# TECHNIQUES

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## Tools and Techniques for Turtle Studies: Adjustable Locks for Hoop Trap Poles, Nylon Fencing for Drift Sets, and Stick-on Temporary Identification

Although many research protocols and techniques are described in scientific papers, authors rarely discuss methods or protocols that have been tried and abandoned. Passing on the lessons learned from previous studies can be valuable to novice researchers and to experienced researchers investigating new topics. Techniques papers that compare old techniques to newer ones (Gibbons and Greene 1979; Ewert and Legler 1988; Plummer and Ferner 2012; Nagle et al. 2017) can influence the initial design, planning, and logistics of research (Congdon and Dunham 1999) that may in turn reduce risk of injury to researchers and the stress or trauma experienced by study organisms. We describe three techniques developed during long-term field studies of turtles conducted at the University of Georgia Savannah River Ecology Laboratory and the University of Michigan E. S. George Reserve.

*Adjustable Trap Pole Locks for Hoop Traps.*—A common method of capturing aquatic turtles is to use hoop traps made with netting that must be stretched to maintain the desired cylindrical shape of the trap. One technique used to stretch traps involves employing heavy cord to tie both ends of a trap to stakes driven into the bottom of the wetland. However, staking traps is time consuming and may be difficult in streams and stock tanks with rocky bottoms.

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During field studies at the Savannah River Site (SRS) and E. S. George Reserve (ESGR), we initially used two wooden trap poles (e.g., closet rods or broom handles) to maintain trap shape. Each pole had a permanent L-hook at one end and an adjustable L-hook on the other end that could be placed in one of multiple holes drilled along the pole. Moving L-hooks on both trap poles to positions that fit a particular trap required the use of pliers, a procedure that was time consuming and frustrating when the first hole selected for an L-hook was not the best fit. What was needed was a simple and low-cost solution for stretching traps of varying sizes. After seeing a slide lock on camping equipment, GHK at the SRS solved the problem by inventing and then improving an easily adjustable locking device for hoop trap poles (soon named the "Garlock"; Fig. 1A, B). Trap poles were equipped with a stationary hook at one end and an easily moveable Garlock at the other end that adjusts to different sized traps; a retainer screw keeps the Garlock from sliding off poles (Fig. 2A, B).

Garlocks are constructed by welding a metal hook (e.g., a bent piece of key stock or 10 penny nail) to an industrial flat washer (Fig. 1B; only un-plated metal should be used to avoid potential exposure to dangerous fumes while welding). The diameter of the interior opening in the washer should be large enough to allow it to easily move up and down the trap pole, and to tilt enough to grab and lock to a pole when pressure on the hook is applied from the stretched trap. To release the Garlock, just tap the washer on the opposite side from the hook to relieve the pressure on the pole. In general, the more the trap is stretched, the more secure the lock. A secure lock on the pole is important to prevent collapse of the trap while it is being set and while pulling it into a boat or canoe. Collapse of an unattended trap will render it ineffective and can result in drowning captured turtles (Gibbons 1988).

Garlocks work well with wooden poles (e.g., closet rods or broom handles), or ¾-inch schedule 20 and ½-inch schedule 40 PVC pipe. Garlocks lock more securely to PVC when the outside of the pipe is scored horizontally by gripping the pipe with coarse sandpaper and rotating the pipe. The stationary L-hook on the pole end opposite the Garlock can be made with an open eyebolt that goes through both sides of the pole (Fig. 2A), alternatively notches can be cut into ¾-inch PVC pipe, or into straight connectors installed on ½-inch PVC pipe.


Fig. 1. A) An early and B) recent version of Garlock.

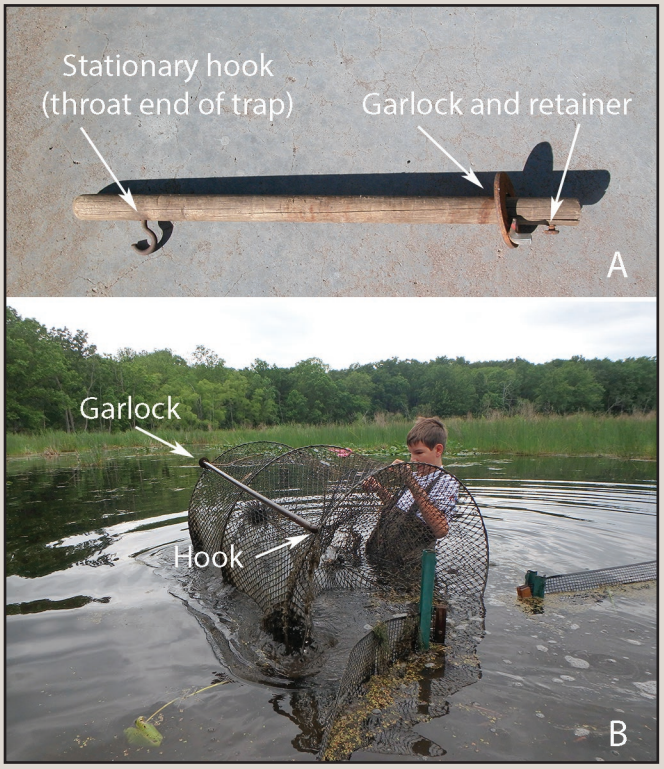


Fig. 2. A) A scale model of a trap pole with a Garlock attached, and B) the positions of the Garlock (back end) and hook (front end) of a pole mounted on a hoop trap.

