The Reptile and Amphibian Communities in the United States

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Executive Summary

Reptiles include lizards, snakes, crocodiles, and turtles, while amphibians are frogs, toads, and salamanders. Reptiles and amphibians are native to every continent in the world except Antarctica; however, most species are found between the latitudes of 40 degrees North and 40 degrees South.

The Domestic Reptile and Amphibian Communities

The domestic reptile and amphibian communities consist of loosely knit groups including importers, universities, organizations, retailers, hobbyists, and pet owners. Little is known about the industry as a whole. Reptiles are kept as pets primarily because they are fun to watch and they are quiet. While the exact number of reptiles owned as pets is not known, it is clear that ownership of reptiles is on the rise. It is estimated that 1.5 to 2.5 million US households owned one or more reptiles in 1996, with snakes and turtles being the most frequently owned type of reptile.

Most pet reptiles and amphibians are purchased from pet stores or pet superstores, with the average price ranging from $15 for frogs to $91 for snakes in 1998. Owners spent an average of $67 to $451 in a year for the feeding and care of their animals, depending on the species owned. While sellers of reptiles and amphibians can be found in every state, they do tend to concentrate across the southern tier of the US including California, Arizona, Texas, and Florida. There is also a concentration in the mid-Atlantic and lower Great Lakes regions, including the states of New York, Pennsylvania, New Jersey, Maryland, Virginia, Ohio, and Illinois.

There are a number of reptile and amphibian organizations that focus on research and/or conservation. In addition, there are many local level organizations for reptile and amphibian owners and hobbyists, as well as associations focused on the health of reptiles and amphibians.

Reptiles, Amphibians, and Medicine

Medical herpetology is the study of diseases of reptiles and amphibians that are transmissible to humans, and the biomedical benefits of reptiles and amphibians to human health. Rapid advances are taking place in medical herpetology in regards to identifying practical applications of biochemical substances derived from amphibians and reptiles, for example antibacterials, antifungals, cancer treatments, and analgesics. Amphibians and reptiles are useful anatomical and physiological models for human diseases and have therefore been used in basic research to study the fundamental mechanisms of disease.

The most common diseases in humans related to reptiles and amphibians are due to transmission of various species of *Salmonella*. But reptiles and amphibians can also secrete toxins, transmit various pathogens and toxins via bite wounds, and cause trauma and pain by biting.

Trade in Reptiles

The US is a major importer of live reptiles for the pet industry. In the early 1990's, US imports and exports accounted for 80% of total world trade in about 70 reptile species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Throughout the 1990's, about 2 million live reptiles were imported into the US annually. In the mid to late 1990's, lizards made up over 80% of all live reptile imports. Snakes accounted for 11% of reptile imports, turtles about 3%, and crocodiles made up less than 1%. Live reptiles came into 30 US ports in 1998; however, only 10 ports accounted for 97% of all these shipments. Similarly, there were approximately 350 importers who brought live reptiles into the US, but 84% of all reptiles imported were brought in by only 20 importers. While live reptiles were imported from about 80 countries in 1998, the top 10 countries accounted for 82% of these imports, with the top 5 countries being Colombia, El Salvador, Vietnam, China, and Thailand.

The number of live reptiles exported from the US between 1993 and 1998 was approximately 4 to 5 times the number of live reptiles imported. Eighty-five percent (85%) of the exports were red-eared slider turtles going to South Korea, Japan, and European countries.

The two most important legislative acts pertaining to the trade of live reptiles and amphibians are the US Endangered Species Act and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Regulations enforcing the provisions of these legislative acts for terrestrial species are administered by the US Fish and Wildlife Service. Other agencies that have enacted additional regulations regarding live reptiles are the Centers for Disease Control and Prevention, and the Animal and Plant Health Inspection Service.

State regulations regarding reptiles and amphibians vary from state to state and most states have very few restrictions on the captive holding or breeding of reptiles or amphibians. Virtually all states have endangered species legislation and most states have some native reptiles and amphibians listed as endangered or threatened. Permits are generally required for any activities involving species that are listed as endangered or threatened. For species not listed as endangered or threatened, many states require some kind of permit to take native reptiles or amphibians from the wild for noncommercial purposes. While commercial taking is prohibited in some states, other states allow commercial taking but require permits or restrict taking to certain species. About half of all states have regulations restricting the importation of nonnative reptiles or amphibians.

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List of Abbreviations

ABVP - American Board of Veterinary Practitioners
APHIS - Animal and Plant Health Inspection Service
APPMA - American Pet Products Manufacturers Association
ARAV - Association of Reptilian and Amphibian Veterinarians
AVMA - American Veterinary Medical Association
CDC - Centers for Disease Control and Prevention
CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
ESA - Endangered Species Act
FDA - Food and Drug Administration
HSUS - Humane Society of the United States
IATA - International Air Transport Association
LEMIS - Law Enforcement Management Information System
NMFS - National Marine Fisheries Service
NRAAC - National Reptile and Amphibian Advisory Council
PIJAC - Pet Industry Joint Advisory Council
USFWS - US Fish and Wildlife Service

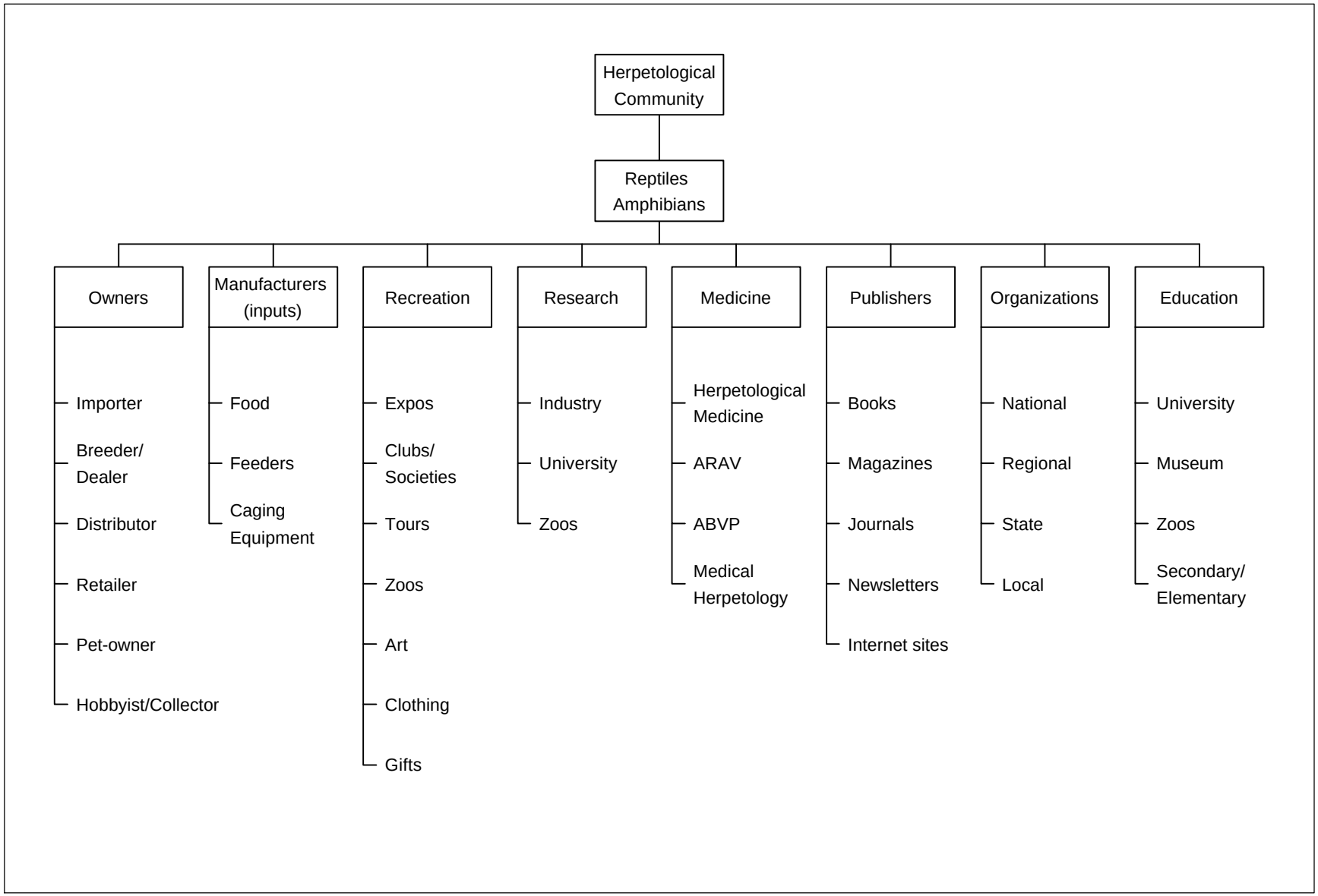
The Reptile and Amphibian Communities in the United States

Introduction

The organization of the amphibian and reptile communities in the US is similar (Figure 1). Although the structure depicted here is an oversimplification and is not intended to be all inclusive, it does contain several consistently present facets of these communities. At one time or another, a reptile or amphibian may pass through the hands of any or all of the following: importer, breeder/dealer, collector, distributor, retailer and eventually, a pet-owner or hobbyist. Manufacturers of inputs used in the housing and care of reptiles and amphibians supply food, feeders, cages, lighting and other equipment. Reptiles and amphibians provide recreation for people through several channels including expos, tours, zoos, and museums. With the increasing popularity of reptiles and amphibians, there is a growing market for decorative clothing, gifts, and art incorporating reptile and amphibian themes. The increasing popularity of these animals also has created a market for various publications including books, magazines, journals, and videos which provide owners with knowledge of housing, breeding, and health, among other things. Collections at universities, zoos, and museums educate the public about reptiles and amphibians, as do educational activities in school classrooms. These collections may also be involved in research projects. Reptiles and amphibians are used in the medical world as research models and in the production of pharmaceuticals. And there are numerous organizations whose general mission is to serve as advocates for reptiles and amphibians. Overlap between activities and these various aspects of herpetology is significant. For example, a breeder may also import and/or export animals or a veterinarian may also be a hobbyist who breeds reptiles or amphibians.

