
- Trauma
- Disorders caused by incorrect water parameters (e.g., bacterial and fungal skin infections)
- Heat stress
- All amphibians should have their stool checked for parasites and should be medicated appropriately.

ZOONOTIC POTENTIAL

- Few, if any, zoonoses are reportedly transmitted by White's tree frogs, but there are anecdotal reports of isolation of *Leptospira* spp., *Listeria monocytogenes, Yersinia enterocolitica* and atypical *Mycobacteria* in other amphibian species. The ability of these species to transmit these pathogens to human beings remains controversial.

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White's Tree Frog Pet Care



VITAL STATISTICS

Life span	15 years (avg), up to 25 years
Body size	2.8-4.3 inches (7-11 cm) snout to vent (medium-sized)

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White's tree frogs (*Litoria caerulea*)

Filipe Martinho, DVM

- Also known as dumpy tree frog or green tree frog.

ORIGIN / FREE-RANGING HABITAT

- North and northeastern Australia and southern Papua, New Guinea; introduced into New Zealand
- White's tree frogs can be found in a variety of habitats, from moist to relatively dry forests to even around human settlements like parks and gardens, where they are usually found climbing branches, bushes or trees.

SUITABILITY AS PETS

- White's tree frogs are popular amphibians in captivity because of their moderate size and interesting behavior.
- They may be considered a beginner's frog.

PHYSICAL CHARACTERISTICS

- As with most members of this family, White's tree frogs possess small discs at the tip of the digits, which function as climbing aids. The fingers and toes are partly webbed.
- The skin is smooth and quite dry for an amphibian because of its waxy secretions, which decrease excessive water loss.
- Coloration is variable, ranging from brown to green, sometimes even bluish. Some individuals have white or yellow spots and an irregular white stripe from the corner of the mouth to the shoulder.
- This species can partially change its skin color, depending

on the surrounding environment (temperature, humidity, vegetation, light intensity) or health status.

- Some adult individuals, especially obese ones, can develop large skin flaps over the eyes.
- Males are smaller than females, often have a green tinge on the throat and are the only ones that call during mating season.

BEHAVIOR

- White's tree frogs are docile and can become relatively tame to tolerate handling.
- They are mostly nocturnal, remaining inactive during the day to reduce water losses.
- They are opportunistic predators, feeding on any insect, small bird, mammal, frog or other prey they can fit into their mouths.
- The breeding period occurs between November and May, and the males call loudly to attract female partners.
- The 200-2000 eggs are laid at the surface of still water bodies, and after 24 hours they sink to the bottom. The eggs hatch after 3 days, and metamorphosis occurs 2 months later.

CAPTIVE HOUSING

- This is a moderately-sized and quite active frog that needs a large enclosure in captivity. A terrarium 31 x 12 x 20 inches (80 x 30 x 50 cm) should be suitable for 1-2 adult individuals, but more space is desirable.
- Since they are arboreal animals, a vertical terrarium is more suitable than a horizontal one.
- A number of substrate materials, such as coconut fiber,





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potting soil (without fertilizers or pesticides), artificial grass carpets or moist paper towels, can be used with safety. Gravel, sand and small-sized tree bark should be avoided, because these can be inadvertently swallowed by the animals or cause skin irritation.

- A large but not very deep water bowl should be placed on the bottom of the terrarium; the water should be free of chlorine, chloramines and heavy metals and changed frequently.
- Because the UV lighting requirements for most amphibian species are not completely known, it is best to include a UV bulb to help prevent nutritional disorders.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Daytime temperatures should be approximately 75-84°F (24-29°C) and slightly lower at night.
- Heat should be provided by an incandescent or infrared light bulb that is placed at a safe distance from the animals to prevent thermal burns.
- A temperature gradient should be created inside the terrarium, with a slightly cool corner and a slightly warmer basking spot, so the frogs can choose the most adequate temperature.

ENVIRONMENTAL ENRICHMENT

- Hideouts, such as hollow logs or tilted flower pots, should be provided.
- Live sturdy plants can be safely used; besides the aesthetic function, they provide extra climbing surfaces and hideouts and help to maintain humidity in the terrarium.

White's Tree Frogs

- Because of their climbing habits, White's tree frogs need branches and vines across the terrarium.
- Plants used in the terrarium should be nontoxic and oxalate-free; live prey, such as crickets, may feed on some oxalate-containing plants and can cause oxalate toxicity in frogs after the prey are ingested.

DIET

- Adult frogs can be fed 2-3 times a week with a variety of invertebrates (crickets, cockroaches, earthworms, silkworms, wax moths, mealworms and other appropriately-sized prey).
- Items high in fat, such as wax moths and flour beetles, should be fed sparingly.
- If flour beetles are fed, only those that have recently shed their skin should be offered (to prevent gastrointestinal blockage), and their heads should be crushed prior to feeding to prevent digestive wall trauma from their mouth armour.
- All food prey should be gut-loaded or lightly dusted with vitamins and calcium before feeding.
- Wild-caught prey may also be fed but can potentially introduce pathogens or toxins.
- Rodent prey should not be fed in captivity because of the tendency to induce obesity.

RESTRAINT

- White's tree frogs should be handled with slightly moist, talc-free, latex gloves, not only to minimize contact with the animals' defensive skin secretions, but also to reduce trauma to their delicate skin.





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Amos T Fairchild



Korallen Laubfrosch

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White's Tree Frogs

- They should be grasped around the forelegs or immediately anterior to the hind legs.
- Small individuals and tadpoles can also be examined while inside transparent plastic containers or plastic bags containing water.

ANESTHESIA

- Amphibians can be anesthetized with baths of a buffered tricaine methanosulfonate (MS-222) solution. The concentration of MS-222 can range from 0.2 g/L for tadpoles to 1 g/L for adults; induction time is about 30 minutes.
- The ideal anesthetic plane is characterized by loss of righting and corneal reflexes and abdominal erythema.
- Deeper planes of anesthesia can be achieved by longer baths; the animal loses its withdrawal reflex while maintaining a visible heartbeat.
- After reaching the desired anesthetic plane, the animal should be placed in a container with well-oxygenated water.
- At the end of the procedure or to remove excess MS-222, the animal should be rinsed with clean water.
- Isoflurane can also be delivered at 5% saturation via anesthetic chamber. A small volume of water should be placed inside the chamber to minimize dehydration. Induction takes 5-20 minutes, and recovery is less than 100 minutes.

MOST COMMON DISORDERS

- Malnutrition
- Trauma
- Bacterial or fungal infections

- Obesity (affected animals can develop large skin flaps over the eyes that can obscure vision)
- Obese individuals can also be at increased risk of developing liver and heart disease, although rarely reported in amphibians.
- Some animals frequently fed rodent prey can develop lipid keratopathy with deposition of cholesterol crystals over the cornea.
- All amphibians should have their stool checked for parasites and should be medicated appropriately.

ZOONOTIC POTENTIAL

- Few, if any, zoonoses are reportedly transmitted by White's tree frogs, but there are anecdotal reports of isolation of *Leptospira* spp., *Listeria monocytogenes, Yersinia enterocolitica* and atypical *Mycobacteria* in other amphibian species. The ability of these species to transmit these pathogens to human beings remains controversial.

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Phillie Casablanca



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Tomato Frog Pet Care



Tomato frogs (*Dyscophus* sp.)

Kenneth Harkewicz, VMD

ORIGIN / FREE-RANGING HABITAT

- Tomato frogs originate in the northeast coastal areas of Madagascar.
- They live in humid forest habitats from sea level to 660 ft (200 m).

COMMON SUBSPECIES

- All tomato frogs belong to the Microhylaidae family and the genus *Dyscophus*. There are 3 subspecies recognized.
- *D. antongilli* is not common in the pet trade because their importation out of Madagascar is prohibited under CITES Appendix I. They are the most vividly red of the three subspecies.
- *D. guineti* is common in the pet trade and known as the false tomato frog (also called the Sambava frog or Guinet's frog). They are red to yellow-orange in color with brown lines running down the sides of the body.
- *D. insularis* is the smallest of the subspecies, rarely getting over 2 inches (5 cm) in length from snout to vent. This subspecies is brownish-orange in color and is never as vivid red as the other two subspecies.

FREE-RANGING HABITS

- The tomato frog is found in areas with soft soil and high humidity, as they burrow most of the day.
- They are often found near accumulations of water during the rainy season, because they need water to breed.

VITAL STATISTICS

Life span	10-18 years (captivity)	
D. guineti body weight		
	male	40 g (1.5 oz)
	female	227 g (8 oz)
D. guineti body length		
	male	2.5 inches (65 mm)
	female	4 inches (10.1 cm)

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Tomato Frogs

SUITABILITY AS PETS

- Tomato frogs require a minimal environmental setup.
- *D. guineti* is bred in captivity. This is always a plus over wild-caught specimens.
- Tomato frogs make good “first frog pets,” as they are hardy and easy to care for.

