

# Florida's Commercial Trade in Native Amphibians and Reptiles

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*Abstract:* A program was implemented by the Florida Game and Fresh Water Fish Commission (Commission) to collect information on the scope and magnitude of the commercial trade in native species of amphibians and reptiles to improve management of this wildlife resource. During the first 2 years of the reporting program (1 Jul 1990–30 Jun 1992), 1,050 salamanders (12 species), 41,493 anurans (18 species), 8,669 turtles (13 species), 19,346 lizards (13 species), and 49,240 snakes (35 species) were reported collected from the wild and sold in the pet trade. Most of the salamanders (85%), 42% of the anurans, 34% of the turtles, and 13% of the snakes came from the Panhandle. Most of the lizards (80%) and snakes (76%), 50% of the turtles, and 27% of the anurans came from Lake Okeechobee south. The seasonality of harvest of anurans, turtles, lizards, and snakes by the major collectors varied between northern and southern Florida. Native amphibians and reptiles were sold to 49 states and 19 other destinations. Florida snake skin dealers reported purchasing 3,647 eastern diamondback (*Crotalus adamanteus*) and 366 timber rattlesnakes (*C. horridus*) from Florida and 18,289 and 4,346, respectively, from other states.

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Florida supports a diverse herpetofauna composed of 141 native species and at least 24 introduced non-native species. Extensive collection of native herpetofauna in Florida provides live animals for the pet trade and dead animals for food and other products (e.g., snake skins).

The Florida Game and Fresh Water Fish Commission's stated goals for the Nongame Wildlife Program include (1) "to achieve and maintain the natural diversity, abundance and distribution of nongame wildlife," and (2) "to provide uses of nongame wildlife on an optimum sustained use basis." One objective identified in the Commission's Strategic Plan for the Nongame Wildlife Program is "to develop and implement a method for determining the extent of exploitation of amphibians and reptiles and identify those species that are exploited . . ." (Fla. Game and Fresh Water Fish Comm. 1988). To meet this goal, a new rule (39-25.0011, Fla. Admin.

Code; see Enge 1991) was implemented on 1 July 1990 to identify which native amphibian and reptile species are being utilized and the approximate scope and magnitude of the exploitation. The Commission's goal is to use this information to improve protection and management of this wildlife resource in the future.

## Methods

Florida Statute (F.S.) 372.921 requires any person wishing to exhibit live reptiles to the public or to possess for sale or sell live reptiles (except anoles [*Anolis* spp.]) to obtain a "license to possess wildlife for exhibition or public sale" from the Commission. The new rule requires any person not possessing an exhibition/sale license to obtain a no-cost "amphibian and reptile product dealers (ARD) permit" from the Commission to sell or possess for sale any live amphibian species native to Florida. Any person without an exhibition/sale license who purchases for resale the carcass, skin, meat, or other body part of any amphibian or reptile species (except alligators [*Alligator mississippiensis*] which are covered under separate rules) native to Florida also must obtain an ARD permit.

The new rule also requires all persons dealing in live or dead amphibian or reptile species native to Florida to "maintain accurate records of the species, number, source, and destination of all native amphibians or reptiles or carcasses, skins, meat, or other body parts thereof bought or sold." A carbon copy of these records is to be submitted to the Commission on a quarterly basis.

The harvest of amphibians and reptiles from the wild in Florida for the pet trade was determined by summing sales reported by persons collecting the animals. Animals were counted only when first reported entering the pet trade; subsequent transactions of these animals were excluded when summarizing the data. Offspring born in captivity to females captured from the wild during the same calendar year were considered wild-caught.

Data also were collected on the commercial harvest of turtles and frogs for human consumption and of snakes for skins and other products. Only data on the harvest of snakes for the skin trade are presented here.

## Results and Discussion

### Administration

Administering the reporting program required approximately 50% of 1 biologist's time. The number of persons reporting such transactions to the Commission quarterly reached a maximum of 615 persons but averaged 500 persons. Of 446 persons who had reporting forms for  $\geq 1$  year, 49% submitted forms quarterly.

