Proper husbandry is critical to the successful maintenance of reptiles in captivity. A number of thorough reviews of chelonian husbandry have recently been published. Strict attention must be paid to environmental temperatures, humidity, light quality, water quality, habitat complexity, and nutrition. Among the hundreds of turtle species, husbandry requirements vary extensively. Prospective turtle owners must familiarize themselves with the requirements of the specific species with which they wish to work prior to purchasing the animal.

Several issues must be addressed in selecting a potential species as a pet. First, the keeper must be sure that the species can legally be kept according to local, state, federal, and international law. Laws pertaining to the sale and ownership of pet reptiles vary tremendously among different states and cities. Several states have revised their legislation such that it is no longer determined which species cannot be kept as pets, but which species can be kept as pets. The list of species is revised on a yearly basis to reflect the current global status of the species. Information on the legal status of species at the state level may be obtained from state fish and wildlife departments. Local laws should also be investigated as some cities restrict ownership of certain large species.

Many reptile species have become threatened due to habitat loss and collection for the international food, skin, and pet trade. As such, the pet owner ethically should avoid keeping animals that have been collected from the wild. In addition to ethical concerns, wild-caught animals should be avoided as they are less likely to adapt to a captive life style and more likely to be harboring parasites than captive-bred animals. The pet owner should avoid the temptation to keep notoriously difficult or rare species, as well as the temptation to "rescue" ill animals from pet stores. Keeping such individuals is often very discouraging, and can introduce disease into an otherwise healthy collection.

In selecting a species as a pet, one should investigate those that are being bred in captivity in significant numbers and that have demonstrated longevity in captivity similar to that in their natural environment. Consideration should be given to the adult size of the species, and whether very large specimens can be humanely housed in a given geographic zone. For example, although the African Spur-Thigh Tortoise (Geochelone sulcata) is a friendly, hardy, inexpensive, captive-bred species, it is the third largest tortoise species in the world and cannot be humanely housed as an adult in the home of the average pet owner. It may make a fine pet in an outdoor corral in Arizona, but is impractical indoors in New England.

The following list of species includes those that are generally captive bred, and have proven in the author's experience to make good pets. This list is not meant to be all-inclusive, but rather a starting-point for the novice keeper. The keeper should be careful to choose captive-bred animals, as many of these species are available as both wild-caught and captive-bred specimens. Among land tortoises, redfoot tortoises (Geochelone carbonaria), Greek tortoises (Testudo graeca), and Russian tortoises (Testudo horsfieldi) make good pets. Among water turtles, painted turtles (Chrysemys picta), Reeve's turtles (Chinemys reevesi), and the New Guinea red-bellied turtles (Emydura subglobosa) are personable and relatively easy to care for.

Numerous sources for captive-bred reptiles have become available in the past ten years. Locally, reptile specialty pet stores often carry a wide range of healthy captive-bred specimens. In addition, the keeper should investigate classified advertisements in reptile pet magazines. Often, local breeders may be found through these advertisements and may allow the purchaser to handpick their animal. Direct contact with a breeder provides invaluable information on husbandry of the species. Other sources for captive-bred reptiles include numerous regional reptile shows, reptile Internet web sites, and large-scale national reptile breeders. Information on these sources can generally be found in reptile pet-magazines or on the Internet.

As ectothermic animals, reptiles must be able to move among various temperature zones to maintain their preferred body temperature. Inadequate temperatures promote poor immune response and poor digestive efficiency, and are a common cause of illness in captive reptiles. As such, heat sources appropriate to the species must be provided. One of the best heat sources for reptiles is simple incandescent lighting. Regular light bulbs in reflector-type fixtures focus heat into certain areas of the environment, simulating the heat derived in the wild from the sun. For most species, this is the most effective and natural way of heating in indoor environments. Temperatures below these lamps must vary with the ecology of the species. For example savanna tortoises may seek basking temperatures of 32–35°C, while some leaf-litter forest species may prefer to be at 20–25°C. In addition, some species must be kept very warm even at night, while others prefer a night temperature drop. Nighttime low temperatures should be maintained at 23–27°C for tropical species and 21–23°C for temperate species. In cases where night temperatures must be high, ceramic radiant heat emitters or heat panels may be installed to provide heat without providing light. Using light-emitting heat sources at night may adversely affect the animal's sleep cycle, immune response, and reproductive cycle.

Water heaters, such as those used in tropical fish tanks, may be useful to maintain stable background temperatures in aquatic environments. In general temperatures from 25–28°C are adequate depending on the species. Since these heaters are often made of ceramic or glass, one must ensure that they are located so that they cannot be broken by the turtles.
Most aquatic turtles need to be able to dry themselves completely while basking. Nonabrasive basking sites such as cork-bark or driftwood should be available. Aquatic plants such as Anacharis provide excellent hiding and resting areas.

