

PRESERVING THE BIODIVERSITY OF THE ECUADORIAN RAINFOREST: Basic healthcare, nutrition and parasitic control of common Amazonian animal species held at the model farm “Centro Fátima”



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This work intends to describe the experiences gained during a two months period in the rain forest in Ecuador and give some recommendations for improving the wellbeing of the animal species that are held at Centro Fátima. This is also a compilation of information and a review of the literature regarding the characteristics and properties of the natural habits of those animals and a description, of some common diseases, disorders and treatments. As a part of this project, most of the animals were de-wormed and nutritional and medical advice was written for almost every species.



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<u>PRESERVING THE BIODIVERSITY OF THE ECUADORIAN RAINFOREST: BASIC HEALTHCARE, NUTRITION AND PARASITIC CONTROL OF COMMON AMAZONIAN ANIMAL SPECIES HELD AT THE MODEL FARM “CENTRO FÁTIMA”</u>	1
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SUMMARY

In order to preserve the rainforest and the animal species, it is essential to create an understanding for the habitat and its creatures. Therefore it is of great value that there is a place like Centro Fátima, which cares and breeds animals from the jungle in a natural environment and show these animals to the rural population and tourists. The Center has created a model farm for preservation of the Amazonas animal species. The three main goals of Centro Fatima are a) to teach native Indians through practical courses and lectures about how to breed and hold those animals, b) to promote sustainable ecotourism and c) create similar Centers in other parts of the country. In this way a greater understanding and respect for the rainforest and its animals is gained. This report contains information about housing, nutrition and medical management of some animal species held at Centro Fátima. It is written as a handbook for the Center to help to promote good health and wellbeing of the animals living there.

SHORT INFORMATION ABOUT ECUADOR

Government type:	Republic
Capital:	Quito
Population:	13,212,742 (July 2004 est.)
Location:	Western South America, bordering the Pacific Ocean at the Equator, between Colombia and Peru Geographic coordinates: 2 00 S, 77 30 W
Area:	283,560 sq km including Galapagos Islands water: 6,720 sq km land: 276,840 sq km.
Land boundaries:	2,010 km border countries: Colombia 590 km, Peru 1,420 km
Coastline:	2,237 km
Climate:	Tropical along coast, becoming cooler inland at higher elevations; tropical in Amazonian jungle lowlands
Regions:	Geopolitically the country is divided in three main regions. The Oriente, the Andes and the Coast. The insular part is The Galapagos Archipelago that is located to the west of the main land. Elevation extremes lowest point: Pacific Ocean 0 m
Natural resources:	Petroleum, fish, timber, and hydropower.
Land use:	Arable land: 5.69% permanent crops: 5.15% other: 89.16% (1998 est.)
Natural hazards:	Frequent earthquakes, landslides, volcanic activity; floods; periodic droughts
Environment:	Current issues: deforestation; soil erosion; desertification; water pollution; pollution from oil production wastes in ecologically sensitive areas of the Galapagos Islands
Geography:	Highest point: Chimborazo 6,267 m. The Cotopaxi in the Andes is the highest active volcano in the world
Ethnic groups:	Mestizo (mixed Amerindian and white) 65%, Amerindian 25%, Spanish and others 7%, black 3%
Religions:	Roman Catholic 95%
Languages:	Spanish (official), Amerindian languages (especially Quechua)

The Oriente Region: Provinces: Morona Santiago, Napo, Orellana, Pastaza, Sucumbios and Zamora Chinchipe. This tropical, warm and humid environment has luxuriant foliage, with a lot of fruit trees and green plants. These surroundings are very favourable for the natural inhabitants of the jungle, but not suitable for imported species. Horses, donkeys, cattle etc. could not profit from the plants in the rain forest, which led to poor growth, undernourishment and a short lifespan. They could eat the plants but were unable to extract any larger amounts of energy. Besides, the warm and humid climate supports insects and other parasites, which adds additional problems. These animals could not reproduce as expected. Dogs (and a few cats) ran around freely. The cats fed on mice that they caught and were also held to serve this purpose. Dogs were mostly held to guard property. De-worming was unusual, and only done regularly by breeders and a few others. Dogs often suffer from internal parasites, which needed to be cured with expensive drugs not available in the common store or at every veterinary clinic.

The Andean Region (mountains): Provinces: Azuay, Bolívar, Cañar, Carchi, Cotopaxi, Chimborazo, Imbabura, Loja, Pichincha and Tungurahua. As this region of the country is located high above the sea level, it is relatively cold, and the vegetation is quite similar to that found in Sweden during summer. The cattle, llamas, alpacas, horses and donkeys held in this area were therefore in good shape. Dogs and cats were not as common as in the villages in the Oriente or at the coast. A lot of poultry were held in these parts of Ecuador. These animals were bred for food or for use in cockfights. In the mountains it is also popular the bull fights. Guinea pigs and rabbits are also common domestic animals, bred for food for special occasions.

The Coast Region: Provinces: El Oro, Esmeraldas, Guayas, Los Ríos and Manabí. The coast has one dry and one rain season. During the dry period there is not much vegetation. The horses and cattle had to depend on what was managed to be “stored” during the green period. Horses were used by tourists for riding at the beach. In some areas along the coast, houses are often built on poles, to avoid damage by floods during the rain season. Dogs and cats at the coast are well fed, thanks to the large fishing industry.

ANIMAL WELFARE

At the whole the animal welfare was not in focus in Ecuador. The animal transportations in the country over all were not designed in the best interest of the animals. If one was to travel with a local bus with animals like hens and guinea pigs these were simply put on the roof of the bus (in sacks or cages). Children were warned to beware of dogs (due to the risk of rabies) and for preventing them from coming close, some violent methods were used. They also did not have much respect for other animals. It was hard to get through the value of these animals and the importance of avoiding extinction in the jungles, since monkeys etc. often only caused damage to property, and was considered as harmful animals.

THE VETERINARY MEDICINE IN ECUADOR

There are several Veterinary Faculties in the country; 2 each in Guayaquil and Quito, one each in Cuenca, Ambato, Loja and Portoviejo and a couple of other cities. However, the universities have very different standards and different reputation. The best universities are those in Quito, Guayaquil and Cuenca but are also more expensive. Medicines are easily accessible in the shops without prescription. The personnel in the stores are quite well informed, but it is recommended to consult a veterinarian on how to use the drugs, and dosages. Medicines are relatively

expensive. More interest is given to vitamins, minerals and other supplements. Compared to Sweden, the veterinary care is extremely cheap, but it is still a lot of money to the local inhabitants, and sick animals are not often taken to the veterinarian. In the the Amazonas-area there are difficulties in de-worming dogs that often suffer from sometimes fatal, blood-sucking internal parasite, which needs to be cured with expensive drugs. The more skilled veterinarians often make necropsies in Ecuador. However, neutering is uncommon; people rather give pet's preventive pills if they prefer not to get offspring. In certain areas dog rabies is a huge problem and owners are obligated to vaccinate annually free of charge. Once every year in cities with a lot of stray dogs the sanitary authorities place poisoned meat along the streets to get rid of the potential rabies carriers. The local people are informed in advance, so they can keep their pets inside their homes.

CENTRO FÁTIMA

Centro Fátima is the name of a model farm in which this study was carried out during a period of around two months. Centro Fátima is situated in the Ecuadorian province of Pastaza, fifteen minutes by car from Puyo, the capital of the province. The center was founded nearly seventeen years ago. It consists of 28 hectares of mainly recovering secondary forest, pastures and paths, but also of some remaining primary forest. The area is located 1,000 meters above sea level in a very humid tropical forest. The average temperature is 21° C, the relative air humidity is 85% and the annual amount of rain is 4,000mm. The center has created a model farm for preservation of indigenous animal species. The three main goals of Centro Fatima are a) to teach native Indians through practical courses and lectures about how to breed and hold those animals, b) to promote sustainable ecotourism and c) create similar centers in other parts of the country.