In this paper, the following topics are covered:
- Overview of reptiles and amphibians,
- The domestic reptile and amphibian communities,
- Reptiles, amphibians and medicine,
- International trade in reptiles,
- US federal regulations pertaining to reptiles and amphibians,
- US state regulations pertaining to reptiles and amphibians.

Figure 1: The US Reptile and Amphibian Communities



Overview of Reptiles and Amphibians

What are reptiles?

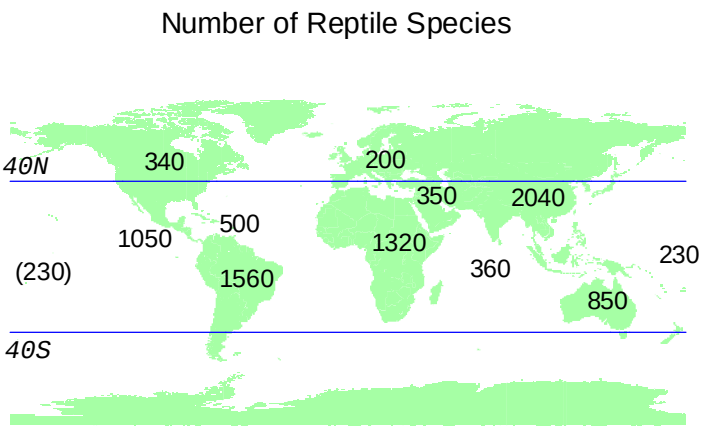
Reptiles are vertebrate animals with scaly body coverings, instead of hair or feathers. Their skin tends to be dry with no or very few glands and they have lungs with which to breathe. Reptiles are in the class Reptilia, which includes four orders. Order Rhynchocephalia only includes one species, the tuatara. The order Crocodilia is made up of crocodiles, alligators, caimans, and gavials. Tortoises and turtles are in the order Testudinata.[1] The fourth order, Squamata, includes lizards and snakes.

The most commonly known difference between reptiles and mammals or birds is that reptiles are poikilothermic (cold blooded) in that they cannot internally regulate their body temperature as accurately as homoiothermic (warm blooded) animals. Instead, they depend upon the external environment to do so. To warm themselves, they bask in direct sunlight or absorb radiant heat from warm surfaces. To cool themselves, they utilize activities such as moving into shady areas or raising their bodies off the ground. Reptiles do generate body heat by their physical activity, but they have minimal means to conserve the generated heat.

Another distinguishing feature of the class Reptilia is that most species either lay eggs (oviparous) or give birth to live young that hatch from eggs internally in the mother (ovoviviparous). The length of time that the embryonated eggs stay within the mother varies from just a few days up to the egg being laid shortly before hatching. There are a few reptile species that do give birth to living young with minimal involvement of an embryonated egg.

Where are reptiles found?

Reptiles are native to every continent in the world except Antarctica. However, due to reptiles' dependence on the external environment for body temperature regulation, most species are found between the latitudes of 40 degrees N and 40 degrees S as they do not survive well in extremely cold climates. Over 3,000 reptile species are found in Central and South America, including the Caribbean, and over 2,000 species are found in Asia.



Source: European Molecular Biology Laboratory, Reptile database

[1] Throughout this document, the broad term turtles is used and includes tortoises and terrapins as well as turtles.

What are amphibians?

Amphibians, members of the class Amphibia and phylum Chordata, contain three orders: (1) Salientia or Anurans, (2) Caudata or Urodela, and (3) Gymnophiona (Table 1).

Table 1: Order, common name, and distinguishing physical characteristics of amphibians

Order	Common Name	Distinguishing Physical Characteristics
Salientia or Anura	frogs and toads	four legs as an adult, typically no tail as an adult
Caudata or Urodela	newts and salamanders	four legs as an adult, has tail as an adult
Gymnophiona	caecilians	no legs, most have no tail

Frogs and toads are members of the order Salientia. There are approximately 4,500 species of frogs and toads that belong to 41 families. The exact number of species has not been determined because new frogs are being discovered at the rate of several dozen species a year. With the exception of marine habitats, frogs inhabit virtually every environment on the earth. These environments include all continents except Antarctica, and areas such as deserts, forests, mountains, jungles, grasslands, water, land, underground, and trees. Although the geographic distribution of frogs is widespread, they are most diverse in the tropics.

Unique characteristics of frogs are the elongated tibia and fibula which enhance their jumping ability and a distinctive phase of the life cycle, the tadpole, which is a specialized "eating machine". There is no scientific distinction between frogs and toads, but there are physical differences. Frogs usually are smooth-skinned, have long rear limbs, leap, and live in water. Toads have rough skin, short rear limbs, hop, and live on land.

Salamanders are members of the order Caudata. Salamanders are distinguished from other amphibians (i.e., frogs and caecilians) by the presence of a tail in all larvae, juveniles, and adults, and by having limbs set at right angles to the body with forelimbs and hind limbs of equal size. Salamanders inhabit nearly all northern temperate regions of the world where the habitat is moist and cool. Terrestrial salamanders may be found on the forest floor beneath rocks and logs. Aquatic salamanders live in the floor of streams and ponds. Salamanders are carnivorous in all three stages of their life cycle, preying mainly on small arthropods.

Caecilians are members of the order Gymnophiona. These are carnivorous amphibians that prey on insects, insect larvae, and worms in nature. Terrestrial Gymnophiona are found in Europe, North America, Australia, and Antarctica. There is at least one fully-aquatic subfamily *(Typhlonectinae)* of Gymnophiona in South America. Both aquatic and land-bound caecilians require a moist climate. Many land-bound caecilians live their entire lives burrowed in the earth. They resemble burrowing snakes, but do not have external scales. Gymnophiona may be several inches to several feet long, and are 1 to 2 inches in diameter. The genus Typhlonectes is a fully aquatic caecilian that is native only to South America. *Typhlonectes natans* is found commonly in aquarium and pet stores in the US.

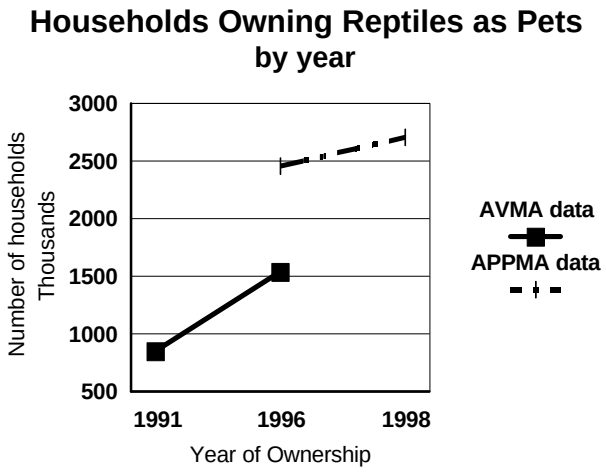
The Domestic Reptile and Amphibian Communities

The domestic reptile and amphibian community consists of many individuals who are not bound together in any great degree. Data was obtainable from various parts of the community; however, there is little published information about the entire industry. Therefore, it should be noted that while the data presented below come from valid sources and are believed to be correct, they may not accurately reflect the industry as a whole.

Ownership of reptiles and amphibians as pets

- How many and what types of reptiles are kept as pets in the US?

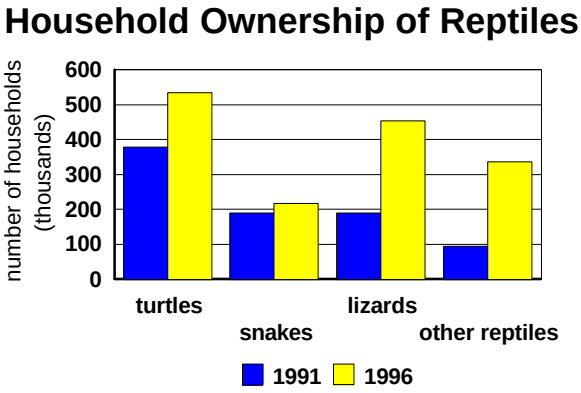
When surveyed, people report that they own reptiles as pets primarily because they are fun to watch and have in their household, as well as being a quiet pet (APPMA). While the exact number of reptiles owned as pets is not known, it is known that ownership of reptiles is on the rise. The American Veterinary Medical Association (AVMA) and the American Pet Products Manufacturers Association (APPMA) have both conducted surveys of US pet owners[2], collecting information about reptile and amphibian ownership as well as other types of pet ownership information. These surveys have provided estimates of 1.5 million (AVMA) and 2.5 million (APPMA) US households that owned one or more reptiles as a pet in 1996. The AVMA data show an increase in reptile ownership from 1991 when approximately 850,000 households owned reptiles, while the APPMA data show that the 1996 estimate of 2.5 million US households has risen to over 2.7 million households for 1998. The average number of pets per household has not changed greatly since 1991 (AVMA); therefore, the increase in the total number of pets owned since 1991 reflects an increase in the number of household that own a reptile or amphibian.