Fig. 3. A three-trap (one at each end and one at an opening in the middle) aquatic drift fence set made with nylon fencing with reinforcement boards on each end that are attached to metal fence stakes driven into the bottom of the wetland.

Trap poles should be installed parallel to the throat opening and to each other to maintain the shape of the trap and its throat (Fig. 2B). If turtles are removed from the front of hoop nets, the stationary L-hook should be attached to the front hoop so that extension of poles beyond the terminal hoop does not interfere with access to the throat of the trap (Fig. 2B). To prevent drowning of turtles when water levels rise due to heavy rains, floatation devices (e.g., pool noodles or Styrofoam buoys) can be installed on the stationary end of trap poles where they will not interfere with movement of the Garlocks, or flotation devices can be tied to the inside of one end of the trap.

*Aquatic drift fences made from nylon fencing.*—Segments of fencing or netting can often be used to increase capture rates of traps, particularly during spring and fall when water temperature is low and movements are common. Typically, trap wings and aquatic drift fences are made from netting sewn to a top rope with floats and a bottom rope with lead weights attached. However, we inherited ¼-inch mesh plastic fencing previously used to make cages for studying bat behavior and converted it into lightweight aquatic drift fences that do not require float or lead lines. We bolted a pair of 1 × 1-inch boards to both ends of fence sections to reinforce the area where anchor stakes are attached (Fig. 3). Finally, proposed fence lines should be walked first to clear out obstructing vegetation and debris (slightly uneven substrates can require additional stakes to support the middle sections of the fence). We found that aquatic drift fences made of nylon fencing were very effective for capturing freshwater turtles, were faster and easier to set and maintain than those made with nylon netting, and, with careful handling, have required minimal repairs over the past 15 years.

*Temporary numbers and letters for identification of turtles from a distance.*—Studying the behavior and nesting ecology of turtles often requires a way to identify individuals from a distance. Females are easily disturbed when they are on land and will often abort nesting migrations and abandon nest construction if approached too closely. During the long-term study of nesting on the ESGR, we cleaned an area of the carapace using nylon brushes and Scotch Pads™, to avoid damaging the seams between dermal plates, and


Fig. 4. Temporary, high-visibility stick on temporary identifications codes on: a) Blanding's Turtle (*Emydoidea blandingii*), b) Painted Turtle (*Chrysemys picta*), and c) Snapping Turtle (*Chelydra serpentina*). Different colors and configurations temporary identifications were used during a particular year.

dried the cleaned area with warm air from hair dryer with the switch for the hottest setting taped to the off position (some turtles appeared to enjoy the drying process). Combinations of letters and numbers were painted on the cleaned area of carapace with small brushes or paint pens. Some problems encountered with painting numbers included spilled containers, hard-to-read numbers, and retention of numbers into the following year.

After obtaining an initial sample of Electromark™ industrial stick-on numbers and letters, we made an initial test of the duration they remained on turtles released into experimental ponds at SREL and found that they remained attached for at least 60 days. Therefore, the stick-on temporary identifications of individuals would last for more than the maximum duration of nesting seasons in most locations. Numbers and letters are available in different sizes and four color combinations (black on yellow or white backgrounds and yellow or black on white backgrounds). Easy and accurate identification of individuals from more than 50 m away was possible because the stick-on numbers and letters have very distinct margins and bright colors and are resistant to accumulation of dirt or algae growth (Fig. 4A–C). One unexpected issue was that the stick-on IDs on some Blanding's Turtles (*Emydoidea blandingii*) and Snapping Turtles (*Chelydra serpentina*) remained into the next nesting season. Different combinations of colors, numbers, and letters for year-specific IDs were used in consecutive years to solve that problem and we continued to use the Electromark™ system for more than 25 years of the ESGR study.

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## Literature Cited

Congdon, J. D., and A. E. Dunham. 1999. Defining the beginning: the importance of research design. *In* K. L. Eckert, K. A. Bjorndal, F. A. Abreu-Grobois, and M. Donnelly (eds.), Research and Management Techniques for the Conservation of Sea Turtles, pp. 83–87. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Ewert, M. A., and J. M. Legler. 1978. Hormonal induction of oviposition in turtles. Herpetologica 34:314–318.

Gibbons, J. W. 1988. Turtle population studies. Carolina Biological Supply Company, Burlington, North Carolina.

———, and J. L. Greene. 1979. X-ray photography: a technique to determine reproductive patterns of freshwater turtles. Herpetologica 35:86–89.

Nagle, R. D., O. M. Kinney, J. W. Gibbons, and J. D. Congdon. 2017. A simple and reliable system for marking hard-shelled turtles: the North American code. Herpetol. Rev. 48:327–330.

Plummer, M. Y., and J. W. Ferner. 2012. Techniques for marking reptiles. *In* R. W. McDiarmid, M. S. Foster, C. Guyer, J. W. Gibbons, and N. Chernoff (eds.), Reptile Biodiversity: Standard Methods for Inventory and Monitoring, pp. 143–150. University of California Press, Berkeley, California.