For centuries Indians have been hunting the local animals in order to get meat. This has contributed to a rapid decrease in number of those animals. The deforestation has also contributed to this and the natural habitats of these animals are threatened. If the rural population could breed these animals instead of hunting them, the wild animals would be preserved from extinction. At the same time the Indian population would have easy accessible and inexpensive food. Those animals also serve as an alternative to e.g. cattle production, which demand large areas for grazing and contributes to the erosion and deforestation of the sensitive environment. Unfortunately, little is known about the major animal health problems of these local animals in conditions of domestic production and therefore an inventory of nutrition, diseases and their etiological agents is necessary.

To promote and develop a sustainable ecotourism is also one of the main goals of Centro Fátima. Ecotourism is a significant source of revenues and contribution not only toward the financing of this particular habitat but also for promoting the "green profile". The Centro Fátima receives help from OPIP (Organizacion de Pueblos Inigenas de Pastaza). This is the largest Indian organization working for preservation of the local culture. The last couple of years also a Swedish organization (Framtidsjorden) has contributed with funds for the Center. However, most of the money comes from the ecotourism. Centro Fátima is also dependent on volunteers from all over the world.

Here follows a list of the animal species found at Centro Fatima. We will also describe the distribution of some of these species and give some recommendations regarding animal behaviour, housing, diseases and general management of them. In this review we have chosen to present data about the species that have relevance for veterinary practitioners in Sweden (dogs excluded). This is a compilation of information and our own experiences at the Centro Fatima.

Mammals:

Capybaras	<i>Hydrochaeris hydrochaeris</i>
Tapirs	<i>Tapirus terrestris</i>
Collared peccary	<i>Pecari tajacu</i>
Guantas	<i>Agouti paca</i>
Guatusas	<i>Dasyprocta fulingosa</i>
Guatins	<i>Myoprocta pratti</i>
South American coatis	<i>Nasua nasua and Nasua narica</i>
Squirrel monkeys	<i>Saimiri sciureus</i>
White-fronted capuchin monkeys	<i>Cebus albifrons</i>
Common woolly monkeys	<i>Lagothrix lagotricha</i>
Black-mantled tamarins	<i>Saguinus nigricollis</i>
Dog	<i>Canis familiaris</i>

Reptiles:

Yellow footed tortoises	<i>Geochelone denticulate</i>
Giant Amazonian river turtles	<i>Podocnemis expansa</i>
Yellow-spotted Amazonian river turtles	<i>Podocnemis unifilis</i>
Red-tailed boa	<i>Boa constrictor constrictor</i>
Rainbow boa	<i>Epicrates cenchria maurus</i>
White caiman	<i>Palenosuchus trigonatus</i>
Black caiman	<i>Melanosuchus niger</i>

Birds:

Severe macaw	<i>Ara severa</i>
Blue gold macaw	<i>Ara araruna</i>
Scarlet macaw	<i>Ara macao</i>
Green wing macaw	<i>Ara chloroptera</i>
Mealy Amazon	<i>Amazona farinose</i>
Blue –headed parrot	<i>Pionus menstrus</i>
REPTILES	

SNAKES

Red-tailed boa - *Boa constrictor constrictor*-



Red-tailed boas, also commonly known by their Latin name - Boa Constrictor - are widespread throughout Central and South America, including the Amazon. They are beautifully colored in a brownish grey and black pattern, with a red and brown tail, which, when the snake is coiled, could be mistaken to belong to another snake. This because its tail color differs totally from the rest of the animal. Juveniles generally have brighter coloration, and are more arboreal than the considerably heavier adults

Rainbow boa - *Epicrates cenchria maurus*



Rainbow boas are one of the less frequently encountered in the Amazonas, and finding one is always a visual treat. It is often said to be the most beautiful of all boas. The colors vary from yellow to reddish brown. It has large, dark circles on the back and smaller on the sides, which has a beige color in the middle. Their abdomen is light grey or white. The head is not particularly large, but it is distinctly wider than the neck. This is a soft-skinned boa with great iridescence in

its skin. Rainbow boas are brown or reddish brown snakes. Rainbow Boas are widely distributed across the whole of the South American mainland and some of the outlying islands, inhabiting a varied range of environments, but mainly humid jungle type habitats. Individuals can reach lengths of 2m or more, though most animals do not reach this size and many of the sub-species are much smaller. Most sub-species of Rainbow Boa will live for 20 to 25 years in captivity.

The Centro Fátima has several boas, both red-tailed and rainbow boas. They came and went – the police brought snakes caught at customs, and later they were released again into the wild. The snakes lived in a 13-angled cage, with a circumference of 19.25m and with a height of 2.2m. The snakes were fed only young chickens. New diets were tried to the rainbow boas.

Recommendations

To improve the health of the snakes, the following advice were written, and left at the centre.

Housing

Cages made with wood, plastic, glass, etc. serve well for boas. Cages should be large enough for the snake to stretch out. Large animals should be kept in cages with a long dimension at least two thirds of the snake's length. Though boas like to climb, floor area is more important than height in a cage, particularly for large individuals. Much controversy exists over what to put in the cage besides the snake. The following is some general advice: it is best to keep the interior of the cage as simple as possible, since it facilitates cleaning, changing water, and taking the snake out of the cage. Careful consideration should be given to rocks, branches, and such that are placed in the cage as the inhabitant's safety depends upon it. Snakes are not bright nor are they adapted to living in cages. As a consequence, they potentially can get caught in rock holes or branch forks that can cause injury or death. Movement through tight spots also can scar the boa if done during the shedding period.

In the bottom of the cage, one can use cedar shavings, dirt, sand, etc. The snakes need to have a hiding place, and since some boas, particularly small ones, like to burrow, shavings are a good substrate that allow them to do this. A depth double the diameter of the snake suffices for burrowing. A damp cage leads to scale mite population explosions and blister disease. Therefore faeces and surrounding shavings should be removed and the bedding replaced with fresh bedding. Cleaning should be carried out at least once a week. All bedding should be replaced and the cage cleaned thoroughly at least twice annually.

Nutrition

A boa can go without food and water for weeks, also it will not beg for food as a cat or dog will. In combination with their elongated morphology and the difficulty of recognizing that the animal is indeed becoming thin, this result in many captive snakes getting so weak that they can no longer feed. For these and other reasons, starvation is probably the most common cause of death in captive snakes. Water should be present in the cage at least a few days out of the week. Boas like to soak in water on occasion, so the container should be large enough to hold snake and water without overflow. Large boas will often tip over containers, unless they are heavy or fastened in place. As boas have a tendency to defecate in their water bowls (and it is also the water they will drink from), water should be changed once or twice a week or whenever faeces are deposited in it.

Boas are not poisonous, but are constrictors. Contrary to a popular myth, constricting snakes do not crush their prey, but rather suffocate it by preventing it from inhaling due to the pressure of the encircling coils. Boas are well equipped to locate prey items, and have a keen sense of smell. The tongue is used to transmit scent molecules from the environment to olfactory pits in the roof of the mouth. The nostrils, play no role in odour detection and processing. Boas may be active by day or by night. As with other snakes, boas are capable of swallowing prey larger than the diameter of their head. This feature is facilitated by their ability to completely unhinge their lower and upper jaws, with the connecting skin and tissue stretching to accommodate the prey item. Boas have no poison fangs, and their teeth are all approximately the same size. The teeth are curved, thus helping them to grasp and firmly hold the prey until they can wrap body coils around it.

Boa constrictors feed on a variety of terrestrial and arboreal prey, with the diet changing over time, as individual snakes grow larger. Prey includes amphibians and other reptiles, small to medium sized mammals (including bats), and even ground-dwelling birds. Boa constrictors are rarely, if ever, considered to be threats to human life, and even infants would be a larger prey item than a large boa would normally consume.

Rainbow boas should be fed with appropriately sized rodents. They feed on a variety of animals juveniles probably eat mostly frogs and lizards, while adults may prey additionally on small mammals, birds and bird eggs. Offering a day old chick, quail or other foodstuffs now and then, according to the size of the individual, will give the snake a varied diet. The adult snake should be fed about once every 14 days or a smaller meal once a week. Young Rainbow Boas should be fed weekly and times between feeds gradually lengthen nearer to adulthood. Considerable discussions exist in food item size, amount of food per feeding, and frequency of feeding for snakes. Table 1 provides a rough guide for boas of different sizes. (Observe that rainbow boas don't grow to the same size as constrictors). Overall amount of food eaten can vary easily from one half to twice as much as indicated in the table. Amount of food given will depend upon temperature and how high a growth rate is desired.

