

**A Proposal for the Captive Breeding of Diamondback
Terrapins (*Malaclemys terrapin*) in Florida**



Presented by USARK FL to FWC

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Introduction

The Diamondback terrapin is a unique and beautiful species of turtle that is native to Florida. Despite not qualifying for State Listing, this species is considered by FWC to be a species of conservation need. There are many challenges facing Diamondback terrapins in the wild. Mortality by drowning in crab traps, habitat loss, predation, road mortality, boat strikes, and poaching are considered to be threats to wild terrapin populations.

Diamondback terrapins are very popular within the reptile hobby. Because of their beauty and ease of captive maintenance, people all over the world like to keep them as pets. As the reptile hobby has expanded and legal protections have reduced supply, the demand for terrapins has exploded over the past decade. The high demand for terrapins in Asia, especially China, has driven illegal wild collection to dangerous and potentially unsustainable levels. The remarkable recovery of the American alligator through farming efforts has proven that sustainable trade in captive produced reptiles can be effective in reducing poaching and conserving species. FWC's current management scheme for terrapins is very different as it legally restricts Florida's citizens from keeping or interacting with terrapins.



Above: Captive bred Mangrove diamondback terrapin (Photo by Ed Komara Jr.)

Florida's turtle breeders would like to be part of the solution to the problems facing wild terrapins. Captive terrapin stock has the potential to be an assurance colony as backup to wild populations. Turtle breeders believe that it would be beneficial for them to be allowed to breed terrapins to supply the market. However, they would also be willing to provide a percentage of captive bred terrapins and even raise them for a time to "head start" them for wild release if FWC were to deem that as a reasonable conservation strategy. Our neighboring states of Georgia and Alabama have captive breeding and/or hatching and release programs. Terrapins should only be released into the wild with proper authorization from wildlife agencies after being verified as disease free and of correct genetic heritage for the release locality.

Diamondback terrapins are easily kept and bred in captivity. The captive maintenance of terrapins is very similar to their close cousins, the sliders, which are currently bred in captivity in huge numbers. However, unlike sliders, terrapins have very little potential as an invasive species, due to their specialized requirement of estuarine salt marsh and mangrove habitats in the wild. Despite receiving proposals for a captive breeding program from turtle breeders as well as top Florida terrapin biologists in the past, FWC has not implemented their suggestions into policy.



Above: A captive hatched Carolina diamondback terrapin being "head started" for release at Zoo Atlanta (Photo by Daniel Parker)

The Advantage of Captive Bred Terrapins

Turtle keepers do not prefer wild caught terrapins if captive bred animals are readily available. Wild caught specimens are undesirable for several reasons:

- They may be difficult to acclimate to fresh water and are prone to both fungal and bacterial infections due to stress and water quality.
- They may also be resistant to switching to normal pelleted captive diets as they prefer to eat mollusks and crustaceans.
- Wild caught females are resistant to using unfamiliar nesting areas, which hinders reproductive success.

By contrast, captive born terrapins are vastly superior, because:

- They are fully adapted to freshwater from hatching and rarely exhibit health issues as they are tolerant of a wide range of temperatures and water qualities.
- They do not easily stress from human interaction.
- They readily accept commercially available turtle diets.
- Female terrapins that are raised in captivity lay eggs in provided nesting areas without problems.



Above: Hatchling Ornate diamondback terrapin in Pasco County, FL (Photo by Daniel Parker)

Breeding

The breeding of captive bred Diamondback terrapins is easily accomplished. Breeding groups often consist of two to four males and four to six females. Males reach sexual maturity at around four to five inches in carapace length and females are usually around six to eight inches. The water volume for a breeding group of that size may vary from 300-600 gallons. Captive bred terrapins may be kept in pure freshwater. They seem to prefer hard, alkaline water but are not fragile. Females may lay eggs from April into August in Florida. Females lay clutches of four to twelve eggs. In northern states, terrapins commonly lay two clutches per year, but may produce up to five clutches per year in southern climates. The clutch size and number depends on the length of the active season and the general health of the female. Females kept in ideal captive conditions in Florida may reach a higher reproductive potential than is regularly observed in other states.



Above: Female Texas diamondback terrapin nesting in captivity (Photo by Ed Komara Jr.)