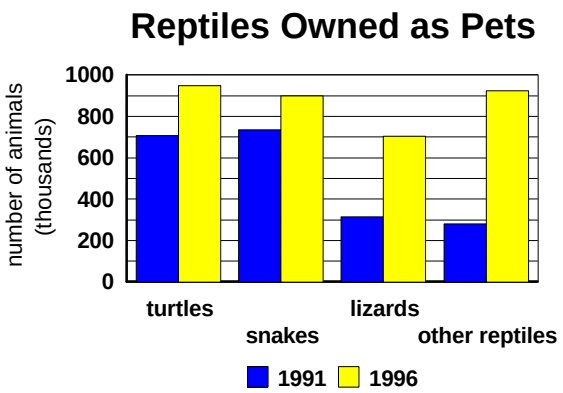
The most frequently owned type of reptile, by number of households that own them, are turtles. Snakes and lizards are also popular reptiles to have as pets, based on the number of households that own them. In terms of total number of animals owned, there are almost as many snakes kept as pets as there are turtles (AVMA). A factor that influences this is that the average number of

[2] It should be noted that the APPMA data are based on a small sample size and thus may not be truly representative.

pets per household for snakes was 4.14 in 1996, while the average numbers of pets per household for turtles, lizards, and other reptiles were 1.78, 1.55, and 2.75 respectively (AVMA).

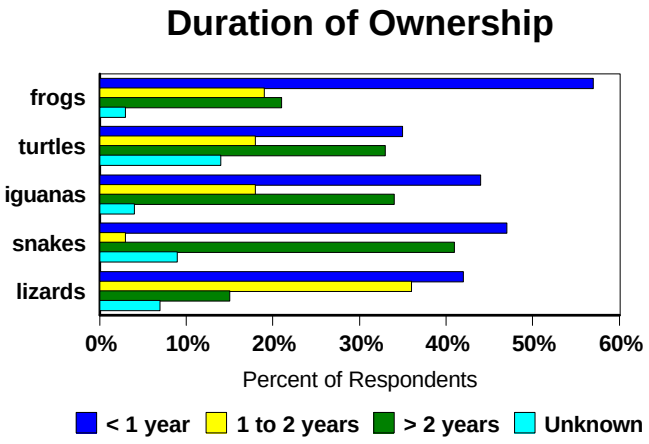


source: AVMA



source: AVMA

The majority of reptile and amphibian owners have their pets for less than 1 year.. While these data reflect duration of ownership due to preferences of the pet owner, they also reflect the life span of the animal and its ability to survive in captivity.



source: APPMA

- Where do reptile owners obtain their pets?

According to the APPMA survey[2] of reptile owners, in 1998 the majority (45%) of pet reptiles were obtained from pet stores or pet superstores. Other sources for pet reptiles included the following: caught outside 16%; friend or relative 15%; breeder 8%; previous owner 8%; newspaper 3%; and bred at home 2%. Turtles were by far the most frequent species caught outside. Other types of reptiles, e.g. snakes and lizards, followed the overall percentages regarding where they were obtained (APPMA[2]). Other potential sources of reptiles and amphibians that were not included in the APPMA survey as separate categories are the Internet, shows and expos, hobby magazines, and wholesalers.

Reptiles and amphibians are bought and sold over the Internet via breeder web pages, classified ads, e-mail, e-mail lists, communities/malls, online auctions, and USENET posts. A search of the Internet, which was by no means exhaustive, found almost 400 web sites that sold reptiles and/or amphibians. Kingsnake.com is the largest reptile and amphibian site. In addition to being a

source of information on all aspects of reptiles and amphibians, approximately 6-7,000 paid ads are placed each month on kingsnake.com, selling animals, related supplies, and services. The webmaster for kingsnake.com estimates there were 20 reptile related web pages in 1994, 100 web pages in 1995, 1,000 in 1996, and 10,000 in 1997 (Barringer, 2000).

It is estimated that 53% of pet stores sell reptiles and amphibians, but they typically have a limited selection, focusing on a few popular species (Meyers, 2000). It varies how and from where pet stores obtain their reptiles and amphibians to sell. Some corporations, such as Petsmart, coordinate the supply of animals to their retail stores from a few centralized distributors. Other pet store chains are not supplied by their parent company and are on their own to obtain reptiles and amphibians to sell. And this is obviously the case with pet stores which are independently owned and are not affiliated with a chain.

Expos, shows, and swaps are other places to buy reptiles and amphibians that occur on a frequent basis. *Reptiles Magazine* has a listing of events for the year 2000 that includes 17 in June, 19 in July, and 19 in August. In some states, these events occur monthly. In addition to live animals, items that can be purchased at shows and expos include feeds, feeder foods (e.g. insects), cages, equipment, supplies, books, publications, jewelry, and gift items. A large expo can have an attendance of 5,000 to 10,000 people and have more than 500 vendor tables present. Expos and shows also often have educational workshops and speakers covering a variety of topics including care and husbandry, general species information, habitat, breeding, diseases, and photography of animals. Some of these events do not allow non-captive bred animals, while some shows do allow wild caught exotic and domestic specimens. Typically, venomous animals are not allowed.

- How much does it cost to keep a reptile or amphibian?

The average price paid for reptiles and amphibians kept as pets ranged from $15 for frogs to $33 for iguanas and lizards in 1998 (APPMA[2]). The average price paid for snakes was significantly greater at $91. While there is quite a bit of variation, on average, owners spent from $67 to $451 in a year for the feeding and care of their animals. Snakes are the most expensive to maintain ($451/year), followed by lizards ($341/year), iguanas ($329/year), turtles ($204/year), and frogs ($67/year). These cost estimates include food, toys, supplies, non-surgical veterinary care, and medications. Not reflected by these data is the fact that hobbyists and collectors might pay thousands of dollars for certain species, such as those that are rare, hard to obtain, or have unique coloring.

Reptile owners buy most supplies and feed from pet stores or pet superstores. The exception to this is the buying of frozen foods or fruits and vegetables for feed. Most of these items are bought from grocery stores (APPMA[2]). In 1998, independent pet retailers (excluding pet superstores) reported total product sales for reptiles and amphibians to be $255 million (Hellwig, 1999). Food sales and sales of animals each made up approximately 30% of this amount. The other 40% of sales consisted of the following items: terrariums, terrarium accessories, heaters, lights, vitamins, backgrounds, and other items. The percent of total pet product sales revenue for the independent pet retailer that reptiles and amphibians account for, 5.9%, has stayed fairly constant from 1996 to 1998.

- Where do owners get their information?

Owners of reptiles and amphibians get most of their information about their pets from either pet store personnel (56%) or from books (56%) (APPMA[2]). Only 23% report veterinarians as a source of information about reptiles and amphibians.

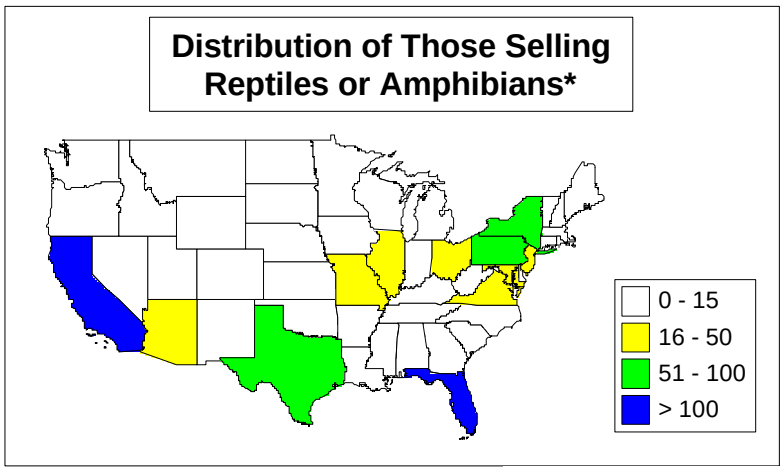
Other ownership of reptiles and amphibians

Zoos and exhibitors are another market for reptiles and amphibians. Zoos acquire animals from other zoos, importers, captive breeding operations, or private individuals. When surplus animals leave zoos, they go to other zoos, dealers, and private individuals such as collectors. Zoos typically demand healthy, well treated animals and thus are willing to pay premium prices. In addition to the exhibition and education roles zoos play, they have breeding programs for endangered species and work to develop husbandry criteria for species for which this information is not yet well known. At the other end of the spectrum can be exhibitors such as roadside type facilities. Many of these exhibitors are less particular regarding the source and condition of the animals they purchase.

Another group of reptile and amphibian owners are the private collectors. These are people who seek to own the most rare or novel animals, and thus often the most expensive animals.

Distribution of breeders, dealers, and wholesalers in the US

Based on a listing of private reptile and amphibian breeders (96-97 directory) and results from an Internet search, breeders, distributors, dealers, and wholesalers (excluding retailers) that sell reptiles and amphibians can be found in virtually every state. However, they do concentrate across the southern tier of the US including California, Arizona, Texas, and Florida. And there is a concentration in the mid-Atlantic and lower Great Lake regions, including the states of New York, Pennsylvania, New Jersey, Maryland, Virginia, Ohio, and Illinois.