### Numbers of Live Amphibians and Reptiles Harvested

My data underestimate the actual number of amphibians and reptiles taken from the wild, because only those sold or traded are included. Many amphibians and reptiles are not reported, including those collected for personal use (e.g., pets,

breeding stock, bait, or food for other animals) and those that die in or escape from captivity before being sold. Many collectors fail to comply with the regulations. Nonresidents who collect amphibians and reptiles in Florida and sell them outside the state do not need an exhibition/sale license and are not required to report.

During the first 2 years of the reporting program (1 Jul 1990–30 Jun 1992), 119,798 live native wild-caught amphibians and reptiles were reported sold in the pet trade. An increase in numbers reported the second year may not necessarily reflect more animals being collected but may reflect increased reporting compliance by the major collectors as the program progressed.

During this period, 1,050 live caudates (newts and salamanders) representing 12 of 25 native caudate species were reported taken from the wild in Florida and sold in the pet trade (Table 1). Native caudates comprise a relatively insignificant part of the amphibian and reptile trade, and few persons collect them commercially. There may be a relatively large but unreported trade in various sirens (*Siren* spp. and *Pseudobranchius* spp.) and small two-toed amphiumas (*Amphiuma means*) for fish bait.

During the 2-year period, 41,493 live native anurans (frogs and toads) were reported taken from the wild in Florida and sold as pets or as food for captive snakes (Table 1). Eighteen of 27 native anuran species entered the commercial trade.

A total of 8,669 live native turtles taken from the wild was sold as pets during the 2-year period (Table 1), and these included 13 of 20 native turtle species, excluding sea turtles. Differences in numbers reported for some species (e.g., cooter [*Pseudemys floridana*], Florida redbelly turtle [*P. nelsoni*]) between years can be attributed to a few persons hatching out turtles from eggs collected from gravid females or from nests.

Thirteen of 17 native lizard species entered the commercial trade. Of 19,346 native lizards reported taken from the wild in Florida and sold in the pet trade, 73% were green anoles (*Anolis carolinensis*) (Table 1). A total of 70,852 anoles was assigned to an unidentified anole category, because collectors did not indicate the species of anole sold or combined green anoles and introduced non-native brown anoles (*A. sagrei*) on their reporting forms.

A total of 49,240 live snakes (35 of 44 native snake species) was reported collected from the wild in Florida and sold in the pet trade over the 2-year period (Table 1). More collectors catch snakes than any other amphibian or reptile, so their numbers may be less susceptible to annual variation in reported totals. Probably because of better reporting by the major collectors, there was an increase in the number of most snake species collected and sold during the second year. Two species showing a marked increase in numbers collected the second year were the rough green snake (*Opheodrys aestivus*) and eastern ribbon snake (*Thamnophis sauritus*) because 1 dealer trained hunters in effective collecting techniques and financed their equipment. The only species showing a large decrease in numbers sold was the common kingsnake (*Lampropeltis getula*), reflecting reduced collecting pressure in the sugar cane fields around Lake Okeechobee (the source of most Florida kingsnakes [*L. g. floridana*]) because of a market glut the previous year and fewer days of favorable collecting weather. The most frequently collected spe-

**Table 1.** Native amphibian and reptile species for which  $\geq 100$  live individuals were collected from the wild in Florida and sold in the pet trade during the first (1 Jul 1990–30 Jun 1991) and second (1 Jul 1991–30 Jun 1992) years of the reporting program. Common names follow Collins (1990).