Incubation

Incubation of terrapin eggs is easy and straightforward. The eggs may be placed in moist vermiculite or perlite and incubated between 80-86 degrees Fahrenheit. Babies usually hatch within 50-75 days, depending on incubation temperature. The hatch rates of captive terrapins are much higher than in the wild due to optimized conditions. Wild terrapin nests experience high mortality due to predation, flooding, and other environmental factors. Wild nest mortalities of over 90% have been reported. By contrast, captive hatch rates of around 95% are commonly reported.



Above: Captive bred Texas diamondback terrapins hatching (Photo by Ed Komara Jr.)

Raising Hatchlings

Captive bred baby terrapins are voracious feeders and grow quickly. Terrapins may become reproductively mature in three to four years. By turtle standards, this is a very rapid rate of maturation, which makes this species ideal for captive breeding programs. This ensures that captive terrapins would be available relatively quickly to supply an ever-growing market.



Keep wild terrapins wild! *Above: Ornate diamondback terrapin in Lee County, FL (Photo by Chris Lechowicz)*

Economic Impact and Conservation Benefit

A captive breeding program of Diamondback terrapins has the potential to have a positive impact on both the economy and the wild terrapin populations of Florida. Making captive terrapins more readily available makes wild terrapins less attractive targets for poachers. As with the war on drugs, prohibition rarely works in practice. There is already a high demand for terrapins and that demand does not go away when legal supply is reduced or eliminated. The value of a product is inflated by prohibitionist policies that reduce legal supply. Like an illegal drug dealer, a poacher is motivated by the profits of selling a product with an artificially inflated value.



Above: Captive bred subadult to adult size Ornate diamondback terrapin (left) and Carolina diamondback terrapins (right) offered for sale at a reptile show in Illinois (Photos by Elizabeth Wisneski)

A price analysis provided to FWC by Florida turtle breeders in 2015 found the following mean prices for the subspecies of terrapins native to Florida:

- Carolina diamondback terrapin (11 listings) \$213.93
- Mississippi diamondback terrapin (4 listings) \$228.75
- Florida East Coast diamondback terrapin (1 listing) \$425.00
- Ornate diamondback terrapin (15 listings) \$1420.00
- Mangrove diamondback terrapin (0 listings) *Rumored to sell for \$5000-\$10,000*

Hong Kong turtle researcher Dr. Yik-Hei Sung recently presented a paper to American scientists in which he documented the Ornate diamondback terrapin as the most valuable turtle imported into Hong Kong with a mean price of \$2608 and a maximum price of \$4103. The mean price of Diamondback terrapins overall was \$690 with a maximum price of \$6410. These numbers demonstrate that the prices of terrapins are continuing to hold strong. Three of the top four turtles imported into Hong Kong were endemic or nearly endemic Florida subspecies. These included the Ornate diamondback terrapin, the Florida box turtle (mean price \$1007, maximum price \$4103), and the Florida snapping turtle (mean price \$937, maximum price \$12,821).



Above left: Florida box turtle in Miami-Dade County, FL. Above right: Florida snapping turtle (Photos by Daniel Parker)

The Florida snapping turtle is an example of a subspecies that experienced a price spike after prohibition. Until new turtle rules were instituted in 2009, it could be legally collected in Florida and sold. Before 2009, adult Florida snapping turtles were rarely offered for sale in the pet/hobbyist trade, but were probably being sold into food markets. Hatchlings were frequently offered for wholesale prices around \$3 to \$5 each. The price started to climb after 2009, with babies going up to \$15 to \$20 each. From 2011 to 2012, Chinese buyers began to offer big money for adult Florida snapping turtles. Wholesalers were paying \$35 per pound and selling to Chinese buyers at \$65 per pound. This led to an incredible demand for Florida snapping turtles that was no doubt supplied, at least in part, by illegal collection in Florida. A typical 10 pound snapper was a \$650 turtle for the wholesalers. The prohibition and resulting black market is a situation that is frequently repeated.

A captive breeding program in Florida will help to reduce the demand for wild caught terrapins. It will allow for a legal source of this species to fill demand from China and everywhere else, while generating income for Florida breeders.



Above: Alligator snapping turtle (Photo by Daniel Parker)

The following are excerpts from a recent USFWS document proposing the federal listing of the Alligator snapping turtle (*Macrochelys teminckii*).