PHYSICAL CHARACTERISTICS

- The name “tomato frog” comes both from their red coloration and the shape they assume when they fill their bodies with air (often when threatened or frightened).
- The ventrum of the frog varies from white to cream in color. The color is usually darker in the throat area, especially in males during the breeding season.

SEXING AND REPRODUCTION

- Mature female tomato frogs are larger than males.
- Female tomato frogs have the most vivid colors; males and juveniles often have more muted coloration.

BEHAVIOR

- Tomato frogs are nocturnal.
- They lack adhesive discs on their fingers and toes so they do not climb well.
- Being round in shape with small legs, they are poor swimmers.
- They are ambush-type hunters when looking for food items. They stay buried in substrate, waiting to ambush prey that comes along.
- The bright red color of tomato frogs serves as a warning to predators; the skin contains a toxic secretion.

Dyscophus antongilli



Dyscophus guineti



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Shallow water should be provided for swimming.



Free-ranging tomato frogs burrow most of the day.



Olaf Leillinger

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Tomato Frogs

CAPTIVE HOUSING

- Terrestrial vivariums are best for tomato frogs. An enclosure that is 3 feet (91.4 cm) long, 15 inches (38 cm) deep and 18 inches (45.7 cm) in height will easily house 3-4 adult tomato frogs.
- Because the frogs burrow, a substrate of at least 2.5 inches (6.3 cm) in depth should be provided. Coconut coir makes an excellent substrate and holds humidity well.
- Ventilation is important, so partial screening on the enclosure's sides and top is essential.
- Only shallow water bowls (with either spring or filtered water) should be used, as the frogs are poor swimmers.
- A low-intensity UVB full-spectrum light is advisable to help prevent metabolic bone disease disorders.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Temperature should not get above 80°F (26°C) for juveniles or above 85°F (29°C) for adults. Juvenile tomato frogs cannot tolerate heat extremes as well as adults.
- A temperature gradient is preferred. The cooler side of the enclosure can drop to 75°F (23°C).
- Nighttime temperature should be 60-65°F (15.5-18.3°C).
- A humidity of 70-80% is best for tomato frogs.
- Spraying the enclosure with filtered spring water several times daily helps to maintain high humidity.

ENVIRONMENTAL ENRICHMENT

- Hollow logs, ceramic flower pots cut in half, or artificial reptile huts help to provide good hiding spots for frogs.
- Live plants can be used but are often destroyed or damaged by the frog's digging behavior.

Tomato Frogs

DIET

- The tomato frog's diet is mainly insects and small invertebrates.
- Crickets, wax worms, phoenix worms, small silkworms, mealworms and earthworms may all be offered.
- Food items that ingest food can be gut-loaded with a commercial insect chow. Some food items (e.g., wax worms and phoenix worms) do not eat.
- Food items should also be dusted with a vitamin/mineral powder made for reptiles/amphibians before feeding to further enhance their nutritional status.
- Adults are fed every 2-3 days; juveniles are fed daily.
- If not ingested, live food items should be removed from the enclosure within a few hours of being introduced.

RESTRAINT

- Tomato frogs have a mild toxin in their skin, so gloves should be worn when handled.
- Prior to picking up the frog, gloves should be rinsed in filtered water to remove any powder/dust.
- To grasp a frog, use a thumb and forefinger grip behind the hind legs.
- Tomato frogs will often inflate their bodies with air when they are handled.

ANESTHESIA

- MS-222 (tricane methanosulfate) may be used to sedate tomato frogs in a bath. A dose of 1.0 g/ L water and a 30-minute soak will sedate nicely.
- Propofol applied topically at 100-140 mg/kg can be used for sedation. It can also be given ICe at 10-30 mg/kg.



Tomato frogs can be restrained with the thumb and forefinger method.

Kenneth Harkewicz, VMD



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An oral examination may reveal glossitis.



Kenneth Harkewicz, VMD

D. antongilli tadpole



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- Isoflurane may be used either as a gas (3-5% induction, 1-2% maintenance) or applied as a topical mixture to the frog's skin (3.0 ml isoflurane, 3.5 ml K/Y Jelly mixed in 1.5 ml water and applied to effect).

MOST COMMON DISORDERS

- Malnutrition, especially due to a lack of adequate calcium (metabolic bone disease)
- Rostral abrasions/abscesses
- Trauma secondary to improper handling
- Skin ulcerations (and secondary infection) due to unclean surroundings or improper care
- Renal disease
- Fecal checks for internal parasites are important.

ZOONOTIC POTENTIAL

- Bacterial infections, such as *Salmonella,* may be passed to humans through a fecal-oral route.

SPECIAL CONSIDERATIONS

- The skin toxin can cause a burning sensation if it comes into contact with mucous membranes.
- Hands must always be washed after handling these frogs, even if gloves are used.

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African clawed frogs (*Xenopus laevis*)

Bruce Maclean, BSc (VetSci), BVM&S, MRCVS

- Also called platanna

COMMON SUBSPECIES / SIMILAR SPECIES

- Several subspecies have been recognized, but they are not generally recognized in the hobby/pet trade.
- Occasional specimens of other *Xenopus* species or some hybrids between different species may be encountered, but specific identification can be difficult. Fortunately, care is essentially similar.
- *X. tropicalis* are generally smaller and darker in color and require slightly higher temperatures (23-26°C [73-79°F]).

ORIGIN / FREE-RANGING HABITAT

- Clawed frogs are widely spread in sub-Saharan Africa.
- There are feral breeding populations in many places in the United States, Europe, South America and Africa.
- Clawed frogs are generally found in still, often fairly stagnant/muddy bodies of water. *Xenopus laevis* usually live in semi-arid grassland.

PHYSICAL CHARACTERISTICS

- The body of these frogs is dorsoventrally flattened, with small eyes positioned dorsally on the head.
- They lack tongues and teeth.
- The front toes are unwebbed, the hind toes are fully webbed. The medial three digits of the hind feet (digits I, II, III) have short black claws, while the front toes are relatively long and pointed.

African Clawed Frog Pet Care



Bruce Maclean

VITAL STATISTICS

Life span	up to 20 years
Body weight	up to 100 g (3.5 oz)
Body length	
male	5-8 cm (2-3 inches)
female	10-15 cm (4-6 inches)

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Bruce Maclean

The natural color of clawed frogs is olive/grey/brown.



An albino African clawed frog shown in its typical out-stretched pose.

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African Clawed Frogs

- The natural color of clawed frogs is olive/gray/brown blotching dorsally, creamy white ventrally, with a “stitched appearance” along lateral lines. Various albino/hypomelanistic forms are common as pets.

SEXING AND REPRODUCTION

- Females are larger and generally more plump than males. They also have obvious slightly protruding papillae (labial flaps) around the cloaca, which the males lack.
- Males in breeding condition develop black nuptial pads on the front feet and forelegs (although note that females may develop dark palmar surfaces with age).
- Breeding occurs after spring rains, which can be simulated by a 25-40% water change and slight reduction in water temperature. Hundreds of eggs may be laid.

BEHAVIOR

- Clawed frogs are essentially totally aquatic (although they come to the surface for air).
- They can migrate short distances or dig into moist soil and aestivate, if conditions dictate. They spend most of time lying motionless below the surface of the water.
- They are opportunistic predators, using their sensitive lateral line organs and fingers to search for food items in muddy water. They will take non-moving prey, stuffing anything edible into their mouths with their forefeet.

CAPTIVE HOUSING

- A large aquarium is necessary (minimum: 10 gallons [40 L] for first adult frog, 5 gallons per frog after that). Water depth should be more than the frog is long (but care must be taken with water level too close to the top of the

tank, as these frogs are escape artists).
- Water must be free of chlorine, chloramines and heavy metals. Tap water must be treated and quality monitored.
- Substrate should be such that it cannot be swallowed. Gravel is best avoided, as ingestion can be a problem.
- These are quite messy frogs, and filtration is necessary. This must involve as little water disturbance as possible, however, as the frogs are sensitive to water movements.
- Lighting is controversial, but overhead lower-intensity full-spectrum lighting is probably advisable, with timed photoperiod (12:12).

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- These frogs are relatively tolerant of varying temperatures, but a water temperature of 20-22°C (68-72°F) is recommended. Temperature changes should be gradual.

ENVIRONMENTAL ENRICHMENT

- Multiple hiding places are necessary and must be secure to prevent displacement.
- Live plants, if used, must be hardy as well as nontoxic (anubias are recommended). Plastic plants need to be assessed for sharp edges.
- Cage companions are not recommended, except other clawed frogs of approximately equal size.

DIET

- In captivity, complete pelleted foods, supplemented with a variety of live invertebrates and freeze-dried bloodworms should be offered.
- Live small fish, such as guppies, are often used but risk introducing pathogens.