TABLE 1. FEEDING SCHEDULE.

<u>Length of Boa</u>	<u>Size and type of food</u>	<u>Frequency of feeding</u>
40-60 cm	Baby to 3-week-old rats, mice	1 mouse per week
0.6-1 m	3-week-old rats, mice	2-4 mice per week
1-1.5 m	Half-grown rats, chicks	2 rats per week
1.5-2 m	Rats, 1-month-old chickens	2 rats per week
2-2.5 m	Rats, half-grown chickens	3-4 rats every two weeks
2.5 m or more	Rats, chickens, rabbits	1 rabbit every 3 weeks

Please take note that adult rabbits or guinea pigs are no suitable boa food for too small snakes. Even if they may overcome such a large prey item, it is an exertion for the digestive tract and a blow to the system. Fatty liver is frequently diagnosed in animals where such feedings have been applied. The second side effect of such enormous prey items to small snakes is the growth boost in the boas. If one stick to rats, baby rabbits or baby guinea pigs, the growth rate of the boa will always be within a reasonable range. The most significant growth of a boa takes place within its

first 4 years of life. Since boas feed very readily, some precautions are necessary, particularly if more than one animal are present. It is best to separate individuals to different containers, since they will attempt to seize anything that moves nearby when they are feeding and will also try to bite and constrict food that another snake already has. Heavy leather or rubber gloves that extend to the elbows are useful for handling large boas during feeding sessions. Boas feed so eagerly (and carelessly) that they sometimes engulf shavings, gravel, or other indigestible materials as well as the food. The snake may not be able to pass or regurgitate the foreign matter if it is large enough relative to the animal's size. These items can cause stomach ulcers that will kill the snake. The only sure way to avoid this problem is to feed the boa in a container having only the snake and food present. Any aquarium or plastic box will serve for this purpose. Though it isn't always wise to handle the new, wild caught snakes, spreading out big leaves on the ground can solve this problem, on which the snakes can dine.

It is recommended that only animals that already have been killed are to be given as food. The most important reason for this is to prevent injury to the snake as a result of bites or scratches caused by the prey. The most common traumatic lesions in snakes are rat bites. Deaths rarely result from these bites, but permanent scars do, since destruction of underlying soft tissues usually occurs. Live food should *never* be left with a snake, unless the situation is kept under observation. Rats and mice can and will chew patches of skin off of a snake. Killing the food animal beforehand is also more humane for the prey. Boas do not care whether the animal they are eating is alive or dead; they usually constrict it as if it were alive. Food items can be offered to a boa with tongs, by dropping the food into the snake's container, or by leaving the food in its cage.

If a boa refuses to eat, it is either too cold, already full, frightened, shedding, sick, or pregnant. Full, shedding, and pregnant boas should not be fed, cold boas should be kept warmer, frightened individuals may have to be left with their food overnight, and sick animals may require treatment or force-feeding. Newborn boas have a substantial amount of yolk in the gut and spend their initial one to two weeks shedding. They should *never* be fed until after their natal shed, as doing so increases the risk of amoebiasis or other intestinal infections. Since boas readily will accept dead animals, it is often convenient to obtain a large amount of food, kill and freeze it, and defrost suitable portions at the time of future feeding sessions. The food only needs to be at room temperature. The method of choice for euthanasia is cervical dislocation. Freezing destroys parasites that might be passed on to the snake, but it may also be deleterious for vitamins, though this is not proved scientifically. For whatever reason, if a snake should refuse to eat, the food should always be discarded and never refrozen. The convenience of frozen food is another strong reason for giving boas dead animals to eat.

Temperament and handling

Boas tend to be very easy-going snakes. Disposition varies among individuals, between races, with age, and in response to handling. Of course one always needs to be extra careful when handling wild caught animals. If a boa is in a bad mood, the head and neck usually are thrown back in an S-curve and the animal may hiss long and very loudly. It is not hard to tell when a boa wishes to be left alone. After biting, the snake may let go immediately or clamp down with its jaws and coil tightly around anything available, including arms and legs. Holding the animal's head under a running tap may convince it to release its hold. Otherwise, a flat card or blade must

be forced between one of the jaws and whatever it is biting. At this point, the other jaw can be unhooked.

Tongs for holding the food item help greatly in avoiding mistakes on the snake's part during feeding. Another possibility is to give live food, though this might cause injury to the snake, if the food (usually a rat) bites the snake. If live food is given, the snake *must never* be left alone with its prey. Handling the snake after feeding is not recommended, since it is prone to bite and also may regurgitate. Boas feed very reliably and initially seize prey on the basis of smell rather than vision. Thereafter, their sense of smell seems to be swamped and they may bite anything that moves suddenly in their vicinity.

Some boas, especially those around a length of one meter, sometimes become nervous when handled. They also may bite lightly if touched suddenly on the body. These bites are not serious and do not hurt much (though they will bleed a bit). They can be avoided by handling the snake in a gentle manner without any sudden moves. In general, snakes should be supported fully and allowed to wrap around the hands and arms of the person handling them. They fear situations where they might fall so holding an animal around the body at an arm's length definitely tends to make it feel insecure. In any event, this proclivity to biting seems to be part of an "adolescent" stage that the snake will grow out of. Bites of boas less than one and a half meters generally have the severity of a cat scratch, but those from larger boas can require a few stitches if the skin tears when the person or snake pull back.

Some diseases and disorders and recommendations of treatment

Very little therapeutic knowledge exists for diseases and many medicines known to be effective in treatment are not generally available, so the key keeping a snake healthy is prevention. The list below covers most commonly encountered problems.

Colds. Since they are tropical animals, boas are highly susceptible to colds, if not kept in their natural environment in the Amazons (warm and humid). Snakes caught in the jungle, but transported illegally in cold vehicles in the mountains could easily be affected by a cold. Symptoms are mostly as in people: lethargy, depressed appetite, laboured open-mouth breathing, wheezing, congestion, and oral discharge. Simply raising the temperature to the 27 to 30°C range in the cage solves the problem.

- **Pneumonia-** Pneumonia is very serious and requires treatment with antibiotics. An infected animal exhibits extremely severe cold symptoms and will be too weak to shed or eat. It should be isolated immediately and given intramuscular injections of antibiotics. Force-feeding as described below. Snakes that are kept warm and well fed will not contract pneumonia.
- **Mouth Rot (Stomatitis).** Mouth rot can be disfiguring and, if it leads to starvation, lethal. The oral mucosa presents a cottony appearance and swells till the animal cannot fully close its mouth. This bacterial infection (*Aeromonas*, *Pseudomonas*, *Pasteurella*) is treated effectively by swabbing the oral cavity twice a day with mild antiseptic solutions. Severe cases may require antibiotics. Force-feeding as described below may be necessary if the condition has progressed far enough. Mouth rot is prevented easily by proper cage construction and hygiene.