**excluding retail stores*

The same geographic concentrations are seen when looking at the location of breeders, distributors, etc. who sell a particular type of reptile. Types of reptiles that were mapped included snakes, lizards, and turtles/tortoises.

Domestic shipping of reptiles

For commercial shipments of reptiles and amphibians, air cargo appears to be the primary mode of shipping. Reptiles and amphibians that are considered to be harmless can be mailed via the US Postal Service; however, all snakes, turtles, and poisonous reptiles are considered to be dangerous and thus are not allowed to be mailed (www.usps.com; Publication 52). Reptiles and amphibians that are mailed must be less than 20 inches in length. Airborne Express does allow the shipment of turtles and frogs, though they do not accept live snakes, lizards, and all other reptiles or amphibians (www.airborne.com). The UPS and Federal Express (www.fedex.com) guidelines state that neither of these shippers accept live animals. However, it was reported to us that people do indeed ship reptiles via UPS and Federal Express. Shipping counter to counter with an airline is another option. This option appears to be one of the more common methods of shipment; however, it also tends to be the most expensive method.

Market for reptile products

Reptiles and amphibians are used to produce exotic leather used in clothing accessories such as shoes, belts, and wallets. It is also used to decorate clothing, primarily on jackets, vests, and hats. Turtle shells are prized by some for making jewelry and other accessories. In the US, meat from turtles, rattlesnakes, crocodiles, and alligators is available in certain regions of the country. Around the world, one can buy meat from most types of reptiles and amphibians, as well as turtle eggs for consumption. In addition, many types of reptiles and amphibians are utilized in the Asian medicinal markets. Availability of these various products and food stuffs derived from reptiles and amphibians depends upon what country one is in.

Organizations

Few, if any, of the herpetological organizations and societies focus exclusively on reptiles or amphibians. Rather, the organizations tend to be advocates for both. There are a number of reptile and amphibian organizations that focus on research and/or conservation. The American Society of Ichthyologists and Herpetologists is a scientific organization for researchers who work with reptiles. The Society publishes the journal Copeia. The Society for the Study of Amphibians and Reptiles, founded in 1958, is a not-for-profit international organization established to advance research, conservation, and education concerning amphibians and reptiles. It publishes several journals including Herpetological Conservation, Herpetological Review, and the Journal of Herpetology. The Herpetologists' League focuses on furthering the study of the biology of amphibians and reptiles. It is an international organization that publishes two journals, Herpetologica and Herpetological Monographs, as well as supporting the publication of books. The Center for North American Amphibians and Reptiles was established as a nonprofit foundation with the objective of promoting education and conservation of amphibians, turtles, reptiles, and crocodilians in the United States and Canada. They serve as a data bank for information about North American amphibians and reptiles, and promote the study and conservation of reptiles and amphibians by financial support. Partners in Amphibian and Reptile

Conservation is another organization dedicated to the conservation of reptiles and amphibians and their habitats.

There are many local level organizations for reptile and amphibian owners and hobbyists. However, there is not a strong organization at the national level. In the past, national organizations have formed in response to particular issues, such as a new law restricting ownership or trade in reptiles. These organizations were typically effective in fighting the particular issue that caused them to form, but once the issue was dealt with, they have all fallen apart. The National Reptile and Amphibian Advisory Council (NRAAC) is an umbrella organization which is currently in existence. The goal of the organization is to organize the reptile community to fight what they consider to be unfair and overly restrictive state and federal regulations. However, it is uncertain at this point in time whether the NRAAC will become a lasting and effective national organization or not.

The pet industry in general has industry associations such as the Pet Industry Joint Advisory Council (PIJAC), which focuses on education, information and governmental issues that involve or impact the pet industry, with a goal of ensuring the availability of companion animals to sustain the pet industry. PIJAC represents all aspects of the pet industry and membership in their companion animal segment includes breeders, importers/exporters, wholesalers, hobbyist groups, and individual hobbyists. They are also a part of the International Pet Advisory Council. PIJAC has worked with the pet industry to develop Best Management Practices for some aspects of the industry.

Another organization is the International Reptile Breeder Association. The only function of this group appears to be the organization of reptile shows. There are also associations focused on the health of reptiles and amphibians such as the Association of Reptilian and Amphibian Veterinarians and the American Association of Zoo Veterinarians.

Reptiles, Amphibians, and Medicine

Veterinary Herpetology

Veterinary herpetology is the diagnosis, treatment, and prevention of diseases that affect reptiles and amphibians. It is also referred to as herpetological medicine. Much of the veterinary profession seems to recognize herpetological medicine as a distinct specialty, and some veterinary schools offer clinical rotations in herpetological medicine, either as stand-alone rotations, or as part of "exotic animal" medicine rotations.

The Association of Reptilian and Amphibian Veterinarians (ARAV) has a membership of about 1,300, with veterinarians comprising approximately 80 percent (Mitchell, 2000). This number of ARAV veterinarians equals 1.6 percent of AVMA membership. Some recent activities of the ARAV include producing and publishing the Journal of Herpetological Medicine and Surgery, developing guidelines for veterinarians and hospitals that accept reptiles and amphibians as patients, funding research projects in reptilian medicine, and establishment of board certification for reptile and amphibian practitioners through the American Board of Veterinary Practitioners.

Medical Herpetology

Medical herpetology is the study of reptile and amphibian diseases that are transmissible to humans, and the biomedical benefits of reptiles and amphibians to human health. Medical herpetology should not be confused with veterinary (medical) herpetology, which is a distinctly different discipline as discussed above.

- Pharmaceuticals

Rapid advances are taking place in medical herpetology in regards to identifying practical applications of biochemical substances derived from amphibians and reptiles, including the development of new drugs. These potentially lethal toxins may kill humans when exposed to a typical naturally received dosage, but may be beneficial by destroying bacteria, viruses, parasites, and tumors when the dosage is altered, or when the fractions of the toxins are used in isolation.

Several classes of compounds (magainins, xenopsins, dermorphins, and deltorphins) derived from frogs have anti-parasitic, anti-bacterial, analgesic, anti-fungal, or anti-cancer functions. They also have contraceptive and wound healing properties. One major pharmaceutical company, Sandoz Pharmaceuticals, entered into a partnership with Magainin Pharmaceuticals to develop anticancer drugs and other drugs from magainins in the early 1990's. Substances from snakes have been used to develop antimicrobials, anticoagulants, and analgesics, as well as drugs to treat hypertension and snake bites, and to lower levels of triglycerides, lipids, and cholesterol. Products derived from certain species of lizards are used as antipyretics (Table 2).

Table 2: Classes and functions of products derived from reptiles and amphibians that may be used to treat and prevent diseases of humans			
Function	**Species Derived From**	**Class/Name**	**Targeted Disease, Pathogen, or Condition**
Anti-parasitic	amphibians	Magainins	Keratitis (*Acanthamoeba sp.*) Malaria (*Plasmodium sp.*) Amoebic dysentery (*Entamoeba sp.*) Chagas' Disease (*Blastocystis sp.*)
Antibacterial	amphibians	Magainins	*Escherichia sp.* *Pseudomonas sp.* *Staphyloccus sp.* *Streptococcus sp.*
Anti-fungal	amphibians	Magainins	Candidiasis *Saccharomyces sp.*
Anticancer	amphibians	Magainins	lung cancer ovarian cancer melanoma
Contraceptive	amphibians	Magainins	pregnancy
Wound healing	amphibians	Magainins	tissue trauma
Antimicrobial	amphibians	Xenopsins	infectious agents
	snakes	venom	infectious agents
Analgesic	amphibians	Dermorphins Deltorphins	pain
	snakes	venom	pain
Antipyretic	lizards	toxin	fever
Lowering lipid, triglyceride, and cholesterol levels	snakes	venom	elevated levels of fat in the blood
Anti-hypertensive	snakes	Capoten™ (venom)	high blood pressure
Anticoagulant	snakes	Arvin™ (venom)	coagulopathy
Antitoxin	snakes	venom	snake bite

- Use in research as models

Amphibians and reptiles are useful anatomical and physiological models for human diseases and have therefore been used in basic research to study the fundamental mechanisms of disease. Examples of contributions of amphibians and reptiles to human health as animal models and as environmental sentinels include:

- first indication that the growth mechanism of cancer cells could be “turned-off” (frogs);
- potential implications of thinning of the ozone layer for animal and human health (frogs);
- importance of thyroxine in human development (frogs);
- mechanisms for bacterial, protozoan, metazoan, and nematode infections of humans (e.g. *Mycobacterium*, *Trypansoma*, *Polystoma* and *Spirometra*, *Filaria*) (frogs);
- survival mechanisms in anoxic conditions (turtles);
- survival mechanisms to withstand and recover from the freezing of body tissues (turtles);
- mechanisms for tissue and neuronal regeneration (lizards);
- transdermal administration of medications (snakes);
- mechanisms of action of Vitamin K parameters (snakes);

- disease and disorder mechanisms involving acetylcholine receptors (e.g. myasthenia gravis and organophosphate poisoning) (snakes); and
- effects of snake venom on the cardiovascular system, including blood pressure and coagulation (snakes).