The hind toes of the clawed frog are fully webbed.

Bruce Maclean



Bruce Maclean

Females can be identified by the protruding papillae around the cloaca.

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Anubia nana are suitable live plants in an aquarium for clawed frogs.



Clawed frog tadpoles are filter feeders.

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- The commonly used beef heart may be used as a treat but is inadequate as the sole diet.
- The tadpoles are filter feeders; suspension fish fry food or flake may be used.

RESTRAINT

- Clawed frogs should be handled gently with moist, powder-free gloves (preferably vinyl). They should always be handled in such a position that they cannot damage themselves from a fall (i.e., low, over a soft surface/water).
- As much visual examination as possible should be carried out in a transparent container before handling.
- Note: netting should be avoided; the front toes are very easy to damage or even amputate with netting.

ANESTHESIA

- Anesthesia is by immersion to effect in buffered MS-222 (tricaine methane sulphonate), typically at 1 g/L for adults, 0.2 g/L for tadpoles, or in water through which isoflurane is bubbled.
- Alternatively, isoflurane in KY jelly applied topically has been described (3 ml isoflurane in 3.5 ml KY jelly + 1.5 ml water, dosed at 0.025 ml/g, wiped off when desired depth of anesthesia is reached; care must be taken to avoid overdosing).
- Loss of righting and corneal reflexes indicates light anesthesia; loss of withdrawal reflexes indicates deep anesthesia. Note that drowning is possible; monitoring during induction is essential.
- Recovery may be encouraged by rinsing in clean, well-oxygenated water once the procedure is completed.

- For longer-term maintenance, isoflurane in oxygen may be administered by mask or tube; positive-pressure ventilation may be necessary to maintain anesthesia.
- The frog must be kept moist during surgery, and the heartbeat should be monitored visually or with Doppler ultrasound during anesthesia.

MOST COMMON DISORDERS

- Bloat is the most common clinical sign seen; it can be related to a wide variety of problems, including internal infection (various pathogens), liver problems, heart/circulatory problems, kidney problems and parasitic problems. Diagnosing the cause can be challenging, but a logical work-up, as far as feasible, is recommended.
- Metabolic bone disease/nutritional osteodystrophy is not as common in clawed frogs as in many captive amphibians but can occur (signs include: lethargy, weakness, anorexia, pathological fractures, tremors).
- Red leg (septicemia) is also often seen and may be associated with a variety of (mainly bacterial) pathogens.
- Dermatitis may be related to water quality or fungal, bacterial, mycobacterial and/or nematode infection.
- Granulomatous disease is usually associated with mycobacterial or fungal infection.

ZOONOTIC POTENTIAL

- Zoonotic diseases from clawed frogs are rarely reported, but they may carry and/or suffer from many bacteria that can affect humans, including notably *Salmonella* species and atypical mycobacteria.

- Water level should not be too close to the top of the tank, as these frogs are escape artists.



Bruce Maclean



Berliner Tiergarten

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Peter Halasz

SPECIAL CONSIDERATIONS

- Clawed frogs are feral in many places and have been implicated as a reservoir and/or agent of spread of chytrid fungus, to which they are relatively resistant. As a result, their keeping is controlled in several places. Permits are required for owning, selling and transporting these frogs in several U.S. states.
- Due to their relative resistance and potential carrier state for chytrid fungus, strict precautions are necessary when they are in a collection with other amphibians, including other aquatic frogs.
- Historically and to some extent still, clawed frogs are widely used as research animals, originally for human pregnancy diagnosis and now more for genetic and developmental studies.

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Betta Fish (*Betta splendens*)

Helen E. Roberts, DVM

- Also known as Siamese fighting fish.

ORIGIN / FREE-RANGING HABITAT

- Thailand, Cambodia, Laos, Vietnam
- Wild populations have been introduced to Dominican Republic, Brazil, Columbia, Malaysia and Singapore
- Typically found in standing or slow-moving water of flood plains, canals, rice paddies, drainage ditches and rivers.
- Most bettas found in the pet trade are imported from several Asian countries where they are farmed.

SUITABILITY AS PETS

- Bettas make excellent pets and can be housed in small aquaria, making them suitable for small spaces such as offices, dorm rooms and apartments.
- Most bettas are 7-10 months old when purchased at a pet store.

PHYSICAL CHARACTERISTICS

- The species is sexually dimorphic, with males exhibiting long, flowing colorful fins and tails.
- Most bettas sold in the pet trade are males.
- Healthy bettas are available in many colors.
- Several tail types have developed through selective breeding, including halfmoon, delta, super delta, veiltail and crowntail.

Betta Fish Pet Care



Blue and red super-delta *Betta splendens*

VITAL STATISTICS

Life span	2-3 (avg), up to 5 years
Body size	2.25 inches (5.0-6.5 cm)

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Bubble nest made by the male betta



Betta half moon

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Betta Fish

BEHAVIOR

- Male bettas will display or “flare” when another male betta (and occasionally a female) is present.
- The opercula (gill plates, which cover and protect the gills) are flared wide open, exposing a membrane inside the opercula, the colors intensify and the fins are extended, making the fish appear larger and more threatening.
- The fish will occasionally exhibit this behavior when the owner appears. This reaction can also be induced with the use of a mirror. When the male sees the “other” male, he will typically display.
- Repeated induction of flaring or displaying may cause stress in the fish.
- Bettas are usually found at the top of the water column.
- Males will produce bubble nests by mixing air with a mucoid fluid in their buccal cavity.
- The nest is protected by the male after spawning.
- The presence of a nest is usually associated with a healthy betta.

CAPTIVE HOUSING

- Aquaria: 1-2 gallons of water is sufficient, although bettas can be housed with other community species.
- Males must be housed individually, as they will fight.
- Water quality issues may arise when they are kept in small bowls.
- The ideal pH is 7.0 with a range of 6.8-7.5.

Betta Fish

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Preferred temperature is 75-86°F (24-30°C).
- Temperature fluctuations can be stressful and may lead to disease.
- A small wattage heater can be used to maintain a constant water temperature.

ENVIRONMENTAL ENRICHMENT

- Tank decorations may serve as hiding places.
- Silk or live plants that will not cause trauma to the long fins and tails should be used.

DIET

- Bettas are carnivorous and eat insect larvae, crustaceans, small fish and zooplankton in their native habitats.
- Several good quality commercial betta diets are available in flaked, freeze-dried, gel, frozen and pelleted forms.

RESTRAINT / ANESTHESIA

- 50-100 ppm (mg/L) MS-222: tricaine methanesulfonate (TMS), (Finquel® - Argent Chemical Laboratories, Redmond, WA), (Tricaine-S® - Western Chemical Inc, Ferndale, WA)
- Due to the unique anatomy of the labyrinth organ (enabling the fish to breath atmospheric oxygen) and the gills of these fish (thick lamellae and decreased lamellar surface area), it is possible to “drown” the fish if an overdose of an anesthetic agent is used.



Female bettas in a community tank with mollies and rainbow fish.

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Bettas being packed for shipment from Thailand.

Nicholas St. Erne, DVM



Betta fish with ventral coelomic cavity swelling.

Helen E. Roberts

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Betta Fish

MOST COMMON DISORDERS

- Mycobacterial infections
- Traumatic injuries from fin and tail nipping of conspecifics (when 2 males are housed together) and tank mates in a community tank
- Exophthalmia
- "Dropsy" or renal insufficiency/failure secondary to bacterial or mycobacterial disease
- Coelomic cavity swelling

ZOONOTIC POTENTIAL

- Bettas have a high incidence of mycobacterial infections.
- Other zoonoses not specific to bettas include bacterial pathogens that may gain entry through existing open wounds or punctures obtained during handling of fish.

SPECIAL CONSIDERATIONS

- Maintenance of excellent water quality cannot be over-emphasized, particularly if the betta is kept in a small volume of water.

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Oscar fish (*Astronotus ocellatus*)

Helen E. Roberts, DVM

- Also known as oscar cichlid, tiger oscar, velvet cichlid, marble cichlid, red oscar, red tiger oscar, *Acara ocellatus, A. crassipinnis*

ORIGIN / FREE-RANGING HABITAT

- South America; native to Peru, Colombia, Brazil and French Guyana.
- As a result of the illegal release of pet oscars into non-native waters, feral populations occur in China and northern Australia. In the US, feral populations have been found in Florida, Hawaii, Georgia, Louisiana, Massachusetts, Mississippi, New Jersey, Pennsylvania, Rhode Island, Texas and Virginia.
- Most oscars sold in pet stores are either of Asian import or bred domestically in Florida.
- Oscars are usually found in slow-moving white-water habitats, such as the Amazon River basin and related drainage areas.