Taxon	1990–91	1991–92	Total
Marbled salamander	180	32	212
Three-lined salamander	190	75	265
Greater siren	249	3	252
Total caudates <sup>a</sup>	804	246	1,050
Southern cricket frog	400	3,795	4,195
Oak toad	961	383	1,344
Southern toad	3,221	3,924	7,145
Cope's gray treefrog	1,729	981	2,710
Green treefrog	5,341	7,825	13,166
Barking treefrog	2,678	3,559	6,237
Squirrel treefrog	1,509	449	1,958
Unidentified treefrog ( <i>Hyla</i> spp.)	336	106	442
Southern spring peeper	32	750	782
Bullfrog	27	90	117
Pig frog	155	207	362
Florida leopard frog	1,122	566	1,688
Eastern spadefoot	888	239	1,127
Total anurans <sup>a</sup>	18,474	23,019	41,493
Florida softshell	131	242	373
Common snapping turtle	107	155	262
Chicken turtle	60	158	218
Striped mud turtle	441	526	967
Eastern mud turtle	209	587	796
Diamondback terrapin	132	44	176
Cooter	265	1,414	1,679
Florida redbelly turtle	243	609	852
Common musk turtle	432	509	941
Yellowbelly slider	795	1,549	2,344
Total turtles <sup>a</sup>	2,858	5,811	8,669
Green anole	7,521	6,576	14,097
Unidentified anole ( <i>Anolis</i> spp.) <sup>b</sup>	18,713	52,139	70,852
Southeastern five-linked skink	1,183	2,336	3,519
Broadhead skink	84	162	246
Unidentified skink ( <i>Eumeces</i> spp.)	164	228	392
Eastern glass lizard	160	68	228
Unidentified glass lizard ( <i>Ophisaurus</i> spp.)	198	312	510
Reef gecko	171	0	171
Total lizards <sup>a</sup>	9,576	9,770	19,346

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**Table 1.** (continued)

Taxon	1990-91	1991-92	Total
Cottonmouth	122	54	176
Scarlet snake	52	52	104
Racer	810	1,060	1,870
Eastern diamondback rattlesnake	225	203	428
Timber rattlesnake	22	87	109
Ringneck snake	455	523	978
Corn snake	6,629	7,198	13,827
Rat snake	3,167	3,571	6,738
Eastern hognose snake	172	169	341
Common kingsnake	2,372	1,463	3,835
Scarlet kingsnake	791	1,027	1,818
Eastern coachwhip	34	90	124
Eastern coral snake	61	49	110
Southern water snake	1,298	1,311	2,609
Brown water snake	203	161	364
Unidentified water snake ( <i>Nerodia</i> spp.)	809	1,025	1,834
Rough green snake	1,111	4,527	5,638
Dusky pygmy rattlesnake	177	23	200
Brown snake	161	85	246
Eastern ribbon snake	1,056	2,207	3,263
Common garter snake	1,742	2,288	4,030
Total snakes <sup>a</sup>	21,700	27,540	49,240
Grand total <sup>a</sup>	53,412	66,386	119,798

<sup>a</sup> Total includes species not shown that had <100 individuals sold.

<sup>b</sup> Includes introduced non-native species, so their numbers are not included in the total for lizards.

cies, the corn snake (*Elaphe guttata*), thrives in many edificarian habitats, especially in south Florida with its large prey base of non-native brown anoles.