- **Starvation (Inanition).** Starvation is usually a secondary effect of another disease but frequently the primary cause of death. (Many of the snakes arriving were very thin due to long term keeping without proper prey.) A thin snake will be lethargic and weak. An emaciated snake will exhibit prominent bones, sunken eyes, and a shrivelled skin as well. Curing the disease and force-feeding, if necessary, comprise the treatment. Diluted and beaten egg yolk mixed with meat cut in small pieces is tube fed to the snake to gain back or maintain body weight. A flexible tube attached to a syringe filled with food is passed down the oesophagus and the food is then injected into the stomach. Force-feeding small food items to a sick snake is a last resort. The food should be lubricated with beaten egg yolk and pushed down the throat with a flexible blunt probe. Injuring the snake's cervical vertebra is easy to do when force-feeding. Sometimes a non-feeding animal will complete eating unassisted if the food item simply is pushed into its mouth.
- **Scale Infections (Blister Disease or Vesicular Dermatitis).** Bacterial or fungal scale infections result from the combined effects of high mite populations, cool temperature, and damp, dirty cage conditions. In some circumstances, low humidity can also cause this condition. The infections themselves are small, upraised areas covering one or two scales. Severe infections are suppurating. Scarring usually does not result from scale infections. In combination with the conditions causing them, the infections by themselves cause an animal to weaken, stop eating, and forego shedding. The cage must be cleaned and dried out in such cases. The snake can be soaked in dilute organic iodine solutions for an hour a day. Very weak snakes must be given something to support their head out of the solution and should be monitored to avoid drowning. Force-feeding may aid recovery in weakened snakes that refuse food.
- **Problems with Shedding (Dysecdysis).** The reason that snakes shed their skins often is said to be that shedding permits growth. This idea has arisen because the snakes shed their skins as a single piece and the situation has been analogized with the molting of insects and crustaceans. Snakes actually grow in the same way as the majority of other organisms, *i.e.*, cell division. The true reason they shed their skins is the same one that people have for shedding: to replace the outer damaged layer of the skin. The only difference is that snakes do it all at once; people and other animals tend to do it in patches (dandruff is the most visible evidence of this). Boas undergo a well-defined physiological sequence when they shed their skins. The first indication is dulling of the overall pattern; the snake may refuse to feed from this point until after it has shed. Animals should not be fed or handled during the shedding period, as the skin is very soft and susceptible to injuries causing scars. Within a few days, the skin becomes completely dull and the eye spectacles assume an opaque milky appearance for a day or two. Snakes can be quite nervous during this period when they cannot see well. They often develop a proclivity for soaking in the water container at this time. The skin and spectacles then clear up and shedding occurs three to seven days later. As mentioned before, sheds should be removed promptly to prevent mite infestations. The new skin exhibits bright vivid markings.

Unhealthy snakes or those under poor cage conditions often have problems with shedding their skins. Low humidity and/or temperature can cause a boa to forego shedding even though it has completed the preparatory stages. Shedding boas should be kept warm and under high humidity. Recalcitrant individuals can be soaked in an appropriate container to keep the old skin from drying and adhering to the new one. Wetting of the snake and

shedding by hand should be done when areas of old skin have loosened and the snake still refuses to shed on its own. Even healthy individuals occasionally have difficulties with certain areas, usually the spectacles and the tail. If patches of old skin are still adhering to the new one after a snake sheds out, removing the old skin is a fairly simple procedure. A finger moistened with water or mineral oil is rubbed over the free anterior edge of the old skin toward the tail. The old skin should come off fairly easily. Care must be taken with removing an old spectacle, since the edges of it may be adhering tightly and trauma to the underlying new spectacle and eye may occur. Very rarely, it is better just to leave the old spectacle or other unshed skin in place until the next shedding.

- **Amoebiasis.** Amoebiasis is the worst infectious disease of snakes. The rear half of an infected animal's body may swell greatly, movement becomes difficult, a hard plug may form in the colon anterior to the cloaca, anorexia develops, and the snake can only pass blood-tinged mucus. The snake generally can only drag the rear half of its body around. Animals usually die a few days later from gastrointestinal enteritis and liver abscesses. Infected individuals should be isolated immediately, preferably to a different room. The cage must be disinfected thoroughly. Since the pathogen, *Entamoeba invadens*, occurs in a cyst form, it is extremely infectious and can be transported in bedding or on the hands. Antibiotics are necessary, and high temperatures in the 35 to 37°C range evidently cause infections to die out. Control and eradication of infection may be possible by holding animals at this temperature range for one to two days. Conversely, quick drops in temperature to around 25°C may also trigger a latent infection into the full-blown disease. Prevention requires avoidance of crowded community cages with many snakes, an appropriate temperature regime, good cage hygiene, and food that is not old or refrozen. Lesions of the intestinal wall caused by ingestion of shavings or other rough indigestible matter may increase susceptibility to infection.
- **Cestodes, Nematodes, Trematodes, and Lingulatis.** These parasites usually never become a problem unless the infected animal becomes weakened for some other reason. Use of some cat or dog medicines can kill snakes. Some snakes regularly pass tapeworms, but never seems to be bothered by them. If a boa somehow gets internal parasites, it is recommended that nothing is done unless the animal shows chronic weight loss
- **Mites, Ticks, and Lice.** Mites (*Ophionyssus*) and ticks (*Ornithodoros* and *Amblyomma*) are parasitic arachnids dangerous for their ability to transmit viral and bacterial pathogens. They suck snake blood, they annoy snakes and they are potential vectors for the transmission of serious diseases. They can also be difficult to eliminate once introduced to a captive snake collection. Book and wood lice (Psocoptera), however, are only nuisance insect pests. Unfortunately, it is very hard keeping snakes free of mites. The ideal solution is prevention through the strict quarantine of any new incoming animals.
The best strategy to keep the arthropod populations as low as possible (preferably at zero) is by keeping the cages clean, dry, and uncrowded. Prompt removal of faeces and sheds also prevents conditions conducive to their reproduction. The presence of mites and lice can be determined most easily by examining the inner surface of a recent shed (actually the outer surface of the skin). Since they will be moving around and are whitish grey (lice) to black (mites) in colour, even small mites and lice will be visible against the light background of the shed. They also turn up in the water container after an infested boa has been soaking in it. Large mites can be seen easily when they are running around on the head and other body

parts of the snake. When discovering mites on a snake or in the cage of a snake, the snake should be soaked in soapy water for at least 8-10 hours. This is the nicest, simplest and easiest way to get mites off of snakes. Adding soap reduces the surface tension of the water, which makes the surface of snakes and mites "wetter," and the mites then drown more quickly. (Soaking may not be possible if the snake is ill or uncoordinated, or for any reason seems at risk for drowning.).

The snake is put in a container with water just deep enough that it can barely submerge when resting on the bottom. An aquarium will work great for most snakes. When soaking snakes, it is important that the water isn't so deep that the snakes have to swim to be able to breathe; they may become exhausted and drown. It's important to regulate the temperature of the bath so that it does not chill below the normal temperature to which the snake is accustomed. After the period of soaking, it is good to check around the eyes of snakes to see if there are any mites surviving there - they may have been high and dry throughout the soak if the snake has kept his head out of the water. If there are mites around the eyes, they can be removed by wiping some dilute soap around the margin of the snake's eyes. With a cotton swab, one also can wipe a little Vaseline into the space around the margin of the eyes of the snake; the grease of Vaseline will prevent any mites to wander in later.

Ivomec® is a commercially available form of ivermectin, a powerful dewormer. Ivomec is formulated for horses and cattle, and is available in farm and ranch stores. It is a very powerful drug and when used as an injected drug in snakes, the recommended dosages are very tiny. When ivermectin is injected into snakes, it has the unexpected side-effect of killing every mite and tick that is feeding on the snake. This has led to the use of ivermectin spray to control mites. Observe though, that one should be cautious with the use of Ivermectine-spray on wild-caught snakes with infestations of pentastomid or linguatulid lungworms (relatively common parasites in many species of boas) since this might possibly result in the death of the lungworms due to inhalation of the spray which may be fatal to the snake as the lungs get clotted with parasites.

It is not only the snakes that need to be treated – there are also mites in the cage of the snake. Therefore the traditional way of rubbing snakes with paraffin oil does not do the trick since it does not kill eggs in the cage. If mites or lice get out of hand, small pieces of a pest strip can be enclosed in containers punched with holes and placed in the cage for several days. A thorough cleaning of the cage and soaking of its occupants in water should also be carried out at the end of this period.

It is necessary to consider two points to successfully get rid of mites from an infested cage. First, all five life-stages of mites are probably in the snake cage, while only two of the life-stages are on the snake. Mites take nourishment from snakes in the form of blood. But then mites usually drop off the snake to find a mate or some suitable place to lay eggs. Often mites climb up the cage sides, stopping at the first corner, knothole, or seam to deposit eggs. The second point to consider is that mite eggs may be more difficult to find and kill than the mites. In fact, it's best to assume that some eggs will survive all efforts and hatch out in 1-4 days.