Like the choice of heat source, the choice of enclosure will vary by species. Many small species can be maintained in traditional glass terrarium setups. The enclosure must be escape-proof for the kept species. Larger specimens may need to have custom-built enclosures or large commercially available enclosures. Large aquatic species need large pools such as those used in the aquaculture industry, and generally need some type of powerful filter system to maintain adequate water quality. A very effective filter system can be constructed using a pond pump, foam or mesh filter material, and a material such as lava rock to create surface area for biological filtration. In its simplest form, the pump is used to move water from the enclosure, through the foam, over the lava rock, and back to the enclosure. In this author’s experience, tap water seems to be safe for aquatic turtles, although more conservativekeepers may prefer to use aged tap water, bottled water, or reverse osmosis purified water.

Chelonians can be maintained indoors or outdoors, with each having its benefits. Indoor enclosures offer more safety and better climate control, while outdoor enclosures offer improved ventilation and exposure to natural sunlight. Both indoor and outdoor enclosures must be made predator-proof. Outdoor enclosures for small chelonians must include a secure wire bottom and top. The bottom may be covered with several inches of dirt and planted with grass creating an escape-proof enclosure. Where fire ants are a problem, appropriate control measures should be taken. Consider mammalian pets, especially canines and ferrets, to be a threat to small chelonians that are maintained indoors.

Enclosure substrate should be easy to clean and not harmful if ingested. Many types of bedding, including gravel, sand, crushed walnut shells, corn cob, and some bark mulch, are indigestible and often cause intestinal obstructions when they are ingested. Newspaper is a safe and effective substrate for most species. Other safe alternatives include non-frayed artificial turf or carpeting, paper towels, soil, hay, or large size bark mulch. In dry environments, alfalfa pellets such as rabbit food can be used as bedding. Substrates should be spot cleaned daily and replaced when heavily soiled.

Water must be made available as appropriate for the species. Many terrestrial turtles and tortoises will drink water from a shallow bowl. The animal must be able to easily access the bowl without spilling the water. Spraying may also be required to maintain adequate humidity levels for tropical forest species. Areas of high humidity should be available, as even arid zone species will seek out such areas. Small plastic food storage containers can easily be modified to provide high humidity retreats. Recent evidence indicates that the commonly seen condition of “pyramiding,” where the scutes of tortoises develop a conical appearance, may be caused by low environmental humidity. In addition to basking lights, full-spectrum lighting with ultraviolet B wavelengths is thought to be important for many species. Recent research has shown that UV exposure resulted in higher vitamin D levels in young red-eared sliders (Trachemys scripta elegans). The best source of UVB light is unfiltered natural sunlight. It is ideal to have an outdoor enclosure that can be used during mild weather. In the absence of natural sunlight, fluorescent or mercury vapor UVB-emitting bulbs should be provided. The lights should be located at a distance as specified by the manufacturer. UVB light is filtered out by glass or plastic, and UV intensity of most bulbs is reduced after 6 to 12 months of use.

Chelonians may be carnivorous, omnivorous, or herbivorous. Carnivores may accept earthworms, fish, killed rodents, insects, and commercial foods such as trout pellets. Herbivores require a high-fiber, high-calium diet and should be fed greens such as kale, collards, endive, escarole, dandelion, clover, chicory, beet greens, and Swiss chard. These items are chosen to maximize the animal’s calcium intake. High-fiber sources such as alfalfa pellets, chopped hay, and grass are also desirable. The concern about excessive levels of oxalates and thiocyanates in some greens has likely been overstated, and these greens are appropriate for chelonians as part of a balanced diet. Omnivores may be offered a mix of the carnivore and herbivore diet. In general, fruits are not tremendously nutritious and should be used as “dessert” in small amounts.

Unless whole rodents or fortified pellets are being consumed, vitamin and mineral supplementation may be needed. In particular, insects and plant matter are often deficient in mineral content. Reptiles that are not supplemented often suffer from calcium deficiency. Supplementation may be done by mixing a powdered calcium supplement with the food items, or by feeding insects a high calcium diet for several days before they are fed to the reptile (“gut loading”). Supplements should be used in moderation as oversupplementation can also occur. Multivitamin supplements in particular are often excessively high in Vitamin A and D and should generally be used only once weekly.

Proper husbandry and nutrition are the most important aspects of reptile preventive care. However, a number of other practices are recommended. Quarantine of new animals is extremely important. In general, a 2- to 3-month quarantine is recommended. Overzealous collecting and overstocking of environments should be avoided. During quarantine, fecal analysis should be performed several times to test for internal parasites. These parasites should be treated and eliminated if possible before release from quarantine. In some situations, further testing such as bloodwork may be recommended.

Finally, annual physical examination by a veterinarian is recommended for all pet reptiles. At the physical exam, the animal’s growth and weight are measured, maintenance such as nail trimming and beak trimming is done, stool samples are checked, signs of illness may be detected, and a discussion of modifications of husbandry can occur.
Maintaining chelonians in captivity can be a rewarding and fun experience. By properly selecting a species, a specimen, and researching the species needs, the keeper may experience years of enjoyment.

REFERENCES