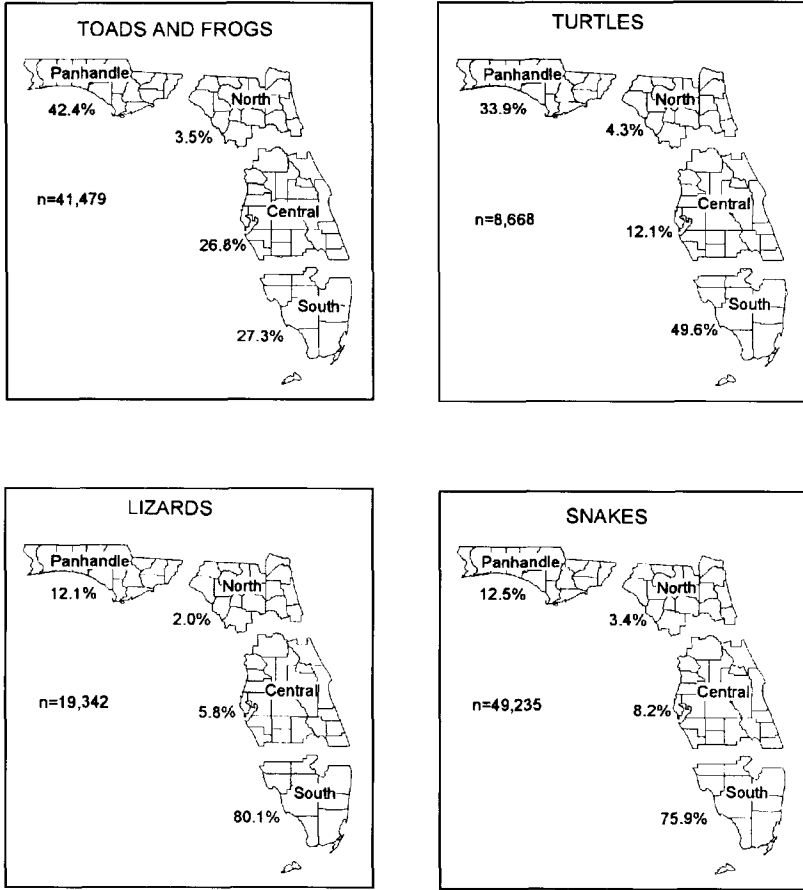
Native amphibians and reptiles sold by Florida collectors, breeders, and dealers during the 2-year period were destined for 49 states (Vermont was the exception), Puerto Rico, the U.S. Virgin Islands, Barbados, and 16 foreign countries.

#### Geographic Distribution of Harvest

Six months into the reporting program, more detailed source locality information (e.g., county, city, lake) was requested from collectors for animals caught in Florida. To determine collecting pressure in different areas of the state, the state was divided into 4 regions (i.e., Panhandle, North, Central, South).

Six of the 12 caudate species entering the pet trade have geographic ranges primarily confined to the Panhandle and North regions. This may explain why 85% of all caudates were captured in the Panhandle.

Overall, 42% of the anurans were collected in the Panhandle, 27% each in the Central and South regions, and 4% in the North (Fig. 1). Eighty-eight percent of the Florida leopard frogs (*Rana utricularia spenocephala*) came from the South, and 94% of the southern cricket frogs (*Acris gryllus*) came from the Central



**Figure 1.** Regional distribution of the live take of all toads and frogs, turtles, lizards, and snakes from the wild in Florida for sale in the pet trade from 1 July 1990–30 June 1992.

Region. Almost 90% of the relatively expensive barking (*Hyla gratiosa*) and Cope’s gray treefrogs (*H. chrysoscelis*) were collected in the Panhandle Region, whereas most of the less expensive green (*H. cinerea*) and squirrel treefrogs (*H. squirella*) were collected in the South Region (46% and 84%, respectively). Despite their statewide abundance, most toads (*Bufo* spp.) came from the Panhandle.

Most of the turtles reported harvested from the wild for the pet trade came from the South (50%) and Panhandle regions (34%) (Fig. 1). The Panhandle Region accounted for 97% of the diamondback terrapins (*Malaclemys terrapin*), 81% of the yellowbelly sliders (*Trachemys s. scripta*), and 41% of the common musk turtles (*Sternotherus odoratus*). The South Region accounted for 90% of the Florida redbelly turtles, 84% of the eastern mud turtles (*Kinosternon subrubrum*), 81% of the striped mud turtles (*K. baurii*), and 71% of the cooters.

Of all native lizards reported collected and sold, 80% came from the South Region (Fig. 1), including 74% of the green anoles, 73% of the glass lizards (*Ophisaurus* spp.), and 71% of the skinks (*Eumeces* spp.).

