Mid-Atlantic Diamondback terrapin Working Group conference call: Session I, March 28, 2006

Moderator: Ruth Boettcher – VA Dept Game & Inland Fisheries
Minutes: Holly Niederriter - DE Dept Fish & Wildlife - Natural Heritage;

Paula welcomed the participants to the conference call meetings. To set the stage of the topics to be addressed in the 2 conference call session, she reviewed the mission and objectives of the DTWG.

Ruth briefly explained the basis for the conference call meetings. The agendas for each of the 2 meetings cover very specific issues related to field work with diamondback terrapins: best methods for collecting nesting data, and tagging techniques. Each conference meeting is limited to 2 hours.

Each participant introduced themselves, their area of expertise and specific interest with DT. Nancy Butowski: MD DNR Fisheries Service; taking the lead for developing a MD State management strategy for the diamondback terrapin (DT). Ruth Boettcher and John D Kleopfer – VA Dept Game & Inland Fisheries. Ruth is conducting a nest monitoring study on Barrier beach islands, investigating impacts of predators on both terrapins and beach-nesting birds: JD's primary focus is herps on the western side of the Bay. Dan Day and Paula Henry - USGS Patuxent Wildlife Research Center. Conducted a 2 year nest survey on Eastern and Western shores of the MD Chesapeake Bay, a 3+ year population study at sites located in the Upper and Lower MD Bay, and a 3 year study of wintering terrapins in the lower MD Bay (in collaboration with M. Haramis, USGS PWRC). Eileen Eberly and Christina Watters - The Wetland Institute. Work with many aspects of terrapins including road mortality, crab traps, changes in nest habitat and head starting. Mary Hollinger – Secretary of DTWG. Previously volunteer with the Terrapin Institute, and continues to be interested in terrapin welfare. Joe Mitchell - University of Richmond, VA. monitoring terrapin activities in Cape Charles and Fisherman Island. Holly Niederriter DE Dept Fish & Wildlife - Natural Heritage. Involved with road kill reduction work in Delaware Seashore State Park and is currently studying feasibility of creating new nesting habitat. These are located in areas where fencing is keeping terrapins off roads but also keeping them from reaching much of the available nesting habitat. She plans to conduct surveys to get state wide baseline population size and enable population trends to be detected in future. Willem Roosenburg Ohio University, Ohio. Co-Chair and web guru for DTWG. Conducts an ongoing >20 year study on Patuxent River and a 2year+ study on Poplar island (PI), comparing mainland and island populations. John Wnek - Marine Academy of Technology and Environmental Science. With Drexel University, works with terrapins in Barnegat Bay and marks females on Island Beach State Park. Victoria Ruzika – Graduate student at The College of William & Mary in VA. Studying mammalian predation influence on nesting ecology.

Techniques for conducting crawl/nesting surveys.
Discussions were focused on ways to locate nests before the predators do, and along substrates on which it is difficult to find nest. On Poplar Island (PI) Willem find nests before predators do by walking the beaches once/day, looking for tracks at water's edge, and following the tracks or looking around in vegetation for freshly disturbed sand. Although tedious Willem estimates that once trained, students find approx. 75-80% of nests and one can get fairly accurate nest count this way. Willem's team works 4-5 km beach and excavates all nests, counts, and weighs eggs. Depending on the number of nest, this can take about 6 hours. If area is predator free, can start earlier in the day. Where there is little vegetation or shell substrate from which to track crawls, start searches following mid morning's peak nesting time, and look within the rack (Vicki). When surveying nesting incidence over a larger scale (>2K shoreline), nest counts are based primarily on evidence of predation (Dan). In Maryland, nesting season can extend from mid May through July.

Willem suggested that if one is limited to collecting information from only a sub-sample of multiple islands in a complex, the information can be extrapolated to rest of island if data are collected at time intervals for different areas; or as in a robust design in which some areas are sampled every couple days and the entire area is surveyed on a less frequent time scale. This overlap checks for a correlation to allow you to extrapolate to the larger scale.

It is hard to decipher what parameters the turtles are using: nesting can be concentrated in very specific areas. Two sites may look equally good to us and yet one area is heavily used and the other not at all. Nesting during the extended shoreline was found in many types of habitat: from wide open beaches to very narrow beach fringes, driveways, construction site. Some areas had nesting areas way back from edge of water, making them

difficult to locate (Dan + Paula). Nests can be found by looking for pits in sand (Mary), or if no sandy beach habitat left, look at alternative sites such as hard sand walkways (Christina). The Wetland Institute team locates nests primarily from observing the females. Females nest round the clock but with a peak evening time as well. If you rely on observations, watch out for "back entrances"; females don't always come up from beach; sometimes from marsh or other directions (Vicki).