- Zoonoses

Transmission of various species of *Salmonella* is probably the most common human disease issue related to reptiles and amphibians. Infection with *Salmonella* can result in gastroenteritis which can range from being mild in nature to being fatal. It was for this reason that the importation and sale of turtles with a carapace length less than four inches was banned in the US in the early 1970's. In addition to *Salmonella sp*., there are several other zoonotic diseases transmitted by reptiles and amphibians (Table 3). It should also be noted that reptiles and amphibians are natural exterminators, controlling insect and rodent populations that can act as vectors for human diseases.

Table 3: Zoonoses associated with reptiles and amphibians

Disease	Pathogen	Species
Tuberculosis; "swimming pool granuloma"	*Mycobacterium sp.*	frogs/amphibians turtle
Salmonellosis	*Salmonella sp.*	frogs/amphibians turtle, lizards, snakes
Melioidosis (glanders)	*Pseudomonas spp.*	frogs/amphibians
Yersiniosis	*Yersinia sp.*	frogs/amphibians
localized infection following bites	multiple sp.	snakes
gastroenteritis	*Plesiomonas shigelloides*	snakes
Hepatitis A	Hepatitis A virus	frogs/amphibians
Tapeworm	*Mesocestoides sp.*	frogs/amphibians
Sparganosis (tapeworm)	*Spirometra sp.*	frogs/amphibians

Some amphibians secrete toxins that can have significant effects such as paralysis and cardiac arrest. A specific example is a toxin secreted by frogs (*Phyllobates terribilis*) that is used by Colombian Indians to make poison darts for hunting game.

In addition to the trauma and pain caused by a bite from an amphibian or reptile, transmission of pathogens and toxins can occur. Transmitted pathogens can result in a range of problems from local tissue injury and localized infection to fatal sepsis. Toxins in venom can also vary in severity, the worst resulting in death. Many snakes are venomous, and it is currently believed that many snakes previously considered to be non-venomous, do indeed have varying levels of toxicity. Most snakes are capable of inflicting painful bites; however, non-venomous snake bites are rarely associated with life-threatening results. There are two species of lizards that are venomous. No turtle species are known to be venomous and only a few species have caused biting injuries. However, there are some aggressive species of turtles, such as the Murray River

Turtle in Australia, and Alligator and Common Snapping Turtles in the US. Most species of frogs do not have a strong tendency to bite. One species of frog that is known to bite is the South American and Asian horned frog of the genus Ceratophrys, which is referred to as the “Pac-Man” frog due to its large mouth.

International Trade in Reptiles

(Note: Throughout this trade section, the broad term turtles includes tortoises and terrapins; crocodiles include alligators and caimans; and lizards include dragons, geckos, chameleons, monitors, iguanas, and skinks.)

Live reptiles: Import Trends

The US is a major importer of live reptiles for the pet industry (Hoover, 1998). The total number of reptiles imported over the past 3 decades has fluctuated, and the type of reptiles imported has changed significantly (Tables 4 and 5). While turtles made up 80% of all reptile imports in 1970, they accounted for only 2% of reptile imports in 1996. The percentage accounted for by lizards, on the other hand, increased from 12% to 86% between 1970 and 1996.

Table 4: Total number of live reptiles imported

Year	Number
1970	1,736,695
1993	2,358,324
1996	2,196,834
1998	1,925,680

Source: Hoover, 1998 and personal communication

Table 5: Live reptile imports - Percent by type

Type	1970	1996
Turtles	79.6	2.0
Crocodylians	6.5	<1
Lizards	12.0	86.0
Snakes	1.8	11.0

Source: Hoover, 1998

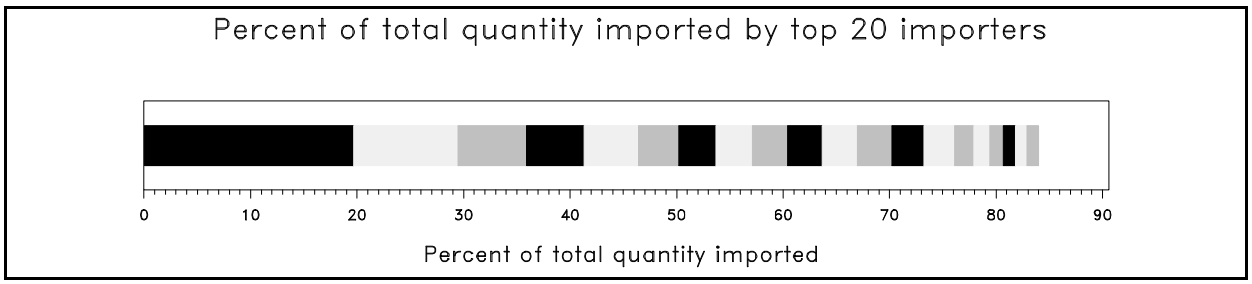
A few species stand out in terms of imports. In 1970, 69% of total reptile imports were red-eared slider turtles (Hoover, 1998). After the sale of all turtles under 4 inches was banned by the Food and Drug Administration (FDA) in 1975, the importation of this species declined (HSUS, 1994). Because US turtle farms that bred red-eared sliders no longer had a viable domestic market, large numbers of these turtles were, and still are, exported (Hoover, 1998; HSUS, 1994). Iguanas, especially the green iguana, have seen the opposite trend, with a substantial increase in numbers imported. Iguanas accounted for 8%, 36%, and 41% of total reptile imports in 1970, 1993, and 1996, respectively (Hoover, 1998).

Almost all turtles imported into the US are wild caught (HSUS, 1994). There are a limited number of import dealers that trade in live turtles. In the early 1990's, 85-90% of all turtles imported into or exported from the US were traded by 10 dealers (HSUS, 1994).

Live reptiles: 1998 Imports

In 1998, about 350 importers brought into the US a total of 1.93 million reptiles (Hoover, personal communication).[3] The top importer accounted for almost 20% of the total volume and the top 20 importers accounted for 84% of total imports.

[3] *This figure for the total number of reptiles imported differs from the data collected by the US Fish and Wildlife Service. Experts familiar with the data and the industry believe that the discrepancy is due to the high probability of exports being miscoded as imports in the FWS data.*



Eighty-two percent (82%) of all reptiles imported in 1998 were lizards, and iguanas accounted for 41% of the lizards (Table 6). Snakes made up about 11% of reptile imports, turtles about 4%, and 2% were unspecified.

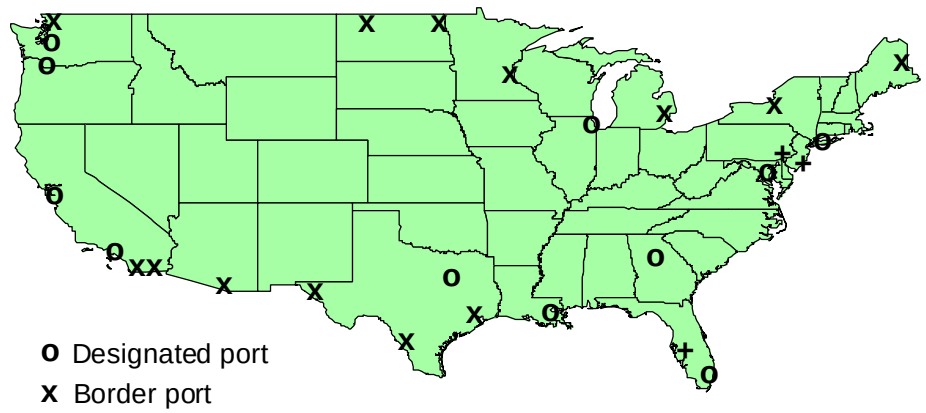
Table 6: Types of live reptiles imported, 1998

Type	Quantity	% of total
Lizards	1,185,910	82.3
Snakes	164,504	11.4
Turtles	50,566	3.5
Crocodiles	5,593	0.4
Unspecified	34,398	2.4

Source: LEMIS, 1998

There are a limited number of ports designated by the US Fish and Wildlife Service through which all wildlife must enter. The designated ports are: Atlanta, Baltimore, Boston, Chicago, Dallas/Ft. Worth, Honolulu, Los Angeles, Miami, New Orleans, New York, Portland, San Francisco, and Seattle (50CFR14.12). Exceptions may be made to minimize loss or to alleviate undue economic hardship. Wildlife coming from Canada or Mexico and whose country of origin is Canada, Mexico, or the US may also enter via a number of additional border ports.

Ports of entry for reptile imports, 1998



Source: US Fish and Wildlife Service, LEMIS

In 1998, live reptile imports came into a total of 30 ports in the US (Appendix A). Ports in the continental US are shown here. In addition to the designated ports and border ports, reptiles entered the US through Newark, Philadelphia, and Tampa in 1998.

Ten ports accounted for 97% of all shipments and 99.5% of total live reptiles imported (Table 7). The value of reptiles that came into the top 10 ports accounted for 99% of the total value of $5.8 million.

Table 7: Live reptile imports for top 10 ports, 1998

Port	Total shipments (number)	Total quantity (number of head)	Total value ($)
Los Angeles, CA	2,776	701,723	1,982,290
Miami, FL	1,879	594,454	2,937,812
Tampa, FL	112	35,523	96,212
New York, NY	222	31,914	166,412
Atlanta, GA	205	31,018	134,642
Dallas/Ft. Worth, TX	284	11,258	213,393
San Francisco, CA	121	9,703	85,297
New Orleans, LA	2	8,000	6,000
Chicago, IL	60	6,102	51,029
Newark, NJ	27	4,029	13,582
Total	5,688	1,433,724	5,686,669

Source: LEMIS, 1998

Live reptile imports in 1998 came from about 80 countries of origin (Appendix A). The top 10 countries of origin accounted for 82% of the total quantity imported (Table 8).