The South Region accounted for 76% of all wild-caught snakes reported entering the pet trade (Fig. 1), including 98% of the rough green snakes, 93% of the eastern ribbon snakes, 91% of the common kingsnakes, 87% of the common garter snakes (*Thamnophis sirtalis*), 78% of the ringneck snakes (*Diadophis punctatus*), 77% of the water snakes (*Nerodia* spp.), 73% of the corn snakes, 72% of the racers (*Coluber constrictor*), 70% of the scarlet kingsnakes (*Lampropeltis triangulum elapsoides*), and 56% of the rat snakes (*Elaphe obsoleta*).

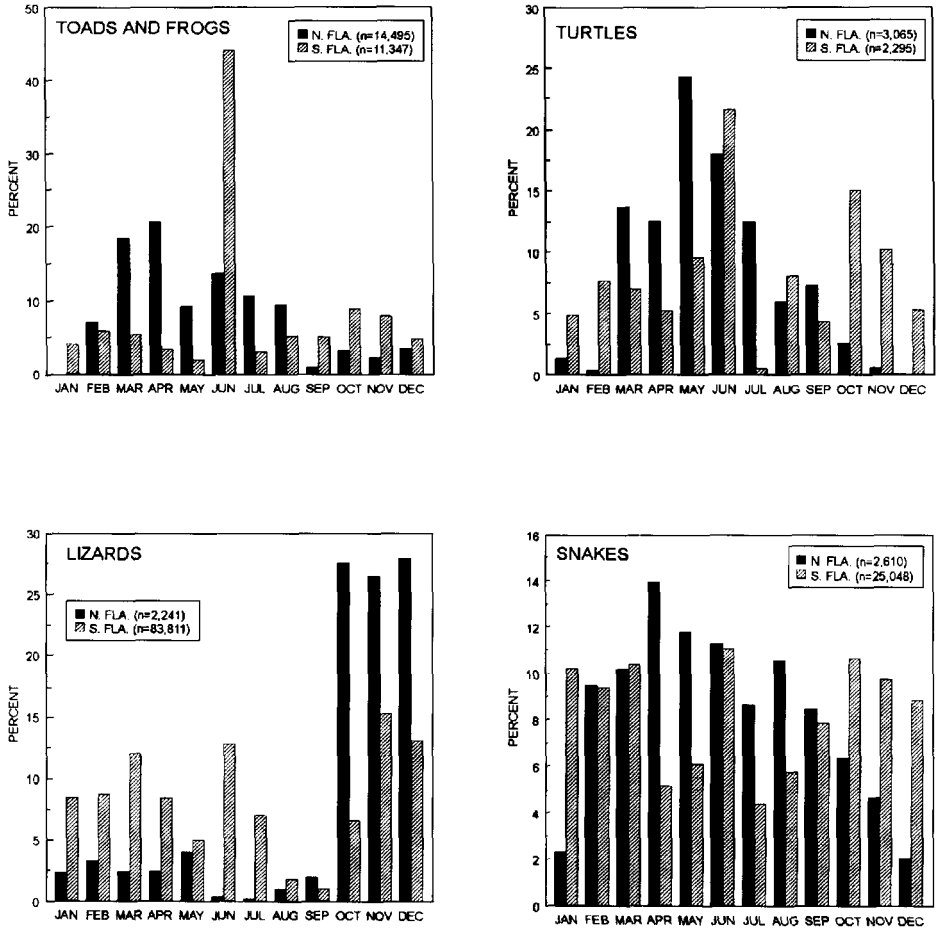
Fifteen collectors accounted for 75% and 68% of the native amphibians and reptiles taken from the wild in Florida during the first and second years of the reporting program, respectively. Most of the major amphibian and reptile collectors and dealers are located in the South Region, although at least 1 large dealer in native amphibians and reptiles is located in each of the 4 regions of the state. Overall, 57% of the amphibians and reptiles were collected in the South Region. This take was comprised mostly of species adapted to edificarian habitats (e.g., truck farms, citrus groves, sugar cane fields, ornamental plant nurseries, suburban environments).