Whether or not active surveying can disturb/interrupt nesting may depend on location, specific population, and presence of predators.(Willem) Terrapins around the Wetland Institute not skittish (Christina). On Smith Island you can spook a female off the beach from a distance in a boat (Dan). It does not matter where the females are in the process of nesting. Willem has seen them run and leave a trail of eggs on the beach.

It can take 20 minutes to an hour to nest; some females take a long time to choose a site to nest (Willem). Willem does not recommend using blinds to observe nesting. One can spend a tremendous amount of time waiting and there's a learning curve (for the turtles) when doing constant surveillance. He found turtles learned to swim behind blind to see if observers were there. To count eggs, onr can use Xrays. Ruth asked if anyone uses cameras. Not yet but it would seem like a good idea for scanning the beach as a method for determining productivity. Potentially one could set it up for 24 hour monitoring periods (Dan). Daily surveys were difficult in Holly's study areas. They spent one hour/day at each site to obtain catch per unit effort. However, there were many days during which no turtles were seen, then other days during which a lot of turtles nested at the same time.

Methods to determine successful nesting attempts.

Can one relate false crawls to successful nesting attempts? (Paula). One would have to excavate each nest Willem's team excavate nests to the top egg: if egg is chalk colored, the nest is >24 hours and they mark and do no further investigation. If the top egg is orange-like color or pinkish, the nest has been laid within 24 hrs and they weigh each egg and replace in the nest. Orientation doesn't matter. But if there is a little chalking spot, this is the top of egg and where the embryo is being developed. In that case, eggs should be oriented upwards and not rotated as this can rupture the allantoic membrane. In sea turtles eggs can only be moved 6-12 hours after laying (Ruth). Willem's team has successfully moved terrapin eggs more than 24 hours post laying but they are VERY careful to keep chalky side up.

For those who watch females can you get a sense of numbers of false crawls? (Ruth). After years of sitting in blinds, Willem has found that a tremendous amount of times when females came to edge of water and looked at beach, 4 of 5 times one would swim back out to water and may repeat this many times before actually coming out of water. Some females seem to show a great deal of apprehension other time, they don't hesitate a bit: females will come right out of water, lay eggs, and return to the water.

Methods for marking nests without attracting predators

Willem used survey flags which worked if no predators around, but recommends GPS. Can bury penny and use metal detector to find the nest later. Place flag 2 meters from nest, a penny just below sand surface right over nest, and use detector to find exact location of nest later. Dan suggested a study in NY addressed these issues with terrapins. Also, human scent, salt water. Burkes, et al. 2005.

Is there a way to estimate hatch date when lay date is not known? (Ruth) Incubation is 50-60 but can last up to 70 days depending on temperature. Hatching time is very different from emergence time. Hatchlings will often sit in nest and wait for right environmental conditions: on PI where the substrate is mixed, the ground can get very compacted: hatchlings emerge with the rainfall. Willem's team puts aluminum flashing around nests after day 50, so hatchlings can be caught as they emerge. To prevent predators from raiding the area, can put screen over top. (Willem). Raccoons have been reported to clue in on exclosures (Dan). To keep raccoons out of nests, Willem has made cages out of 2X4" wire and buried bottom in sand, with strong "stables" made of survey stakes to make it difficult for raccoons to remove. He has also used hardware cloth (.5" mesh), buried with staples. Christina's group has used black, plastic mesh, dug a trench about 2", uses ground stables to secure and zip tags to secure. You need to make it high enough so that avian predators can't sit on top and peck at hatchlings. Shading not a problem because mesh is large enough. This system have had great success and it can be reused and hold up all winter as well. The team at the Wetlands Institute sets these exclusions up as soon as nests are found.

Measuring hatching success

Hatchlings emergence occurs at different rates: there is trickle and some emerge all at once. If all but two of eggs emerge, they will usually excavate for known lay date nests. For nests they don't know clutch size, they excavate nests 10 days after last hatchling emerged. If nest makes it past 24-48 hours without being predated, there is a good chance of it producing hatchlings, although nests are also vulnerable just prior to hatching.