SUITABILITY AS PETS

- Excellent, intelligent, personable fish
- They are fast-growing and relatively hardy.
- They can be hand-fed and learn to recognize owners as the source of food.
- One major disadvantage is their large size at adulthood, requiring a large aquarium.

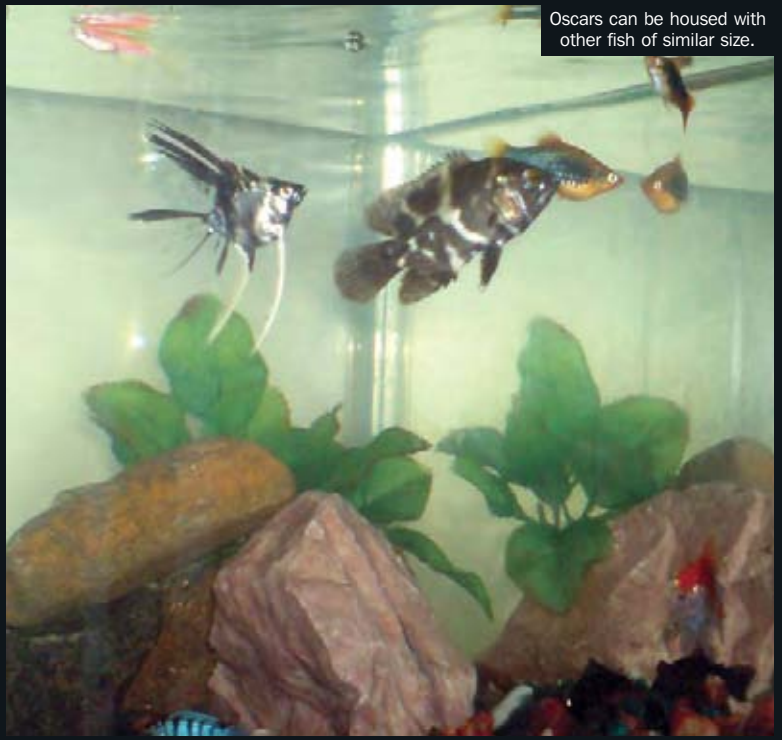
Oscar Fish Pet Care



VITAL STATISTICS

Life span	7-8 years
Body size	12 inches (30 cm) (avg)

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Oscars can be housed with other fish of similar size.

- Other disadvantages include their tendency to uproot plants and be messy eaters.

PHYSICAL CHARACTERISTICS

- Color forms: Captive breeding programs have led to different colors and patterns including albino, leucistic and xanthistic varieties.
- *A. ocellatus*, with patches of red pigmentation, are sold as red tiger oscars, while those strains with mainly red coloration of the flanks are frequently sold under the trade name of red oscars.
- Long-finned varieties may be found in some pet stores.
- The wild-caught forms of the species are typically darkly colored with orange-ringed spots or ocelli on the caudal peduncle (tail) and on the dorsal fin.
- Ocelli may be important for intra-specific communication and to limit fin- and tail-nipping by piranha in the oscar's natural environment.
- Communication may occur with quick color changes.
- Juvenile oscars are striped with white and orange wavy bands and spotted heads.
- Poor husbandry and/or water quality may result in much smaller fish.

BEHAVIOR

- Healthy oscars are normally found in the bottom or middle of the water column unless they are feeding.
- They will often "dance" in anticipation of being fed.
- They are mistakenly thought to be very aggressive but can be housed with other fish that are too large to be considered prey.

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Oscar Fish

CAPTIVE HOUSING

- Aquaria: 50 gallons of water is minimum to accommodate adult size.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Preferred range is 74-80°F (23-27°C)
- Temperatures of 55.2°F (12.9°C) or lower are usually lethal.

ENVIRONMENTAL ENRICHMENT

- Plants for uprooting and "redecorating," live food

DIET

- Carnivorous, piscivorous
- Live food or commercial carnivorous cichlid diet

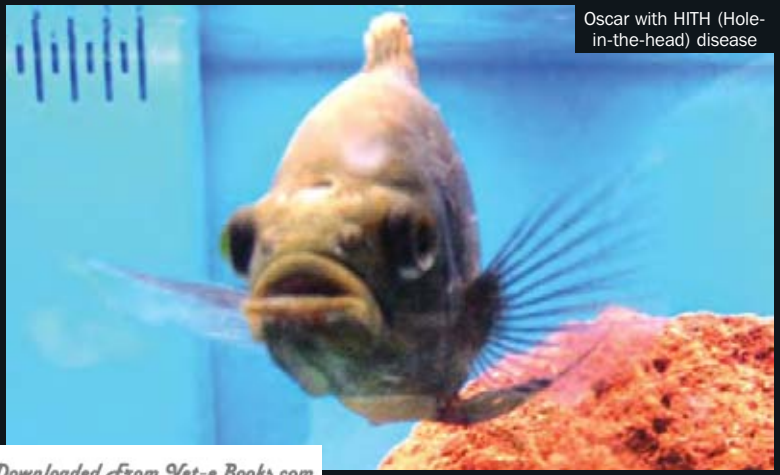
RESTRAINT / ANESTHESIA

- 50-100 ppm (mg/L) MS-222: tricaine methanesulfonate (TMS), (Finquel® - Argent Chemical Laboratories, Redmond, WA), (Tricaine-S® - Western Chemical Inc, Ferndale, WA)

MOST COMMON DISORDERS

- HITH (Hole-in-the-head) disease or HLLE (head and lateral line erosion)
- Intestinal parasites, such as *Hexamita* and *Spironucleus*
- Coelomic neoplasia
- Traumatic injuries (fin-nipping, intra-specific fighting)
- Renal adenomas (rare but may have genetic predisposition)





Oscar with HITH (Hole-in-the-head) disease

Helen E. Roberts

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An albino oscar fish "attacking" glass cleaner



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ZOONOTIC POTENTIAL

- There are no zoonotic pathogens reported to be specific to oscars.
- All fish should be considered potential carriers of *Mycobacterium* sp.
- Bacterial pathogens of fish may gain entry through existing open wounds or punctures obtained during handling of fish.

SPECIAL CONSIDERATIONS

- To reduce the risk of disease, live foods should be quarantined for several weeks prior to feeding.
- Feeder fish may have pre-existing parasitic infections, act as paratenic hosts for intestinal parasites and be carriers of pathogenic bacteria.

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Pigeons (rock doves) (*Columba livia domestica*)

Niklos Weber, DVM, Dipl ABVP - Avian Practice
Dipl ABVP - Canine and Feline Practice

COMMON BREEDS

- Homing or racing pigeons (e.g., sions, van loons)
- Meat pigeons (e.g., king and carneaux breeds, “squab”)
- Flying breeds (e.g., rollers, tumblers, high flyers)
- Fancy pigeons (e.g., fantails, pouters, archangels)

ORIGIN

- The rock dove is ubiquitous and has been domesticated for over 5,000 years. It was first domesticated in the Middle East and Egypt.

FREE-RANGING HABITAT

- Pigeons have adapted well to human settlements and seem to prefer to live in cities.
- In the wild, they are cliff nesters, and buildings offer enough flat areas to nest comfortably.
- Free-ranging pigeons have the ability to “home,” i.e., find their way back to their nests, and racing pigeons have been selected for this ability.
- Fancy and meat pigeons have generally lost the homing instinct, as they were bred for appearance or growth.

SUITABILITY AS PETS

- Fancy pigeons have the potential to make very good pets, especially if hand-raised.
- They are friendly and easy to take care of and don’t have

Pigeon Pet Care



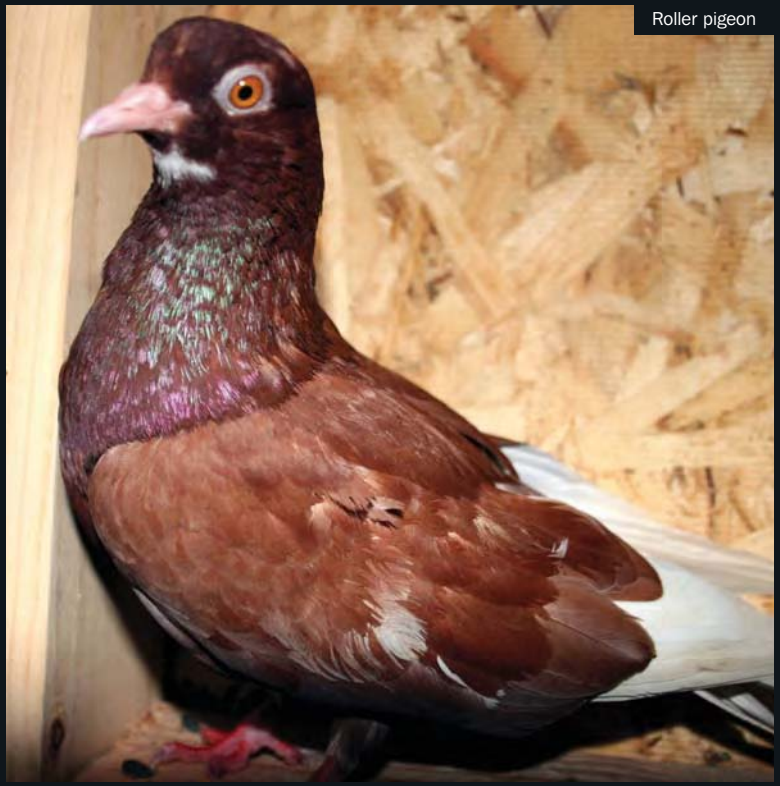
Archangel pigeons

Niklos Weber

VITAL STATISTICS

Life span	11 years (avg)
Body weight	240-550 g (up to 2000 g)
Body size	12.5-40 cm (5-16 inches)
Body temperature	39.8-43.3°C (cloacal)
Heart rate	160-300 beats per minute (resting)
Respiratory rate	20-30 breaths per minute (resting)
Sexual maturity	4 months
First breeding	7-8 months
Clutch size	2
Nestling period	21-28 days

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Roller pigeon

the ability to bite very hard.