### Seasonality of Harvest

The seasonality of the harvest of amphibians and reptiles from Florida was determined from reports submitted by 6–8 major collectors each year from both northern (i.e., Panhandle and North regions) and southern Florida (i.e., Central and South regions). Northern and southern Florida are considered separately, because the primary collecting methods, weather, and species activity patterns differ between these areas. Only sales reported by major collectors were used, because these collectors depend on the sale of amphibians and reptiles for most of their income and tend not to hold onto animals but sell them soon after capture. For turtles and snakes, sales of neonates from wild-caught females confound the picture of monthly harvest.

Most caudates in northern Florida were captured during the cooler months of the year, when they are active on the surface. Most anurans in northern Florida were captured in March and April, when many species migrate to breeding ponds during spring rains and start calling (Fig. 2). Major species exhibiting this trend in northern Florida were the oak toad (*Bufo quercicus*), barking treefrog, Cope's gray treefrog, green treefrog, and squirrel treefrog. The rainy season usually begins in May in southern Florida, and 44% of the anurans were captured in June. One collector captured 3,560 southern cricket frogs in June, which partially explains the June peak.

Most turtles were captured during the warmer months in northern Florida, whereas in southern Florida the catch was distributed more evenly throughout the year (Fig. 2). Discussions with collectors suggest that the summer and fall peaks may be due to sales of hatchling turtles.



**Figure 2.** Percent of the total harvest by major collectors of live toads and frogs, turtles, lizards, and snakes sold each month in northern and southern Florida from 1 July 1990–30 June 1992.

In northern Florida, 82% of all lizards were captured from October through December. In southern Florida, this trend towards cool-season captures was less pronounced (Fig. 2). In southern Florida, *Anolis* spp. were collected year-round (usually at night using lights); however, in northern Florida, 93% of the green anoles were collected while hiding in refugia from October through December. Skinks were collected primarily during cooler weather in both northern and southern Florida, whereas there was no obvious trend for glass lizards.

Fewer snakes were captured in northern Florida from October through January than during the warmer months, when snakes are actively moving and often collected on roads. In contrast, most snakes in southern Florida were captured from October through March (Fig. 2), while they are primarily in refugia (e.g.,



under bark on snags, under debris) or aboveground but relatively inactive. The peak in snake sales in southern Florida during June can primarily be attributed to trade in neonates from wild-caught females.

#### Harvest of Snakes for Skins

Approximately 20 dealers purchased dead snakes, primarily rattlesnakes, for their hides. A total of 2,306 eastern diamondback and 262 timber rattlesnakes from Florida was purchased for conversion to hides, mounts, curios, jewelry, or leather products during the first year of the reporting program. During the second year of the program, 1,341 eastern diamondback and 104 timber rattlesnakes from Florida were reported purchased by snake skin dealers. During the 2-year period, an additional 18,289 eastern diamondback and 4,346 timber rattlesnakes were purchased by hide dealers in Florida from other southeastern states, principally Georgia.

The harvest of rattlesnakes varied seasonally. The 2 largest skin dealers in Florida reported purchasing >55% of 21,736 diamondback rattlesnakes from August through October, during the time of year when snakes are most active due to breeding, foraging, and movements to overwintering sites (Means 1985).

#### Management Implications

The commercial collection of most amphibian and reptile species probably has a negligible impact on populations compared to such threats as habitat destruction, alteration of hydrologic regimes, biocides, and highway mortality (Wilson and Porras 1983, Dodd 1987). However, cumulative impacts of intensive collecting pressure on local populations may be significant, especially in habitats with limited cover (e.g., agricultural land) where animals are susceptible to collection. Only about 50% of Florida is now covered by forests (Harris and Eisenberg 1989), and many of these forests have been fragmented and altered to such an extent that they no longer support a diverse assemblage of herpetofaunal species. An average of about 7 km of new roads per day have been constructed in Florida during the last 50 years (Harris and Eisenberg 1989), leading to increased highway mortality of wildlife, greater accessibility of remote areas to collectors, and fragmentation of individual home ranges and regional populations.

