Diamondback Terrapin Working Group PowerPoint Presentation

SLIDE 2: Diamondback Terrapin *Malaclemys terrapin*

This species is named for the diamond-shaped patterns on its carapace (top shell). They are most noted and easily recognized by their signature "smile" shape to their beak and "mustache-like" appearance. Their scientific name, *Malaclemys terrapin*, comes from Greek meaning "turtle" and Native American meaning "soft-bodied turtle." They have a high tolerance for a range of salinities from freshwater to estuarine to saltwater but prefer estuarine environments; all other U.S. species of turtles either live in freshwater, saltwater, or on land.

SLIDE 3: Diamondback Terrapin Distribution

Diamondback terrapins can inhabit coastal waters from Massachusetts to Texas. Individuals can be found in salt marshes and estuarine environs throughout most of its range, with the exceptions of Florida and southern Texas, where than can be found around mangrove swamps and oyster reefs respectively. Terrapins are sometimes confused with tortoises that mostly occupy terrestrial habitats and have limbs adapted to walking on land.

SLIDE 4: Variations

Diamondback terrapins are currently differentiated genetically, but previously were regionally differentiated as subspecies by location. The previous subspecies included: northern diamondback terrapin (*Malaclemys terrapin terrapin*) has a rage from Cape Cod, Massachusetts to Cape Hatteras, North Carolina. The Carolina diamondback terrapin (*M. terrapin centrata*) ranges from Cape Hatteras to northern Florida. Florida has three subspecies: east coast diamondback terrapin (*M. terrapin tequesta*), Florida Keys diamondback terrapin (*M. terrapin rhizophorarum*), and the Gulf coast diamondback terrapin (*M. terrapin macrospilata*). From the Florida panhandle to western Louisiana, you will find the Mississippi diamondback terrapin (*M. terrapin pileata*). Finally, the Texas diamondback terrapin (*M. terrapin littoralis*) ranges from the west coast of Louisiana to Corpus Christi, Texas. Genetic differentiation among the east coast, Gulf coast, and Mangrove terrapins result in some phenotypic (exhibited visual) differences.

SLIDE 5: Estuarine Life History

The diamondback terrapin is the only turtle species in North America that lives in an estuarine environment. An estuary contains brackish water, where saltwater and freshwater mix. Their mouths consist of a hard beak and strong jaw, which they use to crush the hard shells and exoskeletons of their favorite prey items: snails, mussels, crabs, insects, and sometimes fish and algae.

SLIDE 6: Habitat: Salt Marsh

A salt marsh in an area of wetlands predominantly inhabited by a plant called cordgrass, *Spartina alterniflora*. This plant plays an important role in the terrapin food chain: once the plant dies, microscopic organisms break down the material into detritus. The organisms that are prey species for terrapins will consume the detritus material. As top predators of this food chain, the terrapins rely heavily on the development of cordgrass in the salt marsh ecosystem. Terrapins also eat the snail that direct consume cordgrass, so terrapins help control the herbivores that otherwise can destroy the marshes themselves.

SLIDE 7: Habitat: Salt Marsh

As you can see, cordgrass also acts as great camouflage for hatchlings such as the ones in the picture. Terrapin coloration often mimics that of the cordgrass as an adaptation to their species.

SLIDE 8: Habitat: Mangrove

A mangrove swamp is a subtropical to tropical habitat that is predominantly inhabited by mangrove trees and other halophytic (salt tolerant) trees and shrubs. Most mangrove swamps can be found in the southern tip of Florida but can also be found in Louisiana and Texas.

SLIDE 9: Morphology and Physiology

Morphology is the study of the form and function of an organism in terms of external features and adaptations. Physiology deals with the internal organ function and adaptation. The exterior of the turtle body consists of two fused shells: a plastron (lower shell) and carapace (upper shell). Both parts of the shell act like a protective covering or armor and a terrapin has the ability to pull

its limbs inside its shell when stirred by a predator. Unlike its terrestrial cousin, the box turtle, there are no hinges on the shell to allow the terrapin to completely pull its body inside, so some parts of their limbs remain exposed. The carapace is made up of plates called scutes and they will grow outward as the terrapin grows. Their body is streamlined and their feet are webbed to allow for fast and efficient swimming ability. Their feet also have claws that are used to dig in the mud for prey species and climb out of the water onto the banks of some salt marsh islands.