“State-authorized farming/captive breeding programs — The Service recognizes that turtle farming can alleviate harvest of wild stock and provides a means to serve international markets without affecting wild

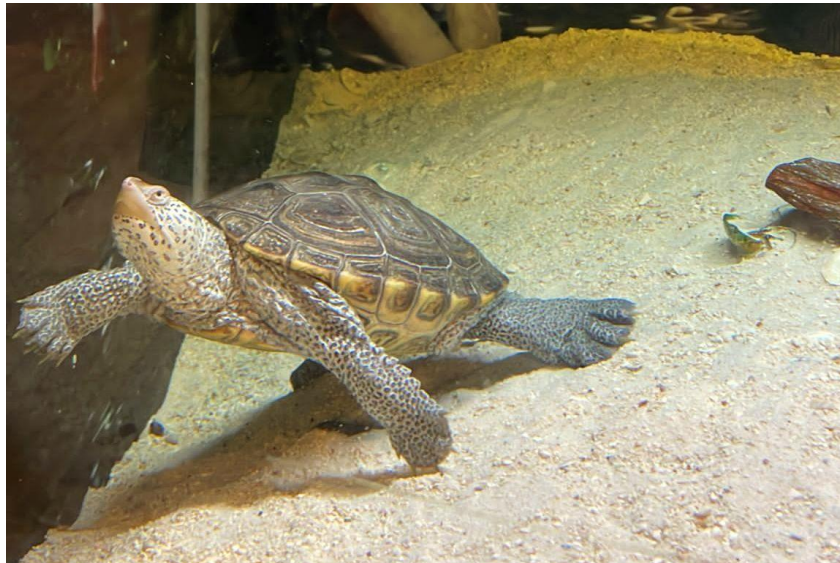
populations in the future. Therefore, existing State-authorized farming operations using captive brood stock or otherwise legally acquired turtles prior to the listing of the species would be excepted."

Here is another excerpt from the document:

"Farm-raised turtles supplement the demand for domestic pet trade and international trade (i.e., turtle meat for consumption and the pet trade), which may alleviate harvest pressure on wild individuals."

USFWS has recognized the benefits of captive breeding for the Alligator snapper. We believe the statements in the excerpt above are equally applicable to the Diamondback terrapin.

A captive breeding program of Northern diamondback terrapins in Maryland is currently working to ensure that captive bred specimens are available to supply the market legally and reduce poaching. A single facility produces over 10,000 terrapins per year, mostly for export to China. A quick glance at ads for Northern diamondback terrapins shows the current retail price to be around \$75-100. Florida has no such program for its native terrapin subspecies. The subspecies which are endemic to Florida have the highest market values of all the subspecies. The primary demand in the market at this time is for phenotypically normal examples of pure subspecies. There is not much demand for intergrades between subspecies. It is the allowance of the breeding of these turtles that will impact the market and discourage poaching of wild turtles.



Above: Captive Ornate diamondback terrapin (Photo by Glenn Bartolotti)

Albinos and other Rare Color Morphs

Albinos and other genetic morphs have popped up in captive breeding projects elsewhere in the world. Those are very small in number and not readily available at this time. Albinos and other genetic morphs are easily identified, are not likely to survive in the wild, and should be legal to keep and breed without special regulation. Florida already has exemptions to restrictions on keeping albino Florida pine snakes, which are state-listed as a Threatened Species, and albino Red-eared sliders, which are a Conditional Species.

The Impact of a Single Breeding Facility

Here is an example of a hypothetical single breeding facility set up for Ornate diamondback terrapins.

14 tubs holding are set up in a 20 foot wide by 60 foot long space. Each tub houses a breeding group of four males and six females. Each female lays three clutches per year, averaging 10 eggs per clutch. With six females per tub, each tub produces 18 clutches of eggs per year for a total of 180 eggs per tub per

year. Multiply the production of 180 eggs per tub by 14 to get 2,520 eggs per year from the 14 tubs combined. Even if the hatch rate is only 80%, 2,016 baby terrapins are produced per year.

