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METHODS

The Turtle Head Immobilization System (THIS): A Tool for Faster and Safer Handling and Processing of Aggressive Turtle Species

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Abstract.—The turtle head immobilization tool (THIS) is an efficient and cost effective tool to aid in the processing of large, aggressive turtles such as the Eastern Snapping Turtle (*Chelydra serpentina*). THIS aids in the reduction of aggressive behaviors by calming the animal during processing and minimizing injuries to the turtle and handlers. This simple tool also streamlines the processing itself, by allowing researchers to focus on measurements and markings, instead of having to maintain the constant vigilance often needed to work safely around these animals.

Key Words.—snapping turtle, head, immobilization, safety, processing.

When handling any live animal, two primary safety issues must be kept in mind; first, the safety of the person who is manipulating, handling, or processing the animal, and second, the wellbeing of the animal itself (Schenider et al. 2001). Wild animals can inflict serious, if not fatal, injuries to the people who work with them. Consequently, developing techniques that, when properly used, can safeguard both animal and operator is important (Fowler 2011).

Turtle researchers over the past 70 years have devised many different ways to process turtles (Meylan 2006; Ferner 2007; Weber et al. 2011). Processing, which includes marking, measuring, weighing, etc. of many turtle species, poses little threat of injury to either the turtle or researcher. However, some North American species such as freshwater Softshells (genus *Apalone*) and Eastern Snapping Turtles (*Chelydra serpentina*) and many other species from around the world can inflict serious injuries to researchers during the data collection process (Meylan 2006; Munscher et al. 2015).

Eastern Snapping Turtles are known for their cantankerous dispositions, large claws, and powerful quick-striking beaks (Meylan 2006) and can inflict considerable damage to a researcher's fingers and hands. Handling these animals can be tedious, time-consuming, and potentially dangerous to researcher and animal (Fig. 1). For instance in 2010, the lead author (ECM) was processing a 19-kg male Snapping Turtle at Wekiwa Springs State Park in Orlando, Florida. During the measuring process, this large turtle bit and broke ECM's thumb on his right hand. Fortunately, ECM was wearing thick dive gloves that prevented the turtle's beak and powerful jaws from inflicting a far more severe injury.

Developing a processing method that will immobilize and reduce the turtle's ability to strike and cause bodily damage is desirable. Currently, methods that employ putting a large stick or broom handle in the turtle's mouth (Fig. 1) or using another researcher as a distraction are often used. While these methods can work, they are not optimal for the animal's wellbeing or the researcher's safety. In 2013, the North American Freshwater Turtle Research Group (NAFTRG), the official North American research group of the Turtle Survival Alliance (Munscher et al. 2013) invited one of the authors (MDD) to join us at our Texas study site at Comal Springs in New Braunfels, Texas. MDD introduced the research group to a processing method that he had been using in Canada on Snapping Turtles. The Turtle Head Immobilization System (THIS) is a small-handled plunger (Fig. 2). THIS is placed over the turtle's head and held in place by the handle (Figs. 2–3). Mild force is applied to the plunger to hold the turtle's head. With the tool in place and the head covered, the turtles

Fig. 1. Processing a large Eastern Snapping Turtle (*Chelydra serpentina*) in Tennessee without the use of THIS. Notice the use of large sticks as a means of restriction and distraction. This method is time-consuming and not optimal for animal or researcher safety.

Fig. 2. Use of the THIS on a large male Eastern Snapping Turtle (*Chelydra serpentina*) while measuring carapace width. Notice the moderate pressure being applied to the plunger. The turtle's head is entirely enclosed.

are far less aggressive. The tool prevents them from being able to snap at the persons attempting to process them, making the overall process much safer and faster. To test the effectiveness of THIS, we timed the processing of nine Snapping Turtles from two different study sites: Comal Springs in New Braunfels, Texas, and Horse Creek in Tennessee.