- Racing pigeons have been bred as high-activity, elite athletes, so they do not do very well inside a house. However, if protected from predators, they can make good pets in an aviary.

PHYSICAL CHARACTERISTICS

- Pigeons have very large, bilobed crops and are unique in that both parents make “crop milk” for their young up to 10-14 days of age.
- They have small uropygial glands, so most of their water-proofing is achieved through the use of powderdown.
- They have no gallbladder, and their cecae are very small.

BEHAVIOR

- Pigeons are generally monogamous and mate for life.
- They establish a definite pecking order in the loft and may scalp the lower-ranking birds if they are overcrowded.
- Pigeon racers commonly use mating behavior to their advantage by separating the males and females all week and letting them see each other before the race, so they fly home faster to their mates (“widowhood”).

CAPTIVE HOUSING

- Pigeons are generally housed in outdoor lofts large enough to allow them to fly up to flat perches.
- The lofts usually contain separate sections for young birds, hens, breeders and the racing team.
- Breeder lofts contain nest boxes or cages, and lofts for racing or show birds contain flat perches, which best support their foot structure.

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Pigeons

- Show birds are sometimes housed in individual cages.
- The lofts should be cleaned frequently and have adequate ventilation.
- Supplemental heat or cooling is usually not necessary, but in cold areas the lofts are usually insulated for winter.

DIET

- There are a number of commercially available pigeon diets, most based on seed or grain.
- Protein content for pigeons' diets ranges from 12-18%.
- Grit is necessary for grinding of the grain in the ventriculus; pigeons consume whole seeds, including the hull.
- Mineral supplementation is necessary if only grain is fed.
- Mineral blocks should be available. Free-flying birds will forage for minerals on the ground if they are deficient.
- Many vitamin and racing supplements are also available.

RESTRAINT / ANESTHESIA

- Pigeon fanciers have a specific restraint method for their birds: the legs are pulled caudally, and the legs and base of the tail are grasped usually in the left hand, while the bird's chest is held against the restrainer's chest.
- The band is usually on the right leg and upside down, so it can be read in the restraint position described above.
- Anesthetic protocols are similar to those of psittacine species, except intramuscular injections should not be given into the breast muscles of flying or meat birds.

MOST COMMON DISORDERS

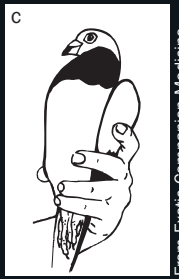
- Most fanciers will attempt to treat problems before the birds are brought to a veterinarian.

Pigeon loft









The basic method of restraint in pigeons is the horizontal hold (a). Large pigeons may require both hands for proper restraint; a second person may be needed to facilitate the physical examination (b). The bird is held upright with the vertical restraint technique (c).

From Exotic Companion Medicine Handbook

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Indian fantail pigeon



Feral pigeons are derived from escaped domestic pigeons.

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Pigeons

- Birds may be brought to a veterinarian only in cases of catastrophic losses or problems with breeding stock.
- Trichomonas or “canker” - very common; can lead to severe disease, breakdown of the crop epithelium and sepsis; clinical signs are head-shaking and yellow plaques in the mouth.
- Upper respiratory infections or “respiratory” - various bacterial causes; signs include sneezing, nasal discharge on the shoulders where the birds wipe their nares.
- Chlamydiosis or “one-eyed cold” - conjunctivitis; signs are commonly in one eye but can be in both or only in the upper respiratory tract.
- Coccidiosis or “cocci” - the most common sign is weight loss or “going light.” Most pigeons have coccidia present in the gastrointestinal tract.
- Viral diseases - including paramyxovirus or “PMV,” a mesogenic strain of PMV-1 that causes severe neurologic disease in pigeons; poxvirus; circovirus (“young bird disease”) and herpesvirus. Viruses usually cause immune suppression, hepatitis and/or death.
- Bacterial diseases - including *E. coli* and salmonellosis or “paratyphoid” - usually cause green diarrhea; *Salmonella* can cause joint infections and lameness.

VACCINES

- Most pigeon fanciers vaccinate birds for paramyxovirus (PMV-1, inactivated virus in an oil emulsion), pox (live attenuated virus) and sometimes *Salmonella typhimurium* (inactivated bacteria), depending on exposure potential.
- LaSota Newcastle’s vaccine for poultry has been shown to be ineffective for preventing pigeon PMV-1.

- Routine preventive measures include periodic treatment for coccidia, trichomonas and external parasites.

ZOONOTIC POTENTIAL

- Chlamydiosis and *Cryptococcus neoformans* are both reported to be potential zoonoses.
- Commonly, pigeon fanciers will acquire allergic lung disease from chronic exposure to the dust in their lofts.

SPECIAL CONSIDERATIONS

- It is difficult to draw blood from the jugular vein due to the lack of feather tracts on their necks, thick skin and the presence of the plexus venosus intracutaneous collaris, a large cuticular vascular plexus that can bleed profusely when lacerated.
- Blood can be drawn from the medial metatarsal vein or the ulnar vein, but care must be taken not to damage any wing structures in flying or racing birds.
- Pigeons are treated as “pet birds,” not “poultry” for international shipping.
- *Trichomonas* and *Coccidia* are almost ubiquitous in the pigeon population.

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Racing pigeon with babies

Niklos Weber

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Japanese Quail Pet Care



VITAL STATISTICS

Life span	up to 7 years (captivity)	Sexual maturity	6 weeks
Body weight		Hatching time	14-19 days
male	100-140 g (3.5-5.0 oz)	Clutch	200-300 eggs a year
female	120-160 g (4.2-5.6 oz)		

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Japanese quail (*Coturnix coturnix japonica*)

Rose Ann Fiskett, VMD, Dipl ABVP-Avian Practice

ORIGIN / FREE-RANGING HABITAT

- Japanese quail are native to all continents except the Americas.
- Their natural habitat consists of grasslands, riverbanks and rice fields.

SUITABILITY AS PETS

- Japanese quail are gentle and easy to handle, but they frighten easily.
- Some behavioral characteristics make them unsuitable in apartments or small houses (e.g., sexually mature males crow throughout the night during the breeding season).
- They are most suited to aviaries but can also be caged.

SEXING AND REPRODUCTION

- The birds are sexually dimorphic. Adult males have cinnamon-colored feathers on the upper throat and lower breast region; these feathers are apparent at about 3 weeks of age.
- Males have a large glandular or bulbous structure above the cloacal opening that produces a foamy secretion.
- Females have long, pointed feathers on the throat and the upper breast. The cinnamon color is less intense than in the male.
- They have a pronounced sensitivity to inbreeding with a marked decrease in production if paired with a closely related mate.

Japanese Quail

- Eggs range from dark brown, blue and white to buff with heavy mottling in black, brown and blue; the color pattern of the egg mottling is the same as the hen.

BEHAVIOR

- Japanese quail can die suddenly if frightened.
- Cannibalism has been associated with overcrowding, inadequate diet, excessive disturbances and handling.

CAPTIVE HOUSING

- Quail can be housed individually or in a colony using standard chicken houses or cages made of 18-gauge welded wire.
- Large enclosures must be secure from other birds (magpies, starlings, crows) and rodents.
- In production settings, brooders for chickens or game birds can be used with some modifications: rough paper floor and ¼" (0.64 cm) hardware cloth to prevent escape through feeders and add access to a water supply.
- In a large group housing, each adult quail needs 16-25 inches (40-64 cm) floor space per bird.
- For maximum egg production they need 14-18 hours of daylight.
- Litter, such as chopped straw, chopped corn cobs, sawdust or wood shavings, should be about 2 inches (5 cm) thick for birds housed directly on the floor.
- Daily cage cleaning is recommended. The most ideal housing is an aviary with natural surroundings.