The volume of the commercial trade in a particular species depends on many factors, including abundance, economic value, market demand, and ease of collection. The susceptibility of a species to collection depends on its population density, tendency to aggregate, habitat and microhabitat use, movement patterns, and conspicuous behavior (e.g., basking, vocalizing).

Many amphibian and reptile species breed prolifically and are adapted for high predation rates. However, collecting pressure on populations already under stress from other human-induced threats may be sufficiently detrimental to warrant curtailment of commercial trade. Of course, some species are vulnerable to extirpation from collecting due to their restricted geographic distribution, limited suitable habitat, low reproductive potential, and/or population concentrations (e.g.,

communal hibernacula, breeding ponds). Populations of many amphibian species fluctuate substantially depending on environmental conditions, such as precipitation patterns.

The appropriate management or conservation techniques for amphibians and reptiles may differ markedly from those for other vertebrates because of their ectothermy, low frequency of viviparity and parental care, frequency of reproduction, age at maturity, and longevity. Amphibians and reptiles generally have low daily energy requirements, high mortality rates of eggs and/or young, and a relatively low frequency of reproduction. They also tend to have relatively slow growth rates, advanced ages of maturity, and long generation times compared to endotherms of similar size (Scott and Seigel 1992).

The number of individuals of a species harvested should not be the sole criterion for restriction of commercial trade, because many amphibian and reptile species are prolific and occur at higher population densities than the game species most familiar to wildlife biologists. In some human-altered habitats (e.g., agricultural areas), certain amphibian and reptile species occur at higher population densities than under natural conditions because of higher prey populations and reduced predator populations. Ideally, before restricting herpetofaunal harvest, the commercial trade data should be supplemented with data on population size and structure, recruitment, mortality, and susceptibility to harvest from field studies. However, these data are difficult to obtain for most amphibian and reptile species because of their cryptic nature, and it may not be feasible to require such data prior to enactment of regulations believed to be in the best interest of a species. At the same time, agencies should take care not to enact biologically unnecessary restrictions that may result in public credibility problems, a detrimental economic impact on certain persons, and possibly an increase in illegal trade of amphibians and reptiles, which is nearly impossible to monitor.

Options to manage a species, subspecies, or population of exploited amphibians or reptiles include: (1) protecting from harvest or commercialization, (2) setting quotas or possession limits, (3) restricting the size and/or sex harvested, (4) establishing closed seasons, (5) prohibiting certain collecting methods, and (6) preserving critical habitats. All of these methods may be imposed differentially on a geographic basis such that the most important or most vulnerable populations receive the greatest protection. The harvest of native herpetofauna also may be affected by imposing more restrictions and/or higher license fees on the commercial trade, which would reduce the number of participants.

The Commission's Nongame Wildlife Program developed a system to rank native taxa according to biological vulnerability, extent of current knowledge of population status, and management needs (Millsap et al. 1990). A biological score was generated for each taxon that reflected different facets of distribution, abundance, and life history; a high biological score indicated greater vulnerability to extirpation. Commercially exploited amphibian and reptile taxa with biological scores  $\geq 24$ , the median biological score for taxa presently listed by the Commission as "species of special concern," are the diamondback terrapin, Florida scrub

lizard (*Sceloporus woodi*), eastern diamondback rattlesnake, and mangrove salt marsh snake (*Nerodia clarkii compressicauda*). The only one of these species that is heavily exploited (primarily for skins) is the eastern diamondback rattlesnake, which has been commercially harvested in Florida since the late 1920s (Snyder 1949). This species does not appear to have the life history parameters of a species that can sustain heavy harvest rates (Means 1985), and it is subject to much human-induced non-commercial mortality (e.g., vehicular traffic, wanton killing) as well. Therefore, some form of protection or management seems appropriate. Therefore, some form of protection or management seems appropriate.

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