Materials and Methods

Capture methods.—Snapping Turtles were captured primarily by hand while snorkeling as components in much more extensive turtle assemblage population studies (average person hours per event ~8 h of water time per person). We also placed two baited double-throated hoop nets (1.9 m dia., 5.7 m long) and four fyke nets (double throated hoop nets with 15.2-m leads; available from Memphis Net and Twine, Memphis, Tennessee) baited with fried chicken. For each sampling session, a variable number of volunteers, typically between 10–16 snorkelers/boaters, surveyed turtles from 0800 to 1700 h depending on weather conditions. All captured turtles were placed in kayaks and canoes and brought to a central location in the spring run for processing before subsequent release in close proximity to where they were captured. Tennessee turtles were captured in double-throated hoop nets baited with fresh fish.

Marking method.—All turtles are marked using two complementary methods — an external hard mark using a variation of the technique described by Cagle (1939) and with passive integrated transponder (PIT) tags (Biomark, Inc., Boise, Idaho; Buhlman and Tuberville 1998). The PIT tags are inserted under the right bridge of the shell, anterior to the right leg. This area is established as an acceptable site for PIT-tag retention (Buhlman and Tuberville 1998; Runyan and Meylan 2005; Munscher et al. 2015). Twelve-mm PIT tags are used for all Snapping Turtles. Capture and handling protocols were approved by the Texas Parks and Wildlife Department (TPWD), the City of New Braunfels, The Tennessee Wildlife Resources Agency (TRWA) (TDEP), and the Institutional Animal Care and Use Committees at

Peninsula College, and conform to the ASIH/SSAR animal-use guidelines (ASIH/HL/SSAR 2001).

Data collection.—The following measurements were taken from each turtle: Maximum carapace length, midline carapace length, plastron length, shell width, shell height, plastron midline, pre-cloacal length, post-cloacal length, and head width. All measurements were taken to the nearest mm using tree calipers. Turtles were weighed to the nearest 50 g with a 10-kg or 20-kg spring scale (Pesola Scales, Kapuskasing, Ontario, Canada). Turtles were sexed based on secondary sexual characteristics of carapace length, tail to cloacal length, and front-claw length (Ernst and Lovich 2009). Once all data had been collected, turtles were released as close to their original capture location as possible.

Results

Data analysis.—We timed the processing for seven Eastern Snapping Turtles at Comal Springs in New Braunfels, Texas, that ranged in size from 300 mm maximum carapace length (CL) to 396 mm max CL and weighing 7.3–15.5 kg. Additionally, we processed two turtles from Horse Creek in Savannah, Tennessee, that possessed maximum CLs of 287 mm and 295 mm, and weighted 4.4 kg and 4.6 kg, respectively.

Processing times were statistically shorter when using THIS to immobilize a turtle's head. A one-tailed t-test, assuming unequal variances, revealed that mean handling time using the tool (2.71 min ± 0.12 SD) was significantly less than without (3.49 min ± 0.35 SD; $t = 4.64$, $df = 4.9$, $p < 0.0029$). Personnel injuries also were kept to a minimum as the only injuries (scratches) occurred during the processing of Snapping Turtles without the use of THIS.

Discussion

Use of the THIS resulted in statistically quicker, far safer (turtle is incapable of striking when its head is within the plunger; Figs. 2–3), and easier processing of these cantankerous turtles. Processing is not only difficult and potentially dangerous to the researcher but can be extremely stressful to the turtles. We noticed that once the turtle's head was inside the plunger, the turtle's ill temperament subsided, allowing us to process the turtle in a faster, safer, and more streamlined fashion. We recommend that researchers who work with larger, more aggressive turtle species consider using the tool (as it is a cost effective way ~$4.00) to minimize the risk of injury to both the turtle and the researcher.

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Fig. 3. The use of THIS on a moderately sized male Eastern Snapping Turtle (*Chelydra serpentina*) while measuring the plastron.

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