Table 8: Live reptiles - Top 10 countries of origin, 1998

Country of origin	Type of reptile					
	Crocodiles	Lizards	Snakes	Turtles	Unspecified	Total
Colombia	1,966	234,712	27,196	2	0	263,876
El Salvador	0	229,177	7	0	0	229,184
Vietnam	0	152,966	12,064	1,669	1,973	168,672
China	0	81,383	10,072	16,897	840	109,192
Thailand	0	91,821	1,704	0	975	94,500
Benin	0	28,906	44,468	2,301	630	76,305
Indonesia	0	44,318	13,189	2,633	10,869	71,009
Madagascar	0	61,378	60	70	2,121	63,629
Togo	0	25,604	30,670	2,081	100	58,455
Tanzania	0	45,828	110	0	6,738	52,676

Source: LEMIS, 1998

Live reptiles: Exports and re-exports

The number of US live reptile exports is approximately 4 to 5 times the number of live reptile imports. Between 1993 and 1998, the US exported 9 to 10 million live reptiles annually (Hoover, 1998 and personal communication). Red-eared slider turtles made up about 85% of these exports every year. South Korea, Japan, and European countries are the major importers of US turtles. In 1993, South Korea imported 1.4 million red-eared slider turtles from the US, followed by Italy and Japan (HSUS, 1994).

The largest proportion of exports, excluding the red-eared slider, is made up of re-exports, meaning the export of animals that had previously been imported into the US (Hoover, 1998). This is due to the US as geographically suited to supply Asia with African species, and Europe with Asian species. Most of Canada's live reptile industry is also supplied by US traders (Hoover, 1998).

The fact that some nonnative reptiles are exported in greater numbers than they are imported attests to the large numbers of these animals that are captive-bred in the US. For example, 952 sulcata tortoises (*Geochelone sulcata*) were imported in 1995, while 2,332 were exported (Hoover, 1998).

Live reptiles: The world trade market

A comparison of world trade to US trade for about 70 reptile species listed under CITES shows that US imports and exports constituted about 80% of the total trade in these species in the early 1990's (Hoover, 1998).

US Federal Regulations Pertaining to Reptiles and Amphibians

US Department of the Interior, US Fish and Wildlife Service

The two most important legislative acts pertaining to the trade of live reptiles and amphibians are the US Endangered Species Act (ESA) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Regulations enforcing the provisions of these legislative acts for terrestrial species are administered by the US Fish and Wildlife Service.

Wildlife imports and exports, including live animals, skins, and other products, must be declared and cleared by the US Fish and Wildlife Service (Form 3-177 Declaration for importation or exportation of fish or wildlife). Other permits may also be required for endangered or threatened species, for CITES-listed species, or injurious species (http://www.customs.ustreas.gov/travel/pet.htm, http://international.fws.gov).

- Endangered and threatened wildlife species listed under the ESA

The ESA provides protection for both native and nonnative species. Generally, the act prohibits the taking of threatened or endangered species within the US, interstate commerce, imports/exports, and the possession, transportation, purchase, or sale of illegally obtained specimens (50CFR17) (Levell, 1997).

Species, or products thereof, that are considered under the ESA as endangered or threatened are prohibited from import or export. Some exceptions may be granted; for example, for scientific research, breeding, or similar purposes that contribute to the species' conservation (Facts about federal wildlife laws at http://www.fws.gov/laws/facts.html).

As of March 2000, a total of 115 species of reptiles and 27 species of amphibians were listed under the ESA (USFWS at http://ecos.fws.gov/tess/html/boxscore.html). Some common reptile products that are included in this ban are whole shells and "tortoise" shell jewelry made from the shells of sea turtles; sea turtle soup and facial creams; and leather articles made from sea turtles and some species of crocodile (Facts about wildlife, above).

While regulations enforcing the ESA for terrestrial species are administered by the US Fish and Wildlife Service, in the case of sea turtles and other marine species, the National Marine Fisheries Service (NMFS) also has jurisdiction. The NMFS regulates incidental take of sea turtles by fishing vessels (Levell, 1995).

- CITES wildlife species

CITES is an agreement among countries to cooperate in the regulation of international trade in rare or vulnerable species (Levell, 1995), or other species whose trade must be regulated for management reasons (e.g. species that look like rare or vulnerable species). CITES is not a self-executing treaty, therefore implementation and practical enforcement of its provisions are the

responsibility of participating countries. Regulations to implement CITES' provisions under US law were put into place in 1977 (50 CFR 23). As of October 2000, 152 countries were signatories of CITES, including the US (http://www.wcmc.org.uk/cites/eng). Of the approximately 6,000 species of reptiles worldwide, currently about 80 species of turtles/tortoises and 270 species of lizards[4] are protected under CITES (http://www.wcmc.org.uk/CITES). Of amphibians, about 90 species of frogs/toads and 4 species of salamanders are listed. Parts or derivatives of animals are also included in the CITES restrictions for all three Appendices.

Species listed under CITES are classified into one of three Appendices, where Appendix I provides the most protection. Species listed in Appendix I are considered to be threatened with extinction and are, or may be, adversely affected by international trade. These species may not be traded for primarily commercial purposes, and both export and import permits are required. Appendix I species may be traded for noncommercial purposes if trade is not detrimental to the survival of the species and the importer can provide proper housing and care (US Fish & Wildlife).

Species in Appendix II are not considered to be currently threatened with extinction, but may become so if international trade is not regulated. These species may be traded internationally, including for primarily commercial purposes, if obtained legally and if trade will not be detrimental to the species' survival. To import Appendix II species into the US, generally only an export permit from the shipping country is required. Export permits are required to export these species from the US.

Species in Appendix III are subject to trade restrictions within a country, and for which the country has requested international cooperation to regulate trade. Export permits are required from within the country which listed the species, and certificates of origin are required to export these species from any other country.

- Lacey Act

The Lacey Act prohibits any wildlife to be taken, transported, or sold in violation of any wildlife law, treaty, or regulation of the US or any Indian tribal law (Hoover, 1998). In addition, the act prohibits the acquisition, transport, and trade, whether interstate or international, of wildlife taken in violation of any wildlife law of any US state or any foreign country. The act also prohibits any person from causing or permitting any wildlife to be transported to the US under inhumane or unhealthy conditions.

- Other restrictions

Importation or transportation of live brown tree snakes or eggs (*Boiga irregularis*) without an injurious wildlife permit is prohibited (Levell, 1997).

Release into the wild of reptiles or amphibians, or their progeny or eggs, is prohibited except as authorized by the state wildlife agency (50CFR 16.14 and 16.15).

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[4] Includes lizards, geckos, monitors, iguanas, and chameleons.

- Importers of wildlife and wildlife products

Importers and exporters of live wildlife and products such as hides and skins, shoes, and jewelry must be licensed with the US Fish and Wildlife Service (50CFR14.91). Licenses are issued on a yearly basis.

- Interstate commerce

Interstate commerce is illegal for endangered or threatened species (under the ESA) and any wildlife that is obtained illegally in foreign countries (under the Lacey Act). Some reptile products that are illegal to transport across state lines are tortoise shell items and sea turtle meat and oils; and articles from certain crocodile species, such as shoes, bags, and belts (Facts about federal wildlife laws).

- IATA regulations regarding transport of reptiles and amphibians

Most major airlines are members of the International Air Transport Association (IATA) and must comply with IATA regulations concerning transport of live animals. In addition, the IATA standards have been adopted by CITES as applicable to shipments of CITES species. The US Fish and Wildlife Service has adopted specific container requirements of the IATA regulations for transporting wild mammals and birds to the US, but not the requirements pertaining to reptiles or amphibians.

IATA regulations stipulate that shipments of live animals must be arranged in advance and be accompanied by proper documentation. In the case of reptiles and amphibians, the shipper must certify that the animals are healthy enough to travel, that they have been examined prior to shipment and are free of any apparent injuries, diseases, and external parasites. IATA also specifies container requirements for reptiles and amphibians, including container size, stocking density, ventilation and temperature maintenance, and labeling.

US Department of Health and Human Services, US FDA, and Centers for Disease Control and Prevention (CDC)

Live turtles, including tortoises and terrapins, less than 4 inches in length, or turtle eggs may not be imported into the US unless the shipment consists of 6 or less turtles or eggs and the importation is not for commercial purposes (CDC). Likewise, eggs or live turtles less than 4 inches may not be transported or sold in the US, except for scientific or educational purposes, or for export (FDA) (Levell, 1997).

US Department of Agriculture, Animal and Plant Health Inspection Service (APHIS)

In March 2000, the importation and interstate movement of three tortoise species were temporarily prohibited. The three species are the leopard tortoise (*Geochelone pardalis*), African

spurred tortoise (*Geochelone sulcata*), and Bell's hingeback tortoise (*Kinixys belliana*). This prohibition was due to the finding that these species have been found to harbor exotic ticks known to be vectors of heartwater disease, which is foreign to the US. In July 2000, the prohibition was modified, allowing the interstate movement of these species if they are accompanied by a health certificate stating that they have been found to be free of ticks (65 FR 45275). APHIS is currently working with the reptile community and the pet industry to establish effective treatment and biosecurity protocols which would remove the threat of heartwater disease.