At the previously documented price of \$1420 per Ornate diamondback terrapin, the gross total revenue from the sale of 2,016 turtles would be \$2,862,720. However, before we get overly-excited about that huge dollar amount, it should be understood that from our previous experience with other turtle species, the production of that many turtles will likely cause a drop in price. If several breeders are achieving that level of production, which is not far-fetched, the price will probably drop even more. That situation has been the case with several rare turtle species, including the Hamilton's pond turtle and Vietnamese pond turtle. Due to the efforts of turtle breeders, both of these species are readily available in captivity for such low prices that very few people would bother to try to poach them out the wild. With an abundant supply of captive bred terrapins, the motivation for poachers to illegally collect the turtles out of the wild will be drastically reduced.



Above: Tubs and nesting area set up for breeding terrapins (Photo by Ed Komara Jr.)

Legal Requirements for setting up a Captive Breeding Program

A captive breeding program need not be costly or overly complicated to administrate by FWC. Some of the provisions of such a program could be similar to what is already done with the Diamondback terrapin pet permit and Venomous Reptiles License. A special license should be issued for Diamondback terrapin propagation. A license fee may be assessed to offset administrative cost and help fund conservation efforts. A Class 3 license from FWC or Aquaculture Certificate from FDACS should be a prerequisite requirement. Most breeders are already being inspected by FWC or FDACS. FDACS has offered to administer this program as it already fits with much of what they already do.

Licensees may acquire hatchling terrapins from legal out-of-state sources. Since terrapins are difficult to collect as juveniles, this lessens the chance of wild turtles being “laundered” as captive born. Terrapins confiscated by law enforcement may also be placed with breeders as a humanitarian alternative to euthanasia. As is already required of license holders by FWC for all captive reptiles in Florida, an inventory must be kept which documents the source of all terrapins. Receipts must be kept for all terrapins acquired from outside sources. Hatch dates must be documented for all terrapins bred by the licensee.

Individual terrapins over four inches in carapace length possessed by breeders must be identified by plastral scans, photographs, or microchips. High resolution photographs should be taken of entire clutches once they have hatched. Educational and pet permit holders for terrapins are already required to submit photos to FWC for documentation purposes. As is currently required by FWC for venomous reptile licenses, the total number of animals possessed as well as births, deaths, and animals sold or otherwise

disposed of should be documented. These records must be submitted annually with license renewal information.

Licensed terrapin breeders may sell their offspring under four inches to other licensed breeders within the state of Florida. Offspring may also be sold to individuals in other states where they may be legally possessed or for export with proper CITES documentation. Exports from the state will contain an invoice detailing the number, common and scientific name, as well as the license number of the breeder. Packages should be labeled with number and species, as is already required by FWC and USFWS. Sales of captive bred terrapins over four inches will be allowed only as authorized by FWC.

Humane Shipping

As with many other reptiles, humane shipping of terrapins is easily accomplished with proper preparation and supplies. By following specific procedures that account for temperature swings and safe containment of the animals, as well as proper documentation and labeling, legitimate businesses successfully ship live reptiles thousands of times per day in the US alone. The cruel smuggling methods sometimes used to exemplify reptile shipping are the work of illegal traffickers who are trying to hide what they are doing. The goal of all responsible shippers of live turtles is to provide a healthy and *ALIVE* product to their customers. Even if you take a cynical point of view and set aside humane concerns, high mortality, especially for high dollar animals, makes little economic sense and would not be tolerated by a legitimate industry motivated by profits.

Shipping supplies for turtles and other reptiles are readily purchased from vendors such as Superior Shipping Supplies, Ship Your Reptiles, Redline Shipping, Reptiles Express, Uline and many other companies. Small turtles may be placed in ventilated deli cups with a substrate of sphagnum moss, paper towel, or newspaper. Larger turtles may be placed in larger deli cups with substrate or cloth bags with crumpled newspaper substrate. Larger turtles may be double contained in a cup and a bag or have the lid of the cup taped if there is any risk of the turtle pushing out. The containers containing the turtles are then placed in a box of appropriate size lined with foam insulation to prevent temperature swings and ventilated by punch holes through the side of the box and insulation to allow for breathing. Shippers must include an invoice detailing the number, common and scientific name, as well as the license number of the breeder. The outside of the package should be labeled with number and species.



Above: Responsible packing and shipping of captive bred Diamondback terrapins (Photos by Ed Komara Jr.)