It is important to clean everything out of the cage, and to throw away everything that's not plastic, glass, metal or ceramic. Then soak everything that is saved in a strong disinfectant solution, e.g. chlorine. The cage should be washed out with a strong disinfectant solution, scrubbed thoroughly from top to bottom remembering all the corners and seams and other possible egg laying sites. On a light-colored surface, the eggs of one female mite will appear as a tiny, tan smudge, almost invisible to the unaided eye. Often many female mites will lay their eggs in the same location. Many good disinfectants will kill mites of any age on contact. The first wash may not dislodge the eggs and the disinfectant may not kill the eggs, but the eggs are easily scrubbed free and they can then be washed out of the cage.

The cage is then rinsed and dried. No mites should be present in the cage or on the snakes at this point of the treatment. When the snake has completed its soak, it should be put back in the scrubbed cage. But, though a few mite eggs may remain behind, it is wise to place the appropriate amount of pest strip in the cage for at least a week. Not too much though since snakes exposed to too high concentrations of fumes from pest strips will suffer a variety of problems, including anorexia, convulsions and could even die.

TORTOISES

General aspects: Tortoises are land-based, thick-bodied, have blunt heads/faces and have “tree-trunk” legs (like an elephant). Most are nearly exclusively herbivorous and should not be offered animal-based foods including live foods. Some tortoises need small amounts of animal protein (this is the case when it comes to true rain forest species). Tortoises can't completely close the shell so the legs tend to be armoured. They come from a wide variety of habitats, ranging from desert to tropical savannah. In the wild, tortoises tend to be browsers. They wander over quite a large area and in the process take small quantities of a very wide variety of seasonally available food. The exact combination of plants, and their status, young, fresh and succulent or old and dry, varies seasonally. Tropical species experience major seasonal (rainy/dry) variations in food availability. A tortoise's diet changes continually throughout the year. By wandering over a wide area, and by consuming such a variety of foods, tortoises ensure that their overall intake is well balanced and can supply the essential mineral trace elements that they require for reproduction and healthy bone development.

Without an adequate level of vitamin D3, calcium is useless for building bones. In order to synthesize D3 properly, both UV-B radiation and radiant heat is required. True rain forest species obviously cannot and do not sunbath to the same extent as species from deserts or plains. Their diets tend to be very different, in that such species are usually omnivores. Much of the vitamin D3 component they require is, in this instance, met from the animal component of their diets. They are therefore far less dependent upon sunbathing than exclusive herbivores. Tortoises have quite a high demand for calcium in their diets, especially when undergoing rapid growth (a juvenile, for example) or in the case of egg-laying females. Such animals tend to actively seek out extra calcium to meet these needs. If it is not available, they can rapidly suffer deficiencies. During episodes of rainfall tortoises will drink from the puddles that form, and they may also approach streams or ponds. They frequently pass urine at this time as well, and will simultaneously dispose of the chalky white uric acid residues, which form in the bladder. During the dry season, and in the more arid parts of their range, tortoises rely mainly upon the water content of their food in order to supply their moisture requirements.

Yellow footed tortoise - *Geochelone denticulata*



The Yellow-footed tortoise is found throughout Amazonians and in Brazil Bolivia, Ecuador, Guianas, Peru and Venezuela, generally restricted to higher sections of the lowlands but they may as well be found up to 800 m. They thrive in moist tropical forest, often in the vicinity of water. It is known as the third largest of the extant (living) mainland tortoises. This designation is somewhat misleading as most reach only a length of 35 cm and a weight of 6 kg (2.5-14 kg), but giant specimens up to 70 cm long and 50 kg in weight have been reported. The males are larger on the average but the giant specimens are usually female.

Tortoises are diurnal, solitary and slow; sometimes resting for days at a time in the thickest vegetation. They are apparently more active during the rainy season, in the morning and towards afternoon. They may bathe in pools, particularly during the hottest hours of the day. Tortoises probably feed primarily on plant matter found in the undergrowth - sprouts, shoots, fungi, flowers and ripe fruit of various kinds (*Annona*, *Duquetia*, *Genipa*, *Spondias*, *Bagassa*, *Inga*, *Clarisia*, *Faramaea*). They often congregate in places where ripe fruit is falling. They also eat carrion and faeces and ingest gravel. Captive adult Yellow footed tortoises eat up to 100-150 g/day (504).

Sexual activity is concentrated in the rainy season from June to August. The eggs are laid from June to February, but egg deposition dates vary seasonally by region. A clutch ranges from four to eight eggs weighing an average 70 g. They may produce as many as four to five clutches during the mating season at intervals of one to three weeks. The incubation period is long and variable, in average 136 days. About two thirds of the eggs hatch.

Indians capture these slow-moving easily caught tortoises wherever they find them. Sometimes they use dogs, but other, more destructive techniques involve burning dry-season vegetation to facilitate capture. The live animals are kept penned or on their backs until they are ready to be eaten or sold. The white and very flavourful meat of the tortoise is the main product. Some tortoises are intended for the family table but often at least half are sold in town.

The importance of this species in rural diets is spurring the exploitation of wild populations. As harvesting advances, it is now suspected that these slow-growing tortoises, requiring several years to reach sexual maturity and are of low reproductive capacity, are gradually dwindling in

numbers. Compliance with the restrictions in force in various countries must be enforced - first and foremost the trade restrictions - if the survival of these chelonians is to be assured. Parallel research on tortoise biology, reproductive capacity and growth in the wild is also needed because so little is known about their population levels and ecology under field conditions. Captive breeding is not all easy, because these tortoises are hard to feed and quite aggressive, particularly males during the oestrus season. Tortoise breeding for food is not attractive economically in any case, due to the low reproduction rates and slow growth.

Recommendations

A nutritional “plan” and advice was also written for the tortoises and turtles. A proper diet is, as for most animals, the best way to avoid diseases and offer the animal the best prerequisites to oppose infections. Housing advice was also given to make the keeping of the animals as optimal as possible (the turtles were the ones in most need of an improvement). A medical handbook was written to be able to recognize some of the common diseases and be able to provide the turtle/tortoise appropriate help. Since the vitamins and minerals needed by turtles and tortoises are the same only one copy of this was written. The rest of both the nutritional advice as well as the “medical handbook” were more adjusted to the animal handled.

Nutrition

Try to ensure that all diets given to tortoises are as varied as possible - in this manner a wider cross-section of natural trace elements will be made available. Most tortoises are strict vegetarians, although the rain forest species also need an animal component (earthworms, slugs etc) to make sure that the need of vitamin D3 is met. They need a maximum of 7% proteins in their diet and lots of fibres. The calcium: phosphorus relationship should be 4:1. The tortoise should be offered leaves, grass and hay (which is rich in fibres). It is important that the hay is green and dust free. The rest of the diet should be composed as follows:

Mixed green-leaved vegetables (90%) such as: clover, lettuce, carrot-leaves and flower-leaves. Other vegetables (10%) such as: tomato, cucumber, zucchini, and cauliflower. Multivitamin preparation should not exceed 4% and calcium 10% of the weight of the feed. Avoid vegetables rich in oxalic acid such as spinach and rhubarb because these bind the calcium so the turtle cannot assimilate it properly. Apricot, dandelion, fig and parsley all are rich in calcium and can therefore with benefit be given to the turtle. Beans, cheese, egg, bread and milk products can cause health problems and should therefore be avoided.

Vitamin-A. Is important to the condition of the skin and mucous membranes, eye (especially retinal) condition, biochemical and reproductive functions. Plants contain carotene that is converted to true vitamin-A in the body.

Vitamin-B Complex. The B-complex vitamins are water-soluble and excesses are excreted in the urine. Vitamin B1, thiamine, is a regulator in the carbohydrate metabolism; Vitamin B2, riboflavin, is a co-enzyme in energy release and interacts with vitamin B6 and vitamin B12; Vitamin B3, niacin, is also crucial to the energy metabolism and is often obtained by converting the amino-acid tryptophan - this process requires the presence of thiamine, riboflavin and pyridoxine; Vitamin B6, pyridoxine, is involved in energy conversion from glycogen and in the synthesis of haemoglobin and antibodies; Vitamin B12 interacts with folic acid to govern the

production of red blood cells. A deficiency causes pernicious anaemia and neurological symptoms. This vitamin is only produced within the gastro-intestinal tract when various microorganisms act upon trace level cobalt. Deficiencies can occur following malabsorption syndrome or as a consequence of severe parasite infestations.