ENVIRONMENTAL TEMPERATURE /HUMIDITY

- Adult birds can be housed outdoors in temperate

Japanese quail eggs



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1 week old chicks



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2-week-old chicks



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Juvenile quail



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climates if provided with adequate protection from the cold, wind and direct sunlight. Supplemental heat bulbs are needed in extremely cold temperatures.

- Quail are more heat tolerant than chickens, but a ventilation fan or indoor air cooling is needed at extremely high temperatures.

ENVIRONMENTAL ENRICHMENT

- Natural surroundings (growing grasses) can be mimicked in an aviary with potted plants and replaceable bedding for ease of cleaning. Grasses can create hide areas.
- Straw or hay can be used in caged housing.

DIET

- Free-ranging quail eat many kinds of grass seeds, including white millet. Their protein sources include small worms, insect larvae and small invertebrates. They will also consume grit.
- Captive quail can be fed turkey starter, chicken starter or game bird starter; breeding hens should have free choice access to calcium (limestone or oyster shell).
- Clean water is essential.

RESTRAINT

- Because of their small size, the quail may be covered with a small towel until the feet and legs are restrained.
- The bird may be gently held by the hocks with one hand and the other hand used to prevent the wings from flapping.
- The eyes may be covered or the lights dimmed to reduce stress. It is best to minimize handling to avoid stress.

Japanese Quail

ANESTHESIA

- Careful attention must be paid to the ambient and core body temperature of quail under anesthesia.
- The author routinely has anesthetized a towel-wrapped quail in a darkened room with isoflurane alone via face mask to effect.
- Ketamine (20 mg/kg IM) and xylazine (2-3 mg/kg) can be used for short-term anesthesia when sedation, analgesia and muscle relaxation are needed.
- Midazolam (0.25-0.5 mg/kg IM) with butorphanol (2-4 mg/kg) is used in many avian species. Midazolam (0.2-4.0 mg/kg IM) has been used for heavy sedation.

MOST COMMON DISORDERS

- Medical conditions contracted from predators include ornithosis, tuberculosis and paratyphoid.
- External parasites include the fowl mite, lice and ticks.
- Coccidiosis is common.
- Quail are susceptible to fowl pox, Newcastle's disease virus, infectious bronchitis virus and a virus causing avian encephalomyelitis in adults.
- Bacterial pathogens include *Salmonella pullorum, S. gallinarum, S. typhimurium, Pasteurella multocida*, and a pathogenic *E. coli* as well as *Aspergillus fumigatus*. Leukosis and fowl paralysis have also been observed.
- Other common ailments based on necropsies include abscesses, candidiasis, hemorrhage (trauma related?), cannibalism, impaction, emaciation, nephritis, peritonitis, reproductive disorders, staphylococcal infections.



Jaime Samour



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VACCINES

- The following vaccines are available for off-label use only in endemic areas with virulent strains: avian encephalomyelitis, Newcastle's disease virus, fowl cholera, infectious laryngotracheitis, avian influenza virus.

ZOONOTIC POTENTIAL

- Ornithosis, *Salmonella*, avian tuberculosis (immunocompromised caretakers), and *Staphylococcus* infections
- Japanese quail may serve as an amplifier for influenza virus.

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American crow (*Corvus brachyrhynchos*)

Sharmie Johnson, DVM

SUBSPECIES

- *C. b. brachyrhynchos* (northern/interior North America)
- *C. b. hesperis* (western USA)
- *C. b. pascuus* (Florida)
- *C. b. paulus* (southern USA)

ORIGIN

- The American crow is ubiquitous throughout North America. It ranges from British Columbia to Newfoundland. The southern range extends to the most northern regions of Baja, California.

SUITABILITY AS PETS/LEGAL STATUS

- American crows are social animals. They readily coexist with man and domestic animals.
- There are federal and state laws prohibiting the capture and possession of these birds without specific permits.
- Legally, veterinarians are permitted to provide care for ill or injured American crows. Federal (United States Fish and Wildlife Service) and state (Game and Fish) authorities should be notified when an American crow is being medically or surgically treated.

PHYSICAL CHARACTERISTICS

- The American crow is smaller in comparison to the common raven (*Corvus corax*).
- The plumage, beak and legs are black. There is an iridescent violet-blue gloss to the feathers on the body,

American Crow Pet Care



VITAL STATISTICS

Life span	7-15; 20+ years (captivity)	Sexual maturity	2 years (avg)
Body weight	438-458 g (15-16 oz)	Clutch size	3-7
Body length	15-19 inches (39-49 cm)	Incubation period	18 days

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There is an iridescent violet-blue gloss to the feathers.

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American Crows

with a green-blue gloss to the wings.
- Black nasal bristles cover the basal one-third of the upper mandible.
- The irides are dark brown, and the oral cavity is dark pigmented.
- Juveniles have a dull, dusky-black plumage with gray-blue irides.
- The oral mucosa is non-pigmented and red in color for the first year of life.

SEXING AND REPRODUCTION

- Adult birds are monomorphic.
- Crows are monogamous and solitary nesters.
- The young are cared for by both sexes as well as other crows, usually older offspring.

BEHAVIOR

- Crows are gregarious and commonly observed in agricultural areas, city dump sites, parks and shorelines.
- They are highly intelligent birds that have the ability to count, solve puzzles, learn symbols, retain information and imitate other animal voices, including humans.
- Crows are usually found in pairs or family groups. In the fall they congregate into flocks of many hundreds to thousands of birds.

CAPTIVE HOUSING

- Guidelines have been established by the National Wildlife Rehabilitation Association (NWRA). Restricted (short-term) care standards require that an enclosure be at least 16 inches (wide) x 22 inches (long) x 22 inches (high) (40 x 55 x 55 cm), followed by limited care

minimums of 24 x 24 x 24 inches (60 x 60 x 60 cm), and finally unlimited enclosure space of 10 x 30 x 15 feet (3 x 9 x 4.5 m).

- Wire cages can be used, but aviary netting is preferred.
- Protection must be provided from environmental elements, predators, vermin and insects (i.e., mosquitoes, ants and bees).
- Perches should be selected to prevent pododermatitis and splay leg. They should be variable in size and covered with natural or artificial products (e.g., rope, Astroturf®).

ENVIRONMENTAL ENRICHMENT

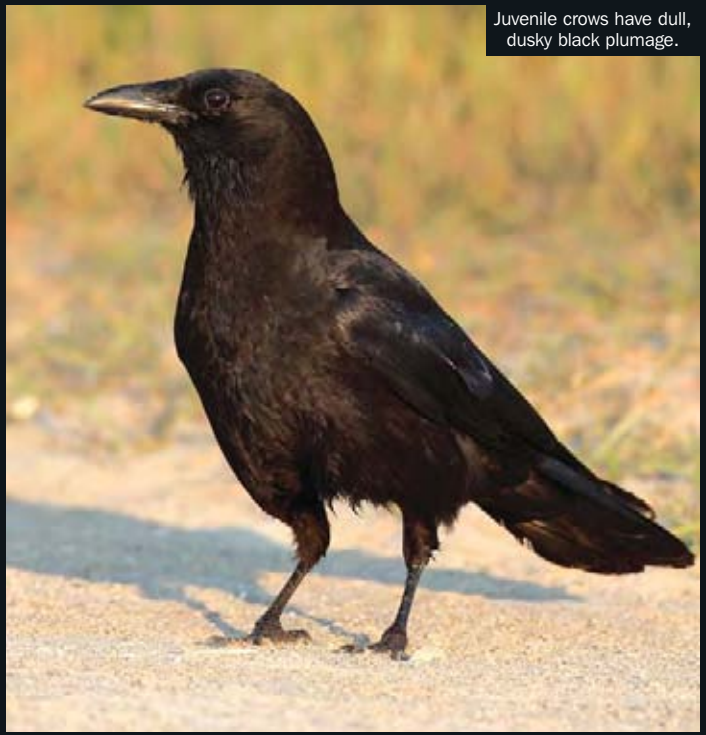
- Cage furniture should not interfere with flight or cause entrapment.
- Environmental stimuli may include approved toys, forage/browse and paper for shredding, caches and hiding food.

DIET

- Free-ranging crows are omnivorous. They feed on a variety of insects, small mammals, amphibians and reptiles. They will consume grain, carrion, eggs and young of other birds, fruit and garbage.
- In captivity, they should be offered a nutritious and complete diet. They can be fed commercial bird of prey diets, insects (e.g., mealworms, waxworms, grasshoppers), eggs, fruit, vegetables and grains.