All responsible live animal shippers check their own weather, the weather of the destination, and the weather of the shipping company hub where packages may be transferred between planes. For terrapins, temperatures between 32 and 80 F are generally safe for shipping. Temperatures outside that range may still be safe for shipping if a cold pack or heat pack is included in the package. Many shippers drop packages off at the shipping company hub and require customers to pick up at their hub, so the animals

do not go out on a truck for delivery and risk being delivered to a wrong address or running late. Overnight shipping is the standard within the industry. Same day shipping is also available through air cargo. By following careful shipping procedures and communicating effectively with the customers receiving those shipments, shippers of live turtles rarely have problems.



Above: Juvenile American alligator in Pasco County, FL (Photo by Daniel Parker)

Conclusion and Goals

The conservation benefits of captive breeding of reptiles have been suggested in a number of publications. *Conservation that's more than skin-deep: alligator farming*, by Peter Moyle (2013) makes the case for the alligator farming program in Louisiana to be used as a model for wildlife managers to follow, with consideration for individual circumstances surrounding each species. See excerpts from this paper below:

"Wildlife farming is sometimes proposed as a solution to conservation problems like poaching or human-wildlife conflicts (Bulte and Damania 2005). It is however a contentious and hence rarely employed measure (Nogueira and Nogueira-Filho 2011). This reluctance to employ it may mean opportunities to improve the status of species are forgone. It is important that this option is evaluated properly."

"Immense rises in farmed output have not caused prices to collapse, however poaching has collapsed"

"In summary, a narrow set of assumptions has guided much of the policy debate around wildlife farming. Many of these assumptions also tend to yield pessimistic outcomes about farming. The Louisiana alligator case however does not support many of these assumptions. This is an example where commercial use has contributed to reductions in poaching, and is not unique amongst the crocodilians."



Above left: Shell of dead adult female Ornate diamondback terrapin found at a known nesting site in Hernando County, FL, likely the result of predation by a raccoon. Above right: Roadkill hatchling Ornate diamondback terrapin in Hernando County, FL (Photos by Daniel Parker)

Despite the fact that some Florida populations of Diamondback terrapins are dense and FWC biologists indicate that the species as a whole is not likely to qualify for state listing, there are many challenges facing Diamondback terrapins in the wild. Commercial crab traps are likely to continue to drown terrapins. Road mortality and predation by subsidized predators like raccoons continues. Threats to terrapin habitats from coastal development still persist. With high demand and market values, the motives for poaching still exist.



Above: Carolina Diamondback terrapins drowned in crab trap in Northeast FL (Photo courtesy of Holland Incitti)

Florida's turtle breeders can help address at least one of those threats. We support a program allowing for captive breeding of terrapins and the sale of captive bred offspring. The result would be the availability of a captive bred alternative to poached wild caught animals in the market and an assurance colony of terrapins as a backup to wild populations. Terrapins reproduce readily in captivity. Florida turtle breeders are some of the best in the world and would have the ability to produce many thousands of captive bred terrapins within a few years if allowed to do so. Florida turtle breeders already produce millions of captive

bred turtles annually. A single facility in Okeechobee County produces 500,000 turtles per year. Several other breeders report producing many thousands of captive bred turtles per year.



Above: Captive bred baby Texas diamondback terrapins (Photo by Ed Komara Jr.)

However, a potential breeding program would not likely start at an industrial scale. It would likely start with just a few captive bred turtles being raised as future breeders. We understand the concerns of FWC law enforcement in dealing with large numbers of animals and we would be willing to start with a small number of founder animals to create less of a regulatory burden.

This program should be regulated to ensure that any turtles sold can be verified as captive bred offspring and that adult breeder animals are not replaced with wild caught animals. We appreciate the commission's consideration of this proposal and we are happy to discuss the provisions with commissioners and staff to create a program that contains safeguards to protect against abuse.

Terrapins are native to Florida and present no risk as an invasive species. Florida's turtle breeders deserve the opportunity to benefit from the native turtle species that we love and want to conserve.

For questions and comments, please contact:

Daniel Parker
863-441-5067
media@usarkfl.net



Above and cover: Ornate diamondback terrapins in Hernando County, FL (Photos by Daniel Parker)