Vitamin-D. Sometimes called 'the sunshine vitamin', vitamin-D is a fat-soluble vitamin, which is essential to the absorption and utilisation of calcium and phosphorus, as such, it plays a major role in bone formation. It can be obtained either naturally, by the action of ultra-violet light on sterols in the skin, or orally by supplementation.

Vitamin-E. Many plants contain vitamin-E, which is an antioxidant and works in conjunction with vitamins A and C.

Vitamin-K. Is a fat-soluble vitamin. This vitamin is synthesised in the gut by bacterial action and is also found in plant foods. It is especially abundant in green, leafy plants.

Minerals. Minerals are both chemical regulators and construction materials - Calcium forms a major part of a tortoise's body, more than any other mineral. Calcium deficiency is also extremely common, as a growing tortoise requires substantial quantities of this mineral in order to build its skeleton. The building of healthy bone tissue is the result of many vitamins and minerals acting in cooperation with each other. It is essential to note that the body poorly absorbs calcium whereas phosphorus is readily absorbed - if a diet is heavy in phosphorus in relation to calcium, the excess phosphorus will prevent the uptake of calcium to the bone. Calcium and phosphorus together account for three-fourths of the mineral elements in the body, and five other elements account for most of the rest. It is important to note that their actions are interrelated; no one mineral can function without affecting the others. The major function of calcium is to act in cooperation with phosphorus to build and maintain bones. Calcium is essential for healthy blood and also helps to regulate heartbeat. In addition, calcium assists in the process of blood clotting and helps prevent the accumulation of too much acid or too much alkali in the blood. It also plays a part in muscle growth, muscle contraction and nerve transmission. Calcium aids in the body's utilization of iron, helps activate several enzymes (catalysts important in metabolism), and helps regulate the passage of nutrients in and out of cell walls. Calcium absorption is very inefficient. Two factors affect absorption directly; the availability of calcium in the diet and the current body need. Unabsorbed calcium is excreted. Certain substances interfere with the absorption of calcium. When excessive amounts of fat combine with calcium, an insoluble compound is formed which cannot be absorbed. Other substances that can disrupt this process include oxalates and phytic acid.

Phosphorus. Phosphorus is the second most abundant mineral in the body. It functions along with calcium. A balance of calcium and phosphorus is needed for these minerals to be effectively used by the body. Phosphorus plays an important part in almost every chemical reaction within the body. It is important in the utilization of carbohydrates, fats and protein for growth, maintenance, and repair of cells and for the production of energy. It aids in the transference of heredity traits from parents to offspring. It is also necessary for proper skeletal growth, kidney function and transference of nerve impulses. If phosphorus content is high, additional calcium must be taken to maintain proper balance.

Some disorders and diseases and recommendations of treatment

- A soft shell can be caused by calcium or vitamin D deficiency in the feed. Give additional calcium or vitamin D (depending on which of them that is causing the problem).
- Swollen eyes are most often a sign of vitamin A deficiency. The remedy is a vitamin A injection and (if the eye is infected) an antibiotic ointment.
- Pneumonia in land turtles is seen by that the tortoise is listless, it lacks in appetite, it opens and closes its mouth (like a fish), often has a nasal discharge and a hissing breathing. A turtle with pneumonia should be isolated and given antibiotics.
- Problems with laying eggs are associated with calcium deficiency and additional calcium should be given. Sometimes the egg has to be removed with help of a veterinarian.
- If the tortoise's neck is swollen behind or under the eyes (on one or both sides of the head) it can be a sign of vitamin A deficiency in which case additional vitamin A should be given. A chronic airway disease can also cause it and then both antibiotics and surgery are needed.
- Shell-rot causes spots or colour changes in the shell. It can be caused by trauma or by the wrong diet. One should help the turtle get well by providing good food, water, warmth and if needed medicine applied locally or injected.
- Intestinal parasites can be seen as thin white worms in the faeces and the turtle should then be dewormed.
- Due to the wrong diet the turtles beak can grow too long and give difficulties eating. The beak should then be trimmed.

NOTE! Salmonella is often part of the normal intestinal flora in turtles while in humans it can cause illness with diarrhoea and vomiting. It is therefore imperative that good hand hygiene is maintained after handling the turtles!

TURTLES

Giant Amazonian river turtle - *Podocnemis expansa*.



The original distribution range embraces the Amazonas and Orinoco river basins and includes Brazil, Colombia, Peru, the Bolivian Amazonas and the Colombian and Venezuelan Orinoco basin, extending also to Ecuador and the Guianas. They live in tropical calm waters of big rivers with marked changes in seasonal water levels. During the high-water period, they are also found in flooded forests, swamps and lagoons whereas during the dry season they concentrate in the principal riverbeds. The giant Amazonian river turtle is the biggest Latin American with strong sexual dimorphism by size. The length of adult females varies between 50 and 80 cm (up to 90 cm) in length and 40-50 cm in width. The total weight is about 25 kg. (The largest can weigh up to 70 kg.) Adult males measure 40-50 cm in length and 30-40 cm width.

Most data on behaviour concern reproductive activities along the river banks. The Giant Amazonian river turtle seems to be diurnal in its aquatic medium, with mid-morning and afternoon peaks of activity. The females bask in the sun for only a few weeks before laying eggs, and are very shy out of the water, diving back at the first sign of disturbance. The Giant Amazonian river turtle seems predominantly frugivorous, feeding on various fruits and seeds of flooded forest trees, particularly legumes, and rounding out its diet with green stems and leaves, freshwater sponge (*Spongilla* sp.), eggs, and other scraps of animal origin. During the breeding season, the stomachs of the Giant Amazonian river turtle females are either empty or contain only residual quantities of sand, decomposed wood or filamentous algae. In captivity, newly-hatched baby turtles eat meat, fish and vegetables, but their diet in the wild is unknown. The nesting is performed along river banks in the dry season, frequenting the same beaches in massive amounts. The egg-laying coincides with dry-season low-water minima and therefore varies from site to site. In Ecuador it is done during January-February. After one or two weeks of basking in the sun on the banks of the nesting beaches, the turtles come out at night to lay their eggs on selected sandy beaches along the big rivers, generally concentrating in the highest part of the beach. In a nest 60-80 cm deep, they deposit from 50 to 180 eggs, depending on female body size. The average number of nest eggs is 80-130, probably reflecting differences in size structure between the respective populations. The incubation period ranges from 45-65 days, but often the newly-hatched baby turtles remain longer in the nest, until the rains begin, when they begin to move down toward the flooded river. About 95 percent of the eggs produce viable

hatchlings. There is one male for every 30 females among the newborn. Some years, flooding before the end of the incubation period takes an enormous toll in mortality.

These turtles are hunted for their eggs, and the adult females are also caught on the nesting beaches and fished out of the water. Turtle tracks and excavations reveal the location of the nests, with the hunters probing the consistency of the sand with the bare heel or a slender rod. Massive captures of the giant Amazonian river turtle on the beaches occurs usually after midnight during their egg-laying period. Outside of the breeding season, these turtles are fished in rivers with hook and line using fruit as bait. They are also hunted with harpoons and spikes in the flooded swamps and riparian forests where they feed (the area having first been baited with their favourite foods). Some indigenous peoples hunt them with bow and arrow and they may also be caught with trawlnets or beach seines. They are captured alive, and simply flipped over and/or tied, for short periods, or penned for longer periods in lagunas or ponds. Turtle meat and eggs are used for food. The oil extracted from the eggs is a major commercial item. The white, very flavourful meat of these turtles is a prized and very palatable food. The shell is often used as a tray or cooking utensil.

Yellow-spotted Amazonian river turtle - *Podocnemis unifilis*.



(left picture-a baby, right picture-adults)

The distribution is similar to that of the Giant Amazonian river turtle. They are restricted to tropical waters up to about 200 metres. They live in the calm waters of big rivers with marked changes in seasonal water levels. During the high-water period, they are also found in flooded forests, swamps and lagoons whereas during the dry season they concentrate in the principal riverbeds.