SLIDE 10: Sexual Dimorphism

Sexual dimorphism is when a male and female of the same species show very distinctly different characteristics. With terrapins, the females are much longer in length, with a larger head. Males will have a longer and wider tail and females will have a shorter and narrower tail. All of these characteristics and adaptations serve a key purpose during reproduction.

SLIDE 11: Adaptations to Saline Environments

Terrapins are the only U.S. aquatic species of turtle that can tolerate fluxes in salinity from freshwater into saltwater for long periods of time. They have the ability to osmoregulate, or regulate the percentage of salt in their bodies but excreting salt through special salt glands behind their eyes. Some say it looks like they are "crying" but the tears are made of thicker mucus to expel the salt. Since saltwater is denser than freshwater, terrapins will drink the freshwater from the surface and filter out any excess salt using these salt glands.

SLIDE 12: Brumation

Brumation is a type of pseudo-hibernation stage that terrapins will go through during the winter months. At lower temperatures, terrapins will enter a stage of torpor: low metabolic rate and inactive state of being as they can stay buried in mud for months. Hatchlings are freeze tolerant and are capable of converting some of their body's water into ice and remain that way throughout the colder months.

SLIDE 13: Terrapin Life Cycle: Adult

In the fall, adult terrapins prepare for the colder weather by burrowing in the mud and slowing their metabolic rates. Once it is warm enough, terrapins are more active, and in spring, they will

mate in the water. During the summer months, females will search for an area to nest on land, and then they will return to the water where they feed all spring and summer long.

SLIDE 14: Terrapin Life Cycle: Hatchlings

Hatchlings that emerge in the fall will overwinter either on land or in the water. Some hatchlings over-winter in their nest. In the spring, they all emerge from their brumation period in search of food along the shoreline. When they hatch, they are only the size of a quarter and very vulnerable to predators.

SLIDE 15: Reproduction

Each female lays a clutch of about 6-15 eggs, averaging about 12 eggs. During the nesting season, which is May through August, a female can lay approximately 0-3 clutches with a period of 14-17 days in between each. Females have the advantage of storing sperm so multiple mating does not have to take place. When searching for a nesting location, they are very particular and will hold out laying until they find a suitable substrate (usually sandy and without roots, but sometimes soft soil, pebbles, or shell fragments). They will use their noses to investigate the substrate to make sure it is suitable before digging their nest using their webbed back feet.

SLIDE 17: Incubation

Temperature Sex Determination (TSD) simply means that the temperature of the nest will determine whether the eggs will produce male or female hatchlings. Terrapins do not have the X and Y chromosomes that mammals do, so their sex is not determined at conception. In terrapins and many other turtle species, the warmer nest temperatures will produce females and the cooler nest temperatures will produce males. There are several factors that influence nest temperature: air temperature, ground temperature, nest depth, humidity, and nest substrate.

SLIDE 18: Hatchlings

It is difficult to identify the sex of a hatchling, since they do not have any of the sexual dimorphic characteristics of the adults. To aid the hatchling in coming out of its shell, it has an "egg tooth" on the edge of its beak, which will eventually fall off. It is made of keratin, the same material as our hair and fingernails. For the first two weeks of its life, a hatchling's yolk sac will

serve as its primary food source, providing four times the amount of protein than a chicken's yolk. The yolk sac is located on the hatchling's plastron and once it is fully absorbed, you will see the umbilicus ("belly button") for another week.

SLIDE 19: "The Missing Years"

Once hatchlings enter the water, it is not likely that we can easily see them until they are full grown adults. Because of their size and elusive behavior, it is very difficult to find them in the wild. As with sea turtle, this period of time is often referred to as the "lost years" for this reason.