US Department of the Treasury, US Customs Service

The US Customs Service also requires a customs declaration for imported and exported wildlife. Imports of live reptiles and amphibians are free of customs duty (http://www.customs.ustreas.gov, and personal communication).

US State Regulations Pertaining to Reptiles and Amphibians

Virtually all states have endangered species legislation and most states have some native reptiles and amphibians listed as endangered or threatened (Levell, 1997). Permits are generally required for any activities involving species that are listed as endangered or threatened.

Many states require some kind of permit such as a hunting/fishing license or a collector's permit to take native reptiles or amphibians from the wild for noncommercial purposes (Appendix B). Some states require a permit for taking any species, while other states require permits for only particular species or for larger quantities, or during specific seasons.

Regulations for the taking of native reptiles or amphibians from the wild for commercial trade also vary between states (Appendix B). While commercial taking is prohibited in some states, other states allow commercial taking but require permits or restrict commercial taking to certain species.

About half of all states have no regulations restricting the importation of nonnative reptiles or amphibians (Appendix B). On the other hand, some states require a permit to import any live wildlife into the state, while some require permits only for certain species such as crocodilians, or venomous or dangerous reptiles and amphibians. Aside from an importation permit, most states do not have any further restrictions on the possession of nonnative reptiles and amphibians.

Although federal law prohibits release of live reptiles or amphibians into the wild, except as authorized by the state wildlife agency, many states also expressly prohibit the release of nonnative species into the wild as doing so could be injurious to the state's environment, including the existing wildlife.

Most states have very few restrictions on the captive holding or breeding of reptiles or amphibians (Appendix B). When permit restrictions exist, they generally pertain only to a few native or dangerous species. Only a few states require permits for the captive propagation of all species.

In addition to state level regulations, some counties and cities have enacted local ordinances regulating certain activities involving reptiles and amphibians. For example, special permits may be required to own constrictors exceeding certain lengths.

Sources

Aiello, SE. (ed) 1998. The Merck Veterinary Manual, 8th ed. Merck & Co., inc., NJ.

American Pet Products Manufacturers Association (APPMA). 2000. The 1999/2000 APPMA National Pet Owners Survey.

American Veterinary Medical Association. 1997. U.S. Pet Ownership & Demographics Sourcebook. AVMA, Schaumburg, IL.

Assemblies: Association of Reptilian and Amphibian Veterinarians. 2000. JAVMA 216 (1), AVMA, Schaumburg, IL.

Barringer, Jeff. 2000. web master for Kingsnake.com. personal communication.

Directory: the herpetology sourcebook. 1996/1997. Reptile and Amphibian Magazine, Pottsville, PA.

Grenard, S. 1994. Medical Herpetology, Amphibians and reptiles - their influence on, and relationship to, human medicine. Reptile and Amphibian Magazine, Pottsville, PA.

Hellwig, Greg. 1999. 26th Annual Pet Product News Buying Guide Directory State of the Industry Report, Irvine, CA.

Hoover, C. 1998. The US role in the international live reptile trade: Amazon tree boas to zululand dwarf chameleons. Traffic North America, August 1998.

The Humane Society of the United States. 1994. Preliminary report: Live freshwater turtle and tortoise trade in the United States. November 1994.

Levell, JP. 1997. A Field Guide to Reptiles and the Law, 2nd ed. Serpent's Tale, Excelsior, MN.

Mitchell, MA. 2000. personal communication. President elect, Association of Reptilian and Amphibian Veterinarians.

Meyers, Marshall. 2000. personal communication. Pet Industry Joint Advisory Council.

The New Encyclopaedia Britannica (vol 26), 15th ed. 1997. Macropaedia, Chicago, IL.

Appendix A: Reptile Imports

Live reptile imports 1998 - Quantity and value by port and type

---------- state=AK ----------

Portname	type	quantity (#)	value ($)
ANCHORAGE, AK	snakes	27	325

---------- state=AZ ----------

Portname	type	quantity	value
NOGALES, AZ	turtles	211	3175

---------- state=AZ/TX ----------

Portname	type	quantity	value
OTHER PORT - REGION 2	crocs	2	1
OTHER PORT - REGION 2	snakes	1	200
OTHER PORT - REGION 2	turtles	1	1
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State		4	202

---------- state=CA ----------

Portname	type	quantity	value
CALEXICO, CA	lizards	2	125
LOS ANGELES, CA	crocs	466	1568
LOS ANGELES, CA	lizards	582619	1141497
LOS ANGELES, CA	snakes	79975	584094
LOS ANGELES, CA	turtles	30505	233989
LOS ANGELES, CA	unspec	8158	21142
SAN FRANCISCO, CA	lizards	8322	47652
SAN FRANCISCO, CA	snakes	644	20911
SAN FRANCISCO, CA	turtles	457	14121
SAN FRANCISCO, CA	unspec	280	2613
SAN DIEGO/SAN YSIDRO, CA	snakes	8	100
SAN DIEGO/SAN YSIDRO, CA	turtles	1	100
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State		711437	2067912

---------- state=FL ----------

Portname	type	quantity	value
MIAMI, FL	crocs	4708	101032
MIAMI, FL	lizards	510401	1159047

MIAMI, FL	snakes	65136	1559412
MIAMI, FL	turtles	6996	99907
MIAMI, FL	unspec	7213	18414
TAMPA, FL	crocs	12	34
TAMPA, FL	lizards	26600	60503
TAMPA, FL	snakes	5431	29356
TAMPA, FL	turtles	699	5777
TAMPA, FL	unspec	2781	542
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State		629977	3034024

---------- state=GA ----------

Portname	type	quantity	value
ATLANTA, GA	lizards	12451	56382
ATLANTA, GA	snakes	2838	38390
ATLANTA, GA	turtles	440	6700
ATLANTA, GA	unspec	15289	33170
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State		31018	134642

---------- state=HI ----------

Portname	type	quantity	value
HONOLULU, HI	turtles	7	14

---------- state=IL ----------

Portname	type	quantity	value
CHICAGO, IL	crocs	2	10000
CHICAGO, IL	lizards	5212	28200
CHICAGO, IL	snakes	706	7579
CHICAGO, IL	turtles	182	5250
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State		6102	51029

---------- state=LA ----------

Portname	type	quantity	value
NEW ORLEANS, LA	turtles	8000	6000

---------- state=MD ----------

Portname	type	quantity	value
BALTIMORE, MD	lizards	9	294
BALTIMORE, MD	snakes	25	11730
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State		34	12024

---------- state=ME ----------

Portname	type	quantity	value
HOULTON, ME	lizards	1	1400
HOULTON, ME	turtles	2	300
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State		3	1700

---------- state=MI ----------

Portname	type	quantity	value
DETROIT, MI	lizards	17	775
DETROIT, MI	snakes	7	490
DETROIT, MI	turtles	1	3
---		---	---
State		25	1268

---------- state=MN ----------

Portname	type	quantity	value
MINNEAPOLIS/ST PAUL, MN	turtles	5	0

---------- state=ND ----------

Portname	type	quantity	value
PEMBINA, ND	crocs	3	0
PEMBINA, ND	snakes	60	0
PORTAL, ND	snakes	210	10
PORTAL, ND	unspec	1	0
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State		274	10

---------- state=NJ ----------

Portname	type	quantity	value
NEWARK, NJ	lizards	1415	10370
NEWARK, NJ	snakes	2613	212
NEWARK, NJ	turtles	1	0
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State		4029	13582

---------- state=NY ----------

Portname	type	quantity	value
BUFFALO, NIAGARA FALLS, NY	lizards	39	318
BUFFALO, NIAGARA FALLS, NY	snakes	4	350
BUFFALO, NIAGARA FALLS, NY	unspec	70	3945
NEW YORK, NY	crocs	393	19780

NEW YORK, NY	lizards	28095	87482
NEW YORK, NY	snakes	1066	18758
NEW YORK, NY	turtles	1760	40011
NEW YORK, NY	unspec	600	381
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State		32027	171025

---------- state=OR ----------

Portname	type	quantity	value
PORTLAND, OR	lizards	534	2054
PORTLAND, OR	unspec	4	0
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State		538	2054

---------- state=PA ----------

Portname	type	quantity	value
PHILADELPHIA, PA	lizards	3	0

---------- state=TX ----------

Portname	type	quantity	value
DALLAS/FT WORTH, TX	crocs	7	4333
DALLAS/FT WORTH, TX	lizards	5936	64696
DALLAS/FT WORTH, TX	snakes	847	125828
DALLAS/FT WORTH, TX	turtles	468	18536
EL PASO, TX	lizards	1	2
EL PASO, TX	turtles	12	80
HOUSTON, TX	lizards	778	5490
HOUSTON, TX	snakes	607	3800
HOUSTON, TX	turtles	6	0
LAREDO, TX	turtles	2	20
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State		12664	222785

---------- state=UK ----------

Portname	type	quantity	value
UNKNOWN	lizards	2086	10354
UNKNOWN	snakes	254	1732
---		---	---
State		2340	12086