Adult females have a length of 40-50 cm, and a width of 35-45 cm and weigh 5-10kg. Adult males measure 20-40 cm in length, 20-35 cm in width and weigh 2-5 kg. Most data on behaviour concern reproductive activities along riverbanks. The Yellow-spotted Amazonian river turtle likes to sun in groups on tree-trunks or stones in the middle of the river and occasionally along the shore.

The Yellow-spotted Amazonian river turtle partly shares the same diet as the Giant Amazonian river turtle, but green floating or submerged plants form the basis of its diet and fruits are only a supplement. The Yellow-spotted Amazonian river turtle juveniles in captivity can collect small particles from the surface water film, and quite possibly also do this in the wild. The nesting

occurs along riverbanks in the dry season. The yellow-spotted Amazonian river turtle breeds approximately in November-December and is believed capable of producing two nests per season. It prefers sandy beaches close to the water for nesting but may also use clay soil beaches, steep riverbanks, and even areas covered with leaf litter. Usually it nests alone or in small groups from evening to midnight. The nest is about 25 cm deep and contains 10 to 50 eggs, depending on female body size. The average is 20-30. These are oval, hard-shelled eggs with an incubation of 50-70 days, and the eggs hatch in 65 to 160 days. A good 90 percent of the eggs in undisturbed nests do hatch, but the local people even in officially protected reserves rob many nests. They are also exposed to natural predation by lizards, ants, birds and raptors and certain mammals. Also mortality from premature flooding of the nest can be very high.

General aspects: The habitat preference of aquatic turtles differs considerably from one to another. These turtles are found in rivers, ponds and streams. In many species the young are much more carnivorous than the adults, a fact to bear in mind when feeding in captivity. Green leaf plant food should always be available however. The female lays her eggs out of the water in a nest dug into a suitable sunny riverbank in late spring or early summer. Just as the tortoise, the aquatic turtle need vitamin D3 and calcium to maintain a healthy bone and carapace development.

The diet of most turtles is, by contrast to most land tortoises, dependent to varying degrees upon animal protein. Many aquatic turtles are predators and most are opportunistic omnivores consuming a wide range of small fish, snails and similar creatures. Their diet also includes many aquatic plants, and in some cases, this constitutes the bulk of their food intake. These provide not only protein but also calcium in balanced amounts (whole animals are eaten - bones included - not just the fleshy parts). Much of the vitamin D3 component they require is obtained from their animal prey. In captivity, it is essential not to make the mistake of feeding only the 'best' meat without the calcium-containing bones. Large bone splinters can, however, prove to be a danger in their own right if swallowed whole. In the wild most aquatic turtles feed regularly upon snails, and similar creatures, which have a calcium-rich shell. Insect larvae, as taken in considerable numbers by juvenile turtles in the wild, are also comparatively rich in calcium which is imperative for healthy bone and carapace development.

RECOMMENDATIONS

Housing

The water area of the enclosure must be deep enough for the turtles to submerge themselves completely and to be able to swim freely. A land area is also required (so that the turtles can get out of the water to sunbath). Without this light, metabolic bone disease (soft shell syndrome) can result. The land area is usually most conveniently located at one end of the tank. Easy access to the land area must be possible, a sloping ramp is usually the best approach. Turtles are messy, and it is very important to maintain good water quality with regular cleaning. The more water volume and fewer turtles one can have in a tank or pond - the better. Most aquatic turtles are omnivores (and preferences for different foods might change at different points in the life cycle), and offering a good variety of foods is the best way to feed them. As a rule, feeding turtles in a separate plastic tub will allow the mess associated with feeding to be smaller (turtles are messy eaters, and this will reduce the need for tank cleaning) and allow monitoring of food intake of each turtle if multiple turtles are kept. Remember to have water in the tub -aquatic turtles can only swallow if under water!

Nutrition

Young water turtles are often carnivores and become, as they grow older, vegetarians to a greater extent. The diet should be composed as follows: Meat 65-90% (depending on age of the turtle), feed-fish, insects, snails, young mice and earthworms. Preferably whole animals should be given so that the turtle can eat the skeleton/shell of the animal (rich in calcium), as well as the intestines (vitamins). Vegetables 10-35% such as: lettuce, carrots, pineapple, apple and pears. The turtle can also be offered hay to complement the diet in fibres. Young turtles should be fed every day while adults should be given feed two or three times a week. Remember not to give too much at a time since fatness can develop. If additional vitamin D is needed it should be vitamin D3. Growing turtles often need additional calcium.

The best diet for the giant Amazon river turtle is one with 50% animal and 50% vegetal protein composition. Such treatment allowed animals to the best increase in weight and best physiological homeostasis, which could be observed also by the lowest mortality rate. For discussion about essential vitamins and minerals, see “Nutrition” of tortoises.

Some disorders and diseases and recommendations of treatment

- Swollen eyes are most often a sign of vitamin A deficiency. The remedy is a vitamin A shot and (if the eye is infected) an antibiotic ointment.
- A soft shell can be caused by calcium or vitamin D deficiency in the feed. Give additional calcium or vitamin D (depending on which of them that is causing the problem).
- Problems with laying eggs are associated with calcium deficiency and additional calcium should be given. Sometimes the egg has to be removed with help of a veterinarian.
- Malformed shells can be due to the wrong diet, above all wrong mineral balance in growing animals.
- Pneumonia manifests itself by the animal having a bad balance in the water, nasal discharge, gasping for air, swollen eyes and breathing with its mouth open. It is caused by too low water temperature or bad diet. The temperature in which the turtle is held should be 30-32° C and antibiotics given until the animal has recovered. The turtle should also be isolated so it is not contagious to other turtles.
- Otitis can be seen as a swelling on one or both the sides of the head, behind the ears. To cure the animal both antibiotics and surgery is needed.
- Shell rot causes spots or colour changes in the shell. It can be caused by trauma or by the wrong diet. The answer to the problem is restriction of the access to water and if needed complemented with medicine locally or injected. The pH in the water should be held sour. Shell rot takes long time to heal. Algae can grow into the defects of the shell caused by the shell rot. They can also grow on the shell on healthy turtles as a result of bad water quality. In such cases the pond should be cleaned immediately!
- If the turtle have difficulties eating it can be due to its beak having grown too long. The beak should in such cases be trimmed.

NOTE! Salmonella is often part of the normal intestinal flora in turtles while in humans it can cause illness with diarrhoea and vomiting. It is therefore imperative that good hand hygiene is maintained after handling the turtles!

BIRDS

Macaws

Severe Macaw (*Ara severa*)



Length: 45-50cm weights: 350-400g. The plumage is general green and the forehead black. Naked white face striped with narrow lines of black feathers. The carpal edge is red. Outer parts of the large flight feathers are blue. Tail feathers reddish brown with green at the base. "Socks" with a red border to the feet. The bill is black, the legs grey and the iris brownish red. Lives in tropical rainforests along the riversides from Northern Venezuela east to French Guyana, Ecuador and Brazil and eat palm fruits, nuts and berries from the treetops. The breeding season starts around November and later in the northern parts. Clutch consists of up to 5 eggs. Incubation time lasts 26 to 28 days. The young fledge after 70 days.

Blue Gold Macaw (*Ara ararauna*)



The distribution is from Central America to South America. Length: 85-90cm. Weight: 1000-1300g. The Blue Gold is a large bird. The head, back, and wings are covered with a blue-green colour. The frontal body plumage is yellow. The Blue and Gold has the whitish skin facemask.

Scarlet Macaw (*Ara macao*)



Originate in the rainforests of South America. They can be seen in the wild in the Galapagos Islands off the coast of Ecuador. For breeders raising and hand-feeding these no longer imported beauties, (it's illegal to import them now because smuggling was making them extinct). Length: 90cm. Weight: 900-1100g. Face and plumage is a bright red. As with all macaws, the Scarlet has the whitish skin facemask. Unlike the Green-wing Macaw, the Scarlet has no green colour on the wing.

Green Wing Macaw (*Ara chloroptera*)



The Distribution is from Central America to South America. Length: 90cm. Weight: 1200-1400g. Face and plumage is a bright red. Like many macaws, the Green-wing has the whitish skin facemask. The wing has a green colour.