If one can only do quick checks on many miles of habitat, could number of predated nests be a good index of population size? (Dan). High predation means low recruitment so not certain that one can predation to determine population size. A site with high numbers of predated nests may be a sink, and one with little or no predation, may be a source. Density dependence studies may provide answers to this dilemma.(Willem). In avian studies, one wouldn't focus on high predation sites when evaluating avian productivity (Dan) Turtles may have fared better before regulations protected birds. (Willem

Measuring success from over wintering

Willem found it impossible to collect over wintering data at his Patuxent River study site because of low hatchling survivorship. is low. On PI, he is finding hatchlings from up to 75 nests/year are over wintering. Survival after over wintering in the nest is lower than those that emerge in the fall. He found that hatchlings do not enter the water but instead go into spartina and other fringe vegetation. There are data on over wintering success from U. of FL researchers and about 25% emerge in spring which is much higher than expected. (Christina).

Environmental conditions related to over wintering. Over wintering nests can survive several short inundations, lasting up to approx. 6 hours, but they are less successful being inundated for longer time periods. -4 degrees C can survive. up to of inundation is generally survivable. No correlations have been found between over winterers and late laid nests or with hatchling size (Christina and Willem) On PI, Willem found that hatchlings from nests started after 15 July, did over winter but this may be due to substrate type (hardening). Christina found that from the same nest at the Wetland Institute sites, some hatchlings emerge in spring and others emerged in the fall. In MD, this type of split emergence has not been observed (Willem). In MD, you start seeing emergence on first nice, warm spring day.

If and when is the best time to excavate nests for checking nesting success? Willem does not recommend planning for multiple checks: once the hatchlings are disturbed they leave the nest. Christina's group does not excavate the nest during the breeding season but will excavate those nests that haven't hatched by spring. They have high hatching success, though, and have found no live hatchlings present at that point. .Baker did some limited winter work: if live hatchlings were found, they were taken into the lab. Ruth: Bottom-line: once nest is disturbed, hatchlings won't stay in nest? Willem: Yes.

Session I Conference call ended at 12:00pm

Mid-Atlantic Diamondback terrapin Working Group conference call: Session 2, March 29, 2006
Land Based and in water mark recapture techniques and protocols

Moderator: Dan Day, USGS, Patuxent Wildlife Research Center
Minutes: Mary Hollinger, DTWG

Participants: Ruth Boettcher, VA Game & Inland Fisheries; Ilene Eberly Wetlands Institute; Paula Henry, USGS PWRC; JD Kleopfer, VA Game &Inland Fisheries; Joe Mitchell, University of Richmond; Holly Niederriter, DE Division Fish & Wildlife; Nancy Butowski, MD DNR; Willem Roosenburg, Ohio University and DTWG Co Chair; Christina Watters, Wetlands Institute; John Wneck, Marine Academy of Technology and Environmental Science.

A pre-meeting inquiry was made on the status of the MD Bill HB980 and changes in entry permit. Nancy explained that the current permits are not restricted to terrapins. The proposed new special permits will be required by all who harvest terrapins. Harvesters will be required to have the permit available upon request, and report catch numbers and per unit effort. Currently there is a discrepancy between harvest and dealer reports: in 2004 2,700 lbs were reported harvested and 10,000 lbs reported purchased.

Background and interests of participants are recorded in Session I minutes. Session II meeting began with a tentative plan on where and when to hold a follow up Mid Atlantic meeting. It was agreed that topics should address data gaps and how to design studies and apply methods so that results may be comparable site to site. It was suggested we draw up a general overall map of locations where studies are being conducted. Topics should focus on study priorities specific for the Mid Atlantic region, including addressing factors limiting recovery such as nest predation, by-catch, low recruitment, and prevalence of ghost pots in the Bay. Christina offered to update and post her list of State commercial regulations for MD, SC, and VA on the DTWG web site.