---------- state=WA ----------

Portname	type	quantity	value
BLAINE, WA	lizards	4	65
BLAINE, WA	snakes	15	430

SEATTLE, WA	lizards	1385	9737
SEATTLE, WA	snakes	30	3260
SEATTLE, WA	turtles	810	8286
SEATTLE, WA	unspec	2	40
---		---	---
State		2246	21818
		======	=======
		1440971	5755675

unspec = unspecified reptiles

Live reptile imports 1998 - Countries of Origin

Country	Number shipments	Quantity
Colombia	206	263876
El Salvador	87	229184
Vietnam	470	168672
China	427	109192
Thailand	78	94500
Benin	289	76305
Indonesia	843	71009
Madagascar	684	63629
Togo	283	58455
Tanzania	686	52676
Egypt	179	48724
Ghana	214	43339
Nicaragua	182	27462
Russia	41	20554
Honduras	221	16806
Costa Rica	21	15545
Suriname	91	8647
Mali	43	8618
Peru	61	7383
Various, Unspecified	39	5443
Guyana	71	5065
Greece	5	5042
Guatemala	31	3640
Equatorial Guinea	5	3575
Solomon Islands	59	3441
Nigeria	23	3231
Venezuela	14	3182
Argentina	4	2990
Cameroon	68	2685
United Kingdom	11	2370
Zambia	13	2320
Germany, Federal Republic of	63	2261
Mozambique	28	1832
Brunei Darussalam	3	1750
Turkey	3	1040
Malaysia	54	1012
Sudan	1	690
Hong Kong	32	663
Switzerland	26	544
Canada	32	515
United Arab Emirates	2	500
Haiti	1	400
Czech Republic	9	365
Paraguay	2	213
Taiwan	1	200
Ukraine	1	200
Hungary	3	188

Uruguay	8	134
Japan	11	121
Mexico	28	116
Phillipines	2	108
Spain	7	65
Chad	1	64
Barbados	1	61
Kenya	10	61
Australia	10	60
Namibia	5	45
Trinidad & Tobago	3	40
France	2	33
Netherlands	4	29
Fiji	4	20
Saudi Arabia	1	19
Korea, South	3	11
Sweden	2	10
South Africa	3	8
Denmark	1	6
New Caledonia	1	6
Brazil	1	5
Tonga	1	4
Jamaica	1	3
Singapore	1	2
Algeria	1	1
Gabon	1	1
Israel	1	1
Italy	1	1
Pakistan	1	1
Panama	1	1
Poland	1	1
		========
		1440971

Appendix B: State Regulations Pertaining to Amphibians and Reptiles

It should be noted that several states have revised or are in the process of revising these regulations since the publication of the sources used to produce this table.

State regulations pertaining to amphibians and reptiles, 1997						
State	Is a permit* required to take amphibians or reptiles from the wild?	Is taking/possession/ transport of native reptiles or amphibians for commercial purposes allowed?	Is the importation of nonnative reptiles or amphibians allowed?**	Are there restrictions on the possession of nonnative reptiles or amphibians?	Is captive breeding of reptiles or amphibians allowed?**	Notes
Alabama	Only for a few species	Yes; some species require permit	Yes; only crocs & alligators require permit	No	Yes; only crocs require permit	
Alaska	Yes	No	Yes; amphibians & venomous reptiles require permit	Permit required for amphibians but not for reptiles	Yes; amphibians & venomous reptiles require permit	Alaska has only one terrestrial reptile and 7 species of amphibians
Arizona	Yes	No	Permit required	Only venomous snakes require permit	Some species require permit	
Arkansas	Yes	Permit required	Yes	No	Yes	
California	Yes	No	Yes	Detrimental species, crocs & venomous reptiles require permit	Requires permit & only some species allowed	Fish & wildlife laws among the most comprehensive
Colorado	Some species	Permit required	Permit required	Some species require permit	Some species require permit	
Connecticut	No	No	Permit required	Crocs & venomous reptiles require permit	Some species require permit	
Delaware	Some species	Yes	Some species require permit	Some species require permit	Some species require permit	A permit is required to bring into DE any live animal not native to the US
Florida	No	Permit required	Yes	Some species require permit	Some species require permit	A permit is required for the keeping of venomous snakes and for selling or exhibiting any live reptiles

State	Is a permit* required to take amphibians or reptiles from the wild?	Is taking/possession/ transport of native reptiles or amphibians for commercial purposes allowed?	Is the importation of nonnative reptiles or amphibians allowed?**	Are there restrictions on the possession of nonnative reptiles or amphibians?	Is captive breeding of reptiles or amphibians allowed?**	Notes
Georgia	Some species	Yes; alligators & turtles require permit	Some species require permit	Crocs & venomous reptiles require permit	Some species require permit	
Hawaii	No; most reptile & amphibian species were introduced and are thus nonnative	No	Permit required	No	Some species require permit	HI has only 6 species of native reptiles and amphibians; all are protected. A permit is required for all imports of live animals; many reptiles and amphibians are prohibited entry
Idaho	Yes	Yes	Permit required	No	Yes	
Illinois	Only bullfrogs & turtles require permit	No	Yes	Crocs & venomous reptiles require permit	Some species require permit	
Indiana	Only turtles & frogs require permit	Yes; frogs & turtles require permit	Permit required	No	Yes	
Iowa	Yes	Yes; some species require permit	Yes	No	Some species require permit	
Kansas	Yes	No	Yes	No	Some species require permit	
Kentucky	Yes	Permit required	Permit required	Amphibians require permit, but not reptiles	Yes	
Louisiana	Yes	Permit required	Only turtles require permit	Turtles require permit	Yes	Specific reptile & amphibian legislation
Maine	No	No	Permit required	Some species require permit	Some species require permit	Permit required to possess venomous reptiles & import wildlife
Maryland	Only for larger quantities	Permit required	Some species require permit	Crocs & venomous snakes require permit	Permit required	Import of crocs & some snakes as pets prohibited

State	Is a permit* required to take amphibians or reptiles from the wild?	Is taking/possession/ transport of native reptiles or amphibians for commercial purposes allowed?	Is the importation of nonnative reptiles or amphibians allowed?**	Are there restrictions on the possession of nonnative reptiles or amphibians?	Is captive breeding of reptiles or amphibians allowed?**	Notes
Massachusetts	No	Permit required	Some species require permit	Some species require permit	Some species require permit	
Michigan	Yes	Permit required	Yes	No	Yes	
Minnesota	Only frogs & turtles require permit	Yes; frogs & turtles require a permit	Yes	No	Some species require permit	
Mississippi	Yes	No	Yes	No	Some species require permit	Commercial trade is allowed only for captive bred reptiles
Missouri	Some species	No	Yes	No	Some species require permit	
Montana	No	Yes	Yes	No	Yes	
Nebraska	Only for a few species	Some species require permit	Yes	No	Some species require permit	
Nevada	Yes	Permit required	Some species require permit	Some species require permit	Some species require permit	
New Hampshire	No	Yes	Yes; venomous reptiles require permit	No	Venomous reptiles & amphibians are prohibited	
New Jersey	Yes	Permit required	Permit required	Some species require permit	Some species require permit	
New Mexico	No	Yes	Permit required	No	Yes	
New York	Some species	Yes; some species require permit	Yes; venomous reptiles require permit	No	Yes; venomous reptiles require permit	
North Carolina	Some species and large quantities	Permit required for collecting, not for sale	Yes	No	Permit required	
North Dakota	No	Yes; frogs & turtles require permit	Yes	No	Yes	
Ohio	Only frogs & turtles require permit	Yes; only frogs are prohibited	Yes	No	Yes	Frogs cannot be bought or sold. Turtles may be bought and sold
Oklahoma	Yes	No	Permit required	No	Permit required	

State	Is a permit* required to take amphibians or reptiles from the wild?	Is taking/possession/ transport of native reptiles or amphibians for commercial purposes allowed?	Is the importation of nonnative reptiles or amphibians allowed?**	Are there restrictions on the possession of nonnative reptiles or amphibians?	Is captive breeding of reptiles or amphibians allowed?**	Notes
Oregon	No	No	Permit required	No	Some species require permit	
Pennsylvania	Yes	No	Yes	No	Yes	
Rhode Island	No	Permit required	Some species require permit	Some species require permit	Yes	Many reptiles species are prohibited from importation
South Carolina	No	Yes	Yes	No	Yes	
South Dakota	Yes	Permit required	Yes	No	Permit required	
Tennessee	Yes	No	Yes; crocs and poisonous species require permit	Some species require permit	Some species require permit	
Texas	Yes	Yes	Yes	No	Yes; alligators require permit	
Utah	No	No	Permit required	No	Some species require permit	
Vermont	No	Yes	Permit required	No, except for importation permit	Permit required	
Virginia	Yes	No	Some species require permit	Some species require permit	Some species require permit	
Washington	Yes	No	Deleterious species require permit	No	Some species require permit	
West Virginia	Some species	No	Yes	No	Permit required	
Wisconsin	Yes	Yes; frogs & turtles require permit	Yes	No	Yes	
Wyoming	Some species	Permit required	Yes	No	Some species require permit	

* Hunting license, fishing license, collection permit. This applies to unprotected species; all protected species require special permits.

** The entry 'Some species req permit' means that the activity is generally allowed; some species do not require a permit, while other species do require a permit.

Sources: Reptile and amphibian regulations, 1996-1997 Directory;
Levell P, 1997. A field guide to reptiles and the law, 2nd edition (includes amphibians)