Mealy Amazon (*Amazona farinose*)



The Mealy Parrot is distributed from southern Mexico through to Colombia and northern Venezuela, in the Amazonas and Orinoco Basins and in south east Brazil. It is found mainly in humid forest particularly on *terra firme*. Mealy Amazon is one of the largest of the Amazon parrots. It is an affectionate pet and an excellent mimic. There are five subspecies of Mealy Amazonas.

Blue-headed parrot (*Pionus menstrus*)



The blue headed parrot is a green, usually without yellow on forehead although may have few scattering of yellow, lacks greyish tinge on breast and abdomen. The beak is dark.

Recommendations

Housing

The largest cage that can be accommodated in the area accessible is recommended for birds that are expected to be confined most of the time. The cage must be strong enough to resist bending or dismantling by the bird, made of non-toxic material, and designed for safety and ease of

cleaning. The perches should be clean, easily replaceable and appropriately sized. Perches should be placed to avoid droppings from contaminating the bird's food or water and to prevent the bird's tail from contacting its food or water. The use of wide bowls rather than deep cups displays food attractively and may encourage the bird to eat new items. Healthy birds with normal ambulatory skills can easily approach the food and water bowls; it is therefore not necessary to place bowls directly beside the perch. A daily cleaning of the cage floor and bowls prevents problems with food spoilage and alerts the owner to potential signs of illness. A weekly, thorough cleaning of the cage is also recommended.

Since parrots are intelligent, active animals, their psychological needs should be addressed. Toys provide diversion, as do a variety of foods. Seeds pushed into an apple or orange presents a bird with entertainment, challenge, and food all at the same time. Toys are useful as mental diversions and tend to encourage physical exercise and beak wear. However, they must be selected with safety of the bird in mind. "Chewable" items include branches, rawhide dog chews and natural fiber rope.

Minimal body care is required for the healthy, well-fed parrot. During the molting of feathers, additional fat, protein and vitamins may be required in the diet. As a new feather develops, the bird may pick at the pinfeather cover to open it. This should not be interpreted as "feather picking" or the presence of mites. Pure water is the most appropriate feather spray. Keep feathers dry and free of oily substances. Soiled feathers may be gently cleaned with a mild detergent solution followed by thorough warm water rinsing and drying. Wing clip may be desired to prevent escape or injury. It may be wise to remove open leg bands to prevent injury. If a closed band must remain on the leg for identification purposes, check under the band occasionally for signs of dirt accumulation, swelling, or constriction of the leg.

Nutrition

The bird's daily diet should be;

- A-vitamin rich vegetables 30%, such as: spinach, broccoli, green pepper, dandelion leaves, peach, apricot, papaya, carrot, sweet potatoes, pumpkin.
- Proteins 20%, such as: Low-fat yoghurt, low-fat cheese, white fish, well boiled chicken, tuna in water, rice, pasta, beans and corn.
- Other fruits and vegetables 15-20%, such as: Corncobs, apple, banana, orange, pineapple, tomato and potatoes.
- Wholemeal seed 15-20%, such as: wholemeal bread, breakfast flakes without sugar, wild rice as well as brown rice.
- Carbohydrates 10%, such as: fruit, pasta, seed, bread, corn, beans, potatoes and grain.
- Insect larvae

Vary the different ingredients. Some days give only A-vitamin rich vegetables to make sure that the bird eats enough of those. Represent all groups every week. Vary form, structure and colour of the food to persuade the bird to eat and stimulate it. Make sure the bird is actually eating and not only playing with the food. **NOTE!** Avocado is POISONOUS to birds!

Plants listed as poisonous to humans and animals should be considered potentially toxic to birds. Some avian species have died from ingestion of a toxic plant, while others have experienced no untoward effects. The following should be considered potentially toxic to birds:

Amaryllis	<i>Amaryllidaceae</i>	Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
Avocado	<i>Persea americana</i>	Jerusalem cherry	<i>Solanum pseudocapsicaum</i>
Azalea	<i>Rhododendron canadensis</i>	Juniper	<i>Juniper virginiana</i>
Black locust	<i>Robinia pseudoacacia</i>	Larkspur	<i>Delphinium spp.</i>
Buckthorn	<i>Rhamnus spp.</i>	Lily-of-the valley	<i>Convallaria majalis</i>
Buttercup	<i>Ranunculus spp.</i>	Lobelia	<i>Lobelia spp.</i>
Caladium	<i>Caladium spp.</i>	Marijuana	<i>Cannabis sativa</i>
Calla lily	<i>Zantedeschia aethiopica</i>	Mistletoe	<i>Phoradendron villosum</i>
Castor bean	<i>Ricinus communis</i>	Monkshood	<i>Aconitum spp.</i>
Cherry	<i>Prunus spp.</i>	Narcissus	<i>Narcissus spp.</i>
Clematis	<i>Clematis spp.</i>	Nightshade	<i>Solanum spp.</i>
Daffodil	<i>Narcissus spp.</i>	Oleander	<i>Nerium oleander</i>
Daphne	<i>Daphne spp.</i>	Philodendron	<i>Philodendron spp.</i>
Datura stramonium (Angel's trumpet)	<i>Datura spp.</i>	Poinsettia	<i>Euphorbia spp.</i>
Delphinium	<i>Delphinium spp.</i>	Pokeweed	<i>Phytolacca americana</i>
Dieffenbachia (Dumbcane)	<i>Dieffenbachia spp.</i>	Potato (sprouts and green skins)	<i>Solanum tuberosum</i>
Elephant's ear	<i>Colocasia spp.</i>	Pothos	<i>Eprimemnum aureum</i>
English ivy	<i>Hedera helix</i>	Privet	<i>Ligustrum volgare</i>
Euphorbia cactus	<i>Euphorbia spp.</i>	Rhodendron	<i>Rhododendron spp.</i>
Fig (Weeping fig)	<i>Ficus benamina</i>	Rhubarb	<i>Rheum rhaponticum</i>
Foxglove	<i>Digitalis purpurea</i>	Skunk cabbage	<i>Symplocarpus foetidus</i>
Holly	<i>Ilex spp.</i>	Snowdrop	<i>Ornithogalum umbellatum</i>
Horse chestnut	<i>Aesculus spp.</i>	Tobacco	<i>Nicotinia spp.</i>
Hyacinth	<i>Hyacinthus orientalis</i>	Virginia creeper	<i>Panthenocissus quinquefolia</i>
Hydrangea	<i>Hydrangea spp.</i>	Weeping fig	<i>Ficus benamina</i>
Iris	<i>Iris spp.</i>	Wisteria	<i>Wisteria spp.</i>
		Yew	<i>Taxus breviflora</i>

Some disorder and diseases and recommendations of treatment

It is of importance to early notice some of the most common diseases in order to deal with them as soon as possible.

- The faeces of a parrot should be green or black and coherent. The urine part of the faeces should be transparent and clear. The uric acid should be white or cream-coloured. If the bird gets a diet rich in fruits it can produce a lot of urine, which then can be misinterpreted as diarrhoea.
- If the bird is ruffled and mostly sits still it is often a sign that something is wrong.
- Nasal discharge can be caused by lack of vitamin A. It is however important to remember that too much of vitamin A can be toxic. It is better to give the parrot beta-carotene instead of additional vitamin A. Beta-carotene is by the bird transformed into vitamin A and the excess is discharged in the faeces. In this way the bird gets exactly the amount of vitamin A it needs without risking overdose.
- Giardia is a protozoan parasite that is spread through water and food. It causes diarrhoea, weight loss, loss of appetite and can lead to depression.
- The beak of the parrot can grow too long and must then be trimmed.
- Birds can easily be de-wormed using Ivomec® (ivermectin 1%) given orally.

A **first aid kit** is very useful. It should contain the following items:

Rubbing alcohol and alcohol swabs. Hibitane (chlorhexidine) as a disinfectant. Do NOT use hydrogen peroxide since it can cause tissue injury.

Sterile saline for irrigation.

Micro-pore tape.

Assorted bandages.

Aloe Vera gel - may provide relief for scalds or burns.

Scissors.

Antacid preparation - in case bird accidentally ingests an irritant plant or substance.

Wire cutters.

Magnifying head piece ("hoop") with light attached.

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Interview

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