# Terrapin Shell Game

## By Russell L. Burke

If you're a northeasterner fond of reptiles and you spend time near the ocean, the only object of your affection you're likely to see is a diamondback terrapin.
Other reptiles are out there to be sure, but nothing else is nearly as common. I grew up in the Midwest and moved to New York. Terrapins drew me to the ocean in 1998, and I've been returning for terrapins every summer since.

Terrapins have always been popular turtles; their populations were nearly decimated range-wide in the 1700-1800s when they were harvested in huge numbers, particularly for turtle soup. Terrapin populations started recovering after the collapse of the soup industry, until large-scale coastal urban development caused massive habitat losses in the 20th century. Despite some recovery, terrapin numbers are still declining throughout their range because of mortality as by-catch in commercial crab traps, ongoing habitat loss, road crossing mortality, and nest predation. As a result, they are protected to some extent in most of the states they inhabit.

Terrapins are medium-sized turtles (females 7-9 inches long, males 4-6 inches long). Unlike their freshwater relatives, terrapins live in the narrow brackish water strip along the ocean coast, from Massachusetts to Texas. They can only be found where either Spartina marshes or mangrove marshes occur. Terrapins have a number of adaptations to salt water, but they are not as tolerant of salt water as true sea turtles. Unlike sea turtles, terrapins rarely go into the open ocean, and they don't make long migrations like sea turtles; instead, terrapins spend their whole lives fairly close to where they hatch. They spend a lot of their time in Spartina or mangrove marshes, because that's where they feed (snails, crabs, clams), bask, and overwinter.

As with many species, one of the main issues regarding the conservation of terrapins is reliable estimates of population sizes and trends. We can't know if they're doing okay unless we know how many there are. Most of what we know about their populations comes from long-term mark-recapture studies, including one my team conducts at Ruler's Bar (an island in New York's Jamaica Bay). The work is just like it sounds - we catch terrapins, we give them permanent marks, then let them go unharmed. Each time we catch them again, it tells us something about their survivorship and movements. Even catching unmarked individuals from the same population is helpful. Data are analyzed using mathematical models, and they produce an estimate of the total population size of marked and unmarked animals. The longer the project runs, the better our population estimates become.

There are about 25 other similar teams counting terrapins elsewhere in the range (nine here in the northeast). But it's a lot of work each year capturing enough terrapins at each of these sites to be able to determine whether populations are increasing or decreasing. It's a truly daunting task to repeat mark-recapture efforts over the 3500 miles of terrapin habitat. For example, I work with an ever-changing crew of 30-50 volunteers who are mostly college students. Every summer during June and July, we patrol a one mile stretch of beach every 15-60 minutes. We look for nesting female terrapins from dawn to dusk. Females are allowed to finish nesting, then are captured, marked, measured and released. As a result of that effort we have a pretty good idea about the population of terrapins that nest on the west side of that one island.

Other terrapin researchers go boating to catch terrapins. They sometimes set fyke nets at the mouths of marsh channels, or they drag nets through the channels, or they use baited traps. Traps and nets capture both females and males. But none of these mark-recapture approaches allow us to say with much confidence what's happening with terrapins elsewhere across the range, just in those few well-studied locations where we sample intensively. These projects have allowed us to determine that in some places, like Jamaica Bay, populations are fairly stable. Other places in the northeast have been collecting population data,

but have not yet analyzed it. As a result, we don't know what's happening with their terrapin populations. However, where crab trapping is common, such as in southeastern states, terrapin populations are crashing because terrapins drown as by-catch in crab pots. These findings have been valuable because they help build the case that terrapin excluder devices are needed on crab pots to keep the terrapins out. So, regular censuses of terrapin populations can give us very useful information, which is important to their conservation.

In the last several years, two new terrapin censusing techniques have started to become popular. These might make counting terrapins much easier. One of the methods uses the existence of the small parasitic trematode Pleurogonius malaclemys (it doesn't have a common name). As an adult, this little trematode only infects terrapins. The parasite's juvenile stages, however, infect a common terrapin prey, the eastern mudsnail. One of the juvenile stages is a pinhead-sized cyst that lives on the outside of the snail, waiting for the snail to be eaten by a terrapin. Mudsnails are easily collected along the beach in low tide. The abundance of these cysts varies with the size of the local terrapin population, which makes it is possible to arrive at a good estimate of the number of terrapins nearby by counting cysts on easily collected mudsnails. This census costs almost nothing and is very quick, making it ideal for anyone to use.

However, many questions remain:
How far do the trematodes disperse from the terrapins?
How big is the range of the trematodes and do they occur as far north as the terrapins?
How well do the cyst counts really match the local terrapin populations?

We've been exploring these and related questions here in New York since 2011. This year my colleagues and I started a pilot program to get other citizen scientists (the youngest is only 12!) to try out this new technique on beaches all over the northeast. We can envision terrapin censuses through cyst counts being done annually by middle school and high school classes over much of the terrapin range. Such counts result high quality data on terrapin numbers in many areas, which at the same time engages many more young people in marine science.

The other "new" terrapin censusing technique uses the fact that turtles love to bask in the sun, especially in the spring. Most people don't see terrapins basking because terrapins usually sun themselves in the Spartina marshes where they live, and it's not easy to see them unless you're in the marsh. Kayakers and canoeists can get into the network of channels that flood and drain marshes with each tide and they can often see terrapins basking and swimming. Several researchers have used standardized kayak routes, counting terrapins seen along the way, and compared the counts to the number of terrapins known to be in the area using more traditional techniques. They have found that visual surveys do a good job of estimating the number of terrapins, at a fraction of the time and cost of mark-recapture studies. Given the popularity of ocean kayaking and canoeing, I can envision organizing

citizen scientist teams to make regular visits to marshes all over the terrapin range, following standardized routes, and counting terrapins.

Over the next two years we will be trying out these techniques here in New York, conducting the first real census of diamondback terrapins for an entire state. New York is home to roughly 1355 miles of potential terrapin habitat, more than any other state in the northeast. This is more than a third of the terrapin habitat between the Delaware River and Cape Cod, making it a good model for the rest of the range. However, because they only live near Spartina salt marshes, New York terrapins only occur around Long Island, the lower Hudson River (at least as far north as Piermont Marsh, river mile 25), and the Hudson River Bight. Four terrapin populations in New York have been studied with mark-recapture techniques, which allows us to estimate their population sizes based on those methods. We will couple these estimates with surveys using mudsnail cyst counts and visual surveys via kayaks throughout suitable New York habitat. The result should not only be a good estimate of how many terrapins we have, but also a good test of these new techniques and increase data collection.

To help or learn more, call the Littoral Society at (732) 291-0055.

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