Marking techniques
Although there is no one consistent method used and everyone has their own system, we all recognize the markings from each other's studies – so far.
Willem has used shell notching on over 10,000 terrapins and has been able to id from his records any recaptured terrapin. At this time as the numbers of groups notching terrapins increase, there is the potential for running out or duplicating notching combinations. He has started using injected binary coded wire tags – readers are expensive but tags are cheap. He cannot say yet if there is a migration problem with wires.
USGS (Paula & Dan) use a redundant marking system that is a combination of injected pit tags, site specific marginal scute holes (10^{th} and 11^{th}), and a monel tag. They rarely recapture a turtle that doesn't have at least 1 of the markers still available. In shallow areas with dense boat traffic they observe high incidence of shell damage resulting from prop hits and predation. Although external markings and tags may be missing, the PIT tag is usually present.
Terrapin Institute has used a variety of tagging methods, always on the 10^{th}-11the marginal, left and right. Two holes are drilled early on, then a wire inserted and fashioned into a staple to attach a tag. The TI has tried brass wire, stainless steel, and monel wire. Started with no.1 monel tags, then switched to the larger no. 2 monel, then to a red floy tag for increased visibility. Mary does not know most recent TI system. Both USGS and TI have found that monel tags wear over time. USGS tried laser etched tags and found the numbers less durable. On the other hand, tags (probably Inconel) used on sea turtles have been found readable as much as 20 years later. John works with nesting females and uses notching and PIT tags. Holly uses notching in DE.
Wetland Institute: Notched in the past, but because of shell damage from road kills, notches were not recognizable. Currently they use microchips with great success. Christina emphasized the need to be careful when inserting the PIT tags and describe the method in use by the WI. The method has proven to be easy to learn and effective so it was suggested their technique be demonstrated if possible at the next meeting.
There are two primary manufacturers of pit tags. Initially they required separate readers however currently both appear to able to read all tags.

To save time and effort reprocessing and reduce human interference, Willem, John, and USGS have painted turtles. Willem uses inexpensive quick dry enamel paint, different colors for different years, which seem to hold up well.

The potential effect of tagging on commercial trade was discussed. Mary pointed out that watermen do not leave marked turtles alone, regardless of tagging of the visibility of the Terrapin Institute's bright red tag. Pet traders usually look for the "perfect" turtles. Holes, notches may ward many of the pet traders off. JD saw this with other turtles from his area. TI's experience is that they look for the most ornate and unusual terrapins, and would tend to reject the flaws if the harvest is good.

Trapping methods

In-water: Willem uses fyke nets of 7-8 hoops with 2 wings to funnel terrapins into the traps. Traps are set perpendicular to the shore, and are fitted with float on the cod end to maintain an air space. Fyke nets are checked once daily. He has lost <10 terrapins in 20 years. USGS uses same fyke set ups. Nets cannot be used in high energy sites but if there is sufficient water, they can be run nearly up to the shore and cover a large area. During the peak season, even with the air space, USGS checks their nets up to three times a day as needed. Fyke nets are expensive and require high maintenance: a lot of time is spent repairing holes from crabs and storm damage. In some areas by-catch, such as horseshoe crabs and jelly fish can be a problem.

Trawls and seines can be effective trap systems but are more difficult to handle.

Baited turtle traps/3 ring hoop traps can be used in areas with a high concentration of turtles; however Willem found that their effectiveness varied year to year. They are set submerged so must be checked every 4 hours, and pulled up overnight, so are very labor intensive. Mollusk bait worked better than fish. Willem found he tended to catch juveniles and males in shallow and females in the deeper water.

USGS uses a 6'x30" vinyl coated wire cylindrical box traps with funnels and a bait chamber at the bottom, which can be set in shallow water. It can be left for several days with little danger to the captured terrapins. The bait used is crabs which have been more durable than fish – razor clams may work well but are less available late in the season. (Dan). The WI has small creeks and has used modified crab pots, baited with menhaden and set and checked at every high tide. It has worked well but they need to be checked often (Christina).

Hibernacula: For their winter sampling, the USGS used a metal dredge with mesh bag similar to those used by watermen. Once a hibernacula is located, this is extremely effective as one can land as many as 200/hour. After more than 1000 turtles, no major injuries were noted. USGS also found no [major] effect from bringing turtles on board for up to 2 hours to process and returning them to the water. The fact that the turtles are so easily landed however, is a measure of how vulnerable they can be to harvesting from their hibernacula. Although summaries of findings are reported annually, the manuscripts are in prep (Dan and Paula).

Willem's fishermen's lore indicates that terrapins preferred hibernacula are shallow coves with muddy bottoms and protected from NE winds. There may be a minimum depth to prevent freezing.

On land: No longer recommended: it is too labor intensive and ultimately may alter nesting behavior (Willem).

Mark-recapture information

A suggestion was made for a centralized location for maintaining Bay wide terrapin ID and researcher contact information. Each study could provide a summary of their techniques and post it, and when a marked terrapin was found there would be a way to contact the investigator with the recapture location information. Ruth notes that there is a similar system for entering sea turtle information on the oyster catcher network.

Session 2 Conference call ended at 12:00pm