RESTRAINT

- Crows have tremendous strength in their jaws and feet. Protective clothing and gloves should be considered.
- Trained birds can be restrained by a tether/jess “on fist.”
- Free-ranging birds can be restrained similar to psittacine



Juvenile crows have dull, dusky black plumage.

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George Gastin

species, with the bird's head and body restrained in one hand, while the other hand holds the feet and legs.

- Birds can also be handled with one hand by grasping the tail and wing tips together.

ANESTHESIA

- Anesthetic techniques are identical to those recommended for psittacine and raptor species. Gas anesthesia (isoflurane or sevoflurane) is preferred, initially with mask induction followed by intubation with an appropriately sized non-cuffed endotracheal tube.

MOST COMMON DISORDERS

- Most crows are admitted to veterinary hospitals due to injury, usually vehicular or gunshot. Fractures of the legs and wings are commonplace, as are ocular and head injuries. Electrocution and poisoning are also seen.
- Ectoparasites (feather lice) and endoparasites (coccidia, nematodes [*Diplotriaena triceps*], filaria [*Splendidofilaria caperata*]) are treated in a standard manner as for raptors or psittacine species.
- Crows are highly susceptible to West Nile virus. Birds can be found acutely dead or with neurologic dysfunction. The author has had success treating members of the Corvidae family and other avian species with supportive care (fluids, force-feeding, antimicrobials for secondary infections, hyper-immune sera from previously immunized birds, and equine-based antibody products). If the birds survive, recovery is on average of 2 weeks.
- Aspergillosis, candidiasis and trichomoniasis are common in debilitated or immune-compromised birds.

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American Crows

VACCINES

- There are no commercial vaccines approved for use in crows. Extra-label use of equine vaccines against West Nile virus has been tried in a variety of avian species.

ZOONOTIC POTENTIAL

- Crows are avid consumers of carrion and other decaying matter. They are susceptible to organisms to which they are exposed through their feeding practices.
- *Erysipelas rhusiopathiae, Pasteurella multocida, Salmonella typhimurium, Francisella tularensis, Mycobacterium avium* and *Campylobacter jejuni* have been isolated in crows.
- West Nile virus can be found in the body fluids, tissues and excrement of affected birds.

SPECIAL CONSIDERATIONS

- Venipuncture is easily accomplished at the right jugular vein. The ulnar and medial metatarsal veins can also be used. Reference values may be obtained through the International Species Inventory System (ISIS), raptor centers and zoological institutions.

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American crows have been used for tracking the spread of the West Nile Virus.



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Mandarin Duck Pet Care

A male mandarin duck



VITAL STATISTICS

Life span	up to 20 years	Wingspan	71 cm (28 inches)
Body length	body 43-51 cm (17-20 inches); tail 10.2-10.4 cm (4 inches); bill 27.9 mm (1 inch)	Weight	444-630 g (1.0-1.4 lb); males are heavier

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Mandarin duck (*Aix galericulata*)

Michelle L. Campbell-Ward, BSc, BVSc (Hons I), DZooMed (Mammalian), MRCVS

ORIGIN / FREE-RANGING HABITAT

- China; current range includes Russia, Siberia, China and Japan. Feral populations exist in northern Europe.
- Mandarin ducks prefer any aquatic environment with nearby trees, e.g., small lakes, rivers, marshes and swamps in thick deciduous forests.

SUITABILITY AS PETS

- Mandarin ducks are one of the most popular ducks due to their beauty and charming behavior.
- They are relatively easy to maintain in captivity.

BEHAVIOR

- Free-ranging mandarin ducks are semi-migratory (can cover 500 miles per day) and semi-colonial.
- Most active foraging occurs at dawn and dusk.
- They are surface-feeders and hunt by head-dipping in shallow waters.
- They spend much of the day resting in shady areas.
- Mandarin ducks are highly social.
- They seek out forests or dense branching during a molt.

SEXING AND REPRODUCTION

- Mandarin ducks are dimorphic.
- Males have a black iridescent crown extending to a long orange/cream crest and chestnut cheeks; maroon breast

with black and white vertical stripes; abdomen and underside white with gold/black flanks; olive/brown back and tail; blue/green upper tail coverts and iridescent blue scapulars; wing feathers are chestnut, orange, green and black with distinctive orange “sail” feathers; a broad white eye-stripe is present and extends from the red bill.

- Females are less colorful than males; they lack the crested head; color varies from gray/white to brown/green; crown and sides of the head and neck are gray with a white eye ring and streak; throat and foreneck are white; breast and sides of the body are buff/gray; the back is gray/brown with white spots on the under parts; wings are similar to the males but lack sail feathers; bill is pink/brown with a pale tip.
- During a molt the males may resemble the females but can be distinguished by their red bill.
- Females bear a strong resemblance to the female wood duck but can be distinguished by the longer and more pointed eye stripe in the mandarin duck.
- Juveniles resemble the females.
- The males guard ducklings until they are able to fly.
- Mandarin ducks are often monogamous.

CAPTIVE HOUSING

- They require a predator-proof enclosure with some form of shelter, a pond and a dry nest box.
- Overhead netting to limit wild bird access is recommended.
- Shelters must be well ventilated with a minimum of 0.75 x 0.75 m (2.5 x 2.5 ft) floor space for each duck.
- The shelter may have solid, slatted or mesh floor, and wheat straw or wood shavings are good litter materials.

A female mandarin duck



Mating



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Mandarin Ducks

- Winter heating may be provided if necessary.
- A pond area of at least 1.8 m^2 (19 ft^2) is recommended.
- Water must be fresh and preferably flowing.
- Minimum water depth is 15 cm (6 inches).
- Various designs of nest boxes are suitable. A raised square plywood structure or hollowed log can be used: inside diameter 22.5-30 cm (9-12 inches), an entrance hole of about 10 cm (4 inches) diameter ideally positioned near/overhanging the pond.
- Nesting materials, such as wood shavings and grass, should be provided.
- Mandarins can be housed with other waterfowl species but should be monitored for interspecific aggression.
- Winter-hardy; tolerant of a range of temperatures and humidity provided enclosure allows shelter from extremes.

ENVIRONMENTAL ENRICHMENT

- Shaded areas should be provided as well as hide areas.
- A number of feeding stations should be provided or food may be scattered to promote normal foraging behavior.
- Live, nontoxic plants can decorate an enclosure.
- Social needs are met by housing in pairs or groups (e.g., one male with several females).

DIET

- Free-ranging diet (often seasonal) consists of: seeds, acorns, grain, aquatic plants, other vegetation, worms, insects, land snails, mollusks, small snakes and fish.
- Captive diet may include: commercial waterfowl pellets, fresh dark leafy greens and access to natural vegetation.
- Small amounts of assorted grains may also be fed but

care must be taken not to overfeed.
- Feeds designed for commercial ducks raised for meat production are not suitable.
- Grit should be provided, especially if grains are fed.
- *Ad libitum* access to clean, fresh water is essential.
- Juveniles are best fed on dry crumbs (some water initially); the addition of finely-chopped weeds or dark greens and hard-boiled egg is useful to promote feeding.

RESTRAINT

- A net may be used if attempting restraint in a large enclosure and/or if the animal is unfamiliar with handling.
- One hand may be used to loosely restrain the neck while the other hand is placed under the breast and advanced caudally to restrain the legs between the fingers. The duck is then lifted and rested on one forearm with the cranial end at the elbow and the caudal end pointing away from the handler. The hand that was holding the neck can then be moved to rest on the back, gently holding the wings to prevent flapping.

ANESTHESIA

- Pre-anesthetic fasting is not required.
- Pre-medication (not always required): butorphanol (0.5-1.0 mg/kg IM/IV) or midazolam (0.1-1.0 mg/kg IM/IV)
- Inhalation (via mask and/or endotracheal tube): isoflurane (5% induction; 2-3% maintenance) or sevoflurane (8% induction; 4-5% maintenance)
- Injectable option 1: medetomidine (0.15 mg/kg IV) + ketamine (3 mg/kg IV); reverse with atipamezole (0.75 mg/kg IM)



Mandarin ducks have sharp, long claws that enable them to live effectively in a forest environment and climb up to and nest inside tree cavities.

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- Injectable option 2: propofol (10-15 mg/kg IV) followed by intubation and maintenance on isoflurane/sevoflurane
- Assisted ventilation may be required.

MOST COMMON DISORDERS

- Pododermatitis
- Amyloidosis
- Botulism
- Algal and mycotoxicosis
- Yolk coelomitis
- Dystocia
- Cloacal organ prolapse
- Viral diseases, e.g., duck viral enteritis, duck viral hepatitis type 1
- Bacterial diseases, e.g., *Mycobacterium avium,* pseudo-tuberculosis, mycoplasmosis, salmonellosis, colibacillosis, chlamydiosis, *Pasteurella multocida* (avian cholera), *Pasteurella anatipestifer*
- Fungal diseases, e.g., aspergillosis, candidiasis
- Parasitic diseases, e.g., coccidiosis, gapeworms, mites
- Neonatal disorders, e.g., yolk sac infection/retention, enteritis, leg/wing deformities

VACCINES

- No vaccines are essential but if significant risk factors: duck viral enteritis, Newcastle disease, avian influenza, duck viral hepatitis 1, West Nile virus.