SLIDE 21 – 22: Legal Status per Region

Diamondback terrapins have a different legal status per state determined by each state's Department of Natural Resources. The highest rating currently is endangered in Rhode Island, followed by threatened in Massachusetts. It is listed as a species of concern in several states in the mid-Atlantic, southeastern, and Gulf regions. Some states, such as Texas, have no current legal protection at all.

SLIDE 23 – 24: Anthropogenic Threats

There are many different types of anthropogenic, or human-caused, threats to diamondback terrapins. Terrapins are completely dependent on marshes for their survival and therefore, marsh loss has been directly linked to terrapin population declines. Humans are responsible for the destruction of most of the east coast marshes by the 1970s, and continue to cause their destruction today. In fact, in New Jersey at least 30% of marsh habitats have been destroyed through overdevelopment. The loss of salt marsh habitat all along the eastern coast is the number one anthropogenic threat to terrapins; this has been going on as long as people have been building coastal cities and continues today. Anthropogenic barriers and erosion can cause steep inclines on the banks of prime nesting areas, making it almost impossible for females to climb to good nesting areas.

Because blue crabs and terrapins share a similar home range, juvenile and smaller adult male terrapins can easily be caught in blue crab traps, attracted to the bait in the center. With no way of escaping, terrapins often drown, not being able to surface to breathe for long periods of time.

This is a very important source of terrapin mortality in many places. Any abandoned or free-floating crab trap is called a ghost trap and can be responsible for many dead terrapins.

For females, a special threat comes in the form of automobiles. As terrapins are searching for suitable nesting substrate, they may have to cross over major roads. Some areas with high concentrations of nesting females have posted speed limit and terrapin crossing signs to reduce speed and avoid impact with females.

SLIDE 25: Natural Threats

Although raccoons, foxes and large birds are natural predators of terrapins, their association with humans has increased the number of predators well beyond natural numbers. In areas where humans provide a foraging habitat for raccoons, including camp grounds, densely populated communities, and garbage dump sites, the predation of terrapins will be much higher, Raccoons commonly eat terrapin eggs, hatchlings, and nesting females.

SLIDE 26: Terrapin Outreach and Education

Conservation is a key element in protecting terrapins throughout their range. Habitat management is an example of how to maintain a viable population. Head start programs eliminate egg predation by protecting the eggs and raising the terrapins to a larger juvenile size before releasing them back out into the wild. Eggs can be removed from the nests or cages can be placed over the nests to keep predators away. Those eggs that are removed are incubated and hatched. Many different education programs have been produced throughout the working group to give students a sense of commitment and stewardship to the conservation of terrapin species.

Turtle Excluder Devices, or TEDs, (sometimes referred to as bycatch reduction devices, BRDs) have been used over the entrance holes (funnels) of commercial-style crab traps (pots) in order to limit terrapins from entering, but these are only effective if used. Some states with terrapin populations have regulations require the use of TEDs (BRDs) on crab pots. Other threats to terrapins include road mortality, especially to female terrapins coming onto land to access nesting areas.

For the terrapin to survive as a species, populations should be left in the wild and not taken for pets. There are scientists conducting important research to learn more about terrapins and working on ways to best conserve them. The Diamondback Terrapin Working Group needs your help to spread the word about diamondback terrapins to further help to save this species.

SLIDE 28 – 29: Objectives of the Working Group

1. To advocate and promote sound, scientifically based survey and populations studies that can identify demographic trends and identify causal factors contributing to changes in population size, growth and structure.
2. To identify factors which threaten terrapin populations and take the necessary steps to remedy those situations.
3. To maintain a database of known terrapin populations which are being or have been studied with specific attention to changes in population growth rates.
4. To provide advice and recommendations for the research direction, effective management, and conservation of terrapins throughout their range.
5. To promote and assist with educational programs that focus on terrapin conservation or that use terrapin as a model organism to promote environmental awareness and stewardship.
6. To meet once every three years as part of the "Workshop on the Ecology, Status, and Conservation of Diamondback Terrapins." The Diamondback Terrapin Working Group will hold an open meeting during the workshop to conduct general business.
7. To serve as a source of information on terrapins and their associated habitats. One aspect of this will be to maintain a bibliography of all known scientific publications concerning this species.