ZOONOTIC POTENTIAL

- Avian influenza
- Avian tuberculosis

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- Campylobacteriosis
- Chlamydiosis
- Erysipelas
- *Escherichia coli* infection
- Newcastle disease
- Salmonellosis

SPECIAL CONSIDERATIONS

- New birds should ideally be quarantined for 30 days prior to introduction to an established group.
- To aid restraint and to permanently limit flying ability where open enclosures are used, pinioning may be performed on conscious ducklings at 1-7 days of age. In older birds, anesthesia is required.

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Emperor Scorpion Pet Care



Bruce Maclean

VITAL STATISTICS

Life span	5-8 years
Body weight	up to 20 g (0.7 oz); pregnant females 50 g (1.7 oz)
Body length	up to 20 cm (8 inches)

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Emperor scorpions (*Pandinus imperator*)

Bruce Maclean, BSc (VetSci), BVM&S, MRCVS

COMMON SUBSPECIES/SIMILAR SPECIES

- There are around 20 species of *Pandinus*, all found in Africa or Yemen.
- Similar species include *Hetrometrus* sp. (Asian, but otherwise approximately similar habits and care).
- Some other species could resemble emperor scorpions to the novice, such as the much more dangerous fat tail scorpions (*Androctonus* sp.), although these have a much thicker tail and smaller pincers.

ORIGIN / FREE-RANGING HABITAT

- Emperor scorpions originate from sub-Saharan Africa and west Africa.
- They are typically found in tropical rainforests in the litter, although there are reports of them in rocky, drier areas.

SUITABILITY AS PETS

- The emperor is probably the most suitable scorpion species as a pet.
- It is generally docile (although there are exceptions).
- Wild-caught specimens and gravid females are more prone to aggression.

PHYSICAL CHARACTERISTICS

- This is a relatively large, heavily built scorpion species with large chelicerae (pincers).
- It has the typical scorpion features of 4 pairs of walking

legs, paired pedipalps (pincers), body consisting of prosoma and mesosoma, and segmented tail (metasoma) bearing a terminal telson (stinger).

- Base color is usually glossy black, but some may be dark brown or even greenish. Notably adult scorpions fluoresce greenish under ultraviolet light. The telson is red/brown.

SEXING AND REPRODUCTION

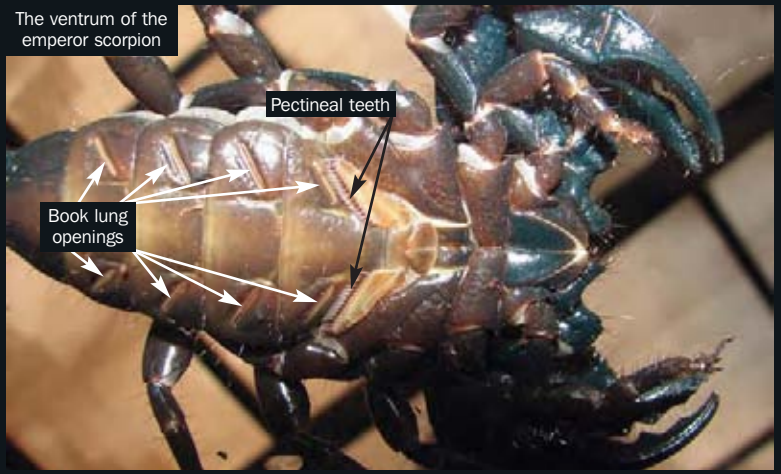
- Sexing requires experience. Males are typically smaller and slimmer than females. They also have longer pectines with more teeth. The genital opening is more oval in the male and heart-shaped in the female.
- The female may kill and eat the male following mating; a larger enclosure may give him a better chance to escape.
- Typically 5-20 (up to 40) live young are born after 7-11 months' gestation. They are white when newborn.
- The young may be reared separately or housed with the mother, who may help them by catching and crushing food. However, if stressed, she may eat the young.

BEHAVIOR

- Emperor scorpions are essentially nocturnal, although they may be observed active in dawn/dusk.
- They are a timid and reclusive species.
- They generally do well housed in groups, especially with siblings, but aggressive (possibly fatal) interactions may occur.

CAPTIVE HOUSING

- The enclosure should be at least 60 cm x 30 cm x 30 cm (2 ft x 1 ft x 1 ft) for a single adult or adult pair.



The ventrum of the emperor scorpion

Bruce Maclean



Scorpion showing fluorescence under a flash

Bruce Maclean

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A basic enclosure for an emperor scorpion



Bruce Maclean

An elaborate enclosure with many hiding places for an emperor scorpion



Bruce Maclean

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Emperor Scorpions

- The substrate should allow some burrowing or at least excavation. Peat, soil or a mix of the two is recommended at a depth of 10+ cm (4+ inches).
- A water dish must be reasonably shallow with easy access and exit to avoid the risk of drowning. It should also be resistant to tipping over as the scorpion(s) may well try to burrow under it.
- Emperor scorpions prefer dim to no lighting; normal room ambient lighting is more than sufficient. A room with bright lighting for 12+ hours is not recommended.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Ambient temperature in the enclosure should be 23-28°C (73-84°F). A gradient should be provided with a heat source at one end (under-floor heating is NOT recommended; they will try to burrow to escape heat).
- Humidity needs to be kept high (80%+), although reasonable ventilation is also necessary.

ENVIRONMENTAL ENRICHMENT

- Hiding places are essential for these scorpions—at least two at opposite ends of the heat gradient and preferably more than the number of scorpions to minimize the risk of aggressive interactions.

DIET

- In captivity, a variety of invertebrates should be offered. Small rodents may also be eaten but should be offered sparingly due to this species' tendency towards obesity.
- Amount should be varied according to body condition of the scorpion, but one invertebrate prey item 3-4 times a

week for young, 1-2 times a week for adults is a reasonable starting point.

- Little is known about supplementation needs for these animals, but gut loading of invertebrate prey is advisable, especially if only one type of invertebrate is offered.
- Uneaten live prey, particularly crickets, should be removed, as they may attack the scorpion, particularly if the scorpion is vulnerable around shedding time.

RESTRAINT

- Direct handling of conscious scorpions is discouraged. They should be encouraged into and examined in a transparent container or gently "pinned" to a transparent sheet to allow visual examination from all angles.
- If handled, it should be done low over a soft/padded surface, to minimize damage from any fall.
- Padded forceps may be used to lift the scorpion by its tail for short distances if necessary, but gentle directing with surfaces or long instruments is preferred.

ANESTHESIA

- Anesthesia may be induced in a chamber with isoflurane (induction at 3-4%); immobility and loss of righting reflex indicate anesthesia. The stinger should always be restrained even when the scorpion is anesthetized.
- As they respire through spiracular openings on the ventral abdomen, maintaining anesthetic gas is challenging.

MOST COMMON DISORDERS

- Emperor scorpions are prone to obesity, although associated pathologic lesions are unknown.

An emperor scorpion can be examined on glass to minimize contact.



Bruce Maclean

A grossly overweight emperor scorpion



Bruce Maclean

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A pregnant female scorpion



A female scorpion with its newborn babies on its back



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Emperor Scorpions

- Shedding problems are uncommon but can occur.
- Failure of juveniles to emerge from their embryonic membrane has been described; moistening and gentle manipulation may resolve the problem.
- Traumatic damage to the exoskeleton may occur; repair may be attempted with tissue glue or superglue. Non-fatal trauma will repair at the next ecdysis.
- Parasitic mites may be seen; these should be gently brushed off under anesthesia to control numbers.

ZOONOTIC POTENTIAL

- Specific zoonoses from scorpions are not recorded, although some potentially zoonotic microorganisms have been isolated from scorpions.

SPECIAL CONSIDERATIONS

- The pincers can draw blood and be painful.
- The venom of emperor scorpions is considered approximately equivalent to a bee sting in severity, but permanent local paralysis has been recorded and anaphylactic shock reaction is possible.
- *Pandinus imperator*, as well as a couple of other *Pandinus* species, are listed on CITES Appendix II.

REFERENCES AND FURTHER READING

1. Lewbart GA: Invertebrate Medicine. Blackwell Publishing, 2006.
2. www.atshq.org (American Tarantula Society)
3. www.thebts.co.uk (British Tarantula Society)
4. www.pandinus.net
5. http://home.mindspring.com/~drrod1/
6. http://www.thedailylink.com/thespiralburrow/anatomy (useful anatomy site)

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