

and even on the roofs of partially submerged automobiles (Ernst and Lovich 2009, *op. cit.*). At 1200 h on 14 May 2018, we observed *C. picta* basking on a dead *Castor canadensis* (American Beaver; Fig. 1A) and on a dead *Cyprinus carpio* (Common Carp; Fig. 1B) at Medicine Lake in Hennepin County, Minnesota, USA. To our knowledge, this is the first report of *C. picta* basking on animal carcasses.

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**CLEMMYS GUTTATA (Spotted Turtle). HABITAT USE.** *Clemmys guttata* is known to inhabit a wide variety of wetland types, such as shallow grassy marshes, forest swamps, ponds, and even bays of large lakes (Ernst 1976. *J. Herpetol.* 10:25–33; Litzgus and Brooks 2000. *J. Herpetol.* 34:178–185; Stevenson et. al. 2015. *Chelon. Conserv. Biol.* 14:136–142). *C. guttata* populations inhabiting wetland complexes often display seasonal shifts in habitat use (Ward et. al. 1976. *Herpetologica* 32:60–64; Beaudry et. al. 2009. *J. Herpetol.* 43:636–645). Individuals have also been documented moving among wetlands over short time intervals, sometimes remaining within a wetland for only one day (Haxton and Berrell 2001. *J. Herpetol.* 35:606–614). Previous studies indicate that movement among wetlands typically involves walking through terrestrial habitat, sometimes traveling up to 250 m from water (Ernst, *op. cit.*; Litzgus and Brooks, *op. cit.*; Rasmussen and Litzgus 2010. *Copeia* 2010:86–96).

Few published studies have investigated the use of streams as habitat or as a factor influencing habitat connectivity for *C. guttata*. Individuals have been documented occupying slow-moving water systems such as drainage ditches and backwater areas of rivers (Stevenson et. al., *op. cit.*), and hibernating on the bottom of shallow (ca. 0.2 m) streams (Ernst 1982. *J. Herpetol.* 16:112–120). Streams with moderate or rapid flow rates bisecting wetlands could act as barriers to movement, but could also function as travel corridors among wetland patches. Here, we report radiotelemetry-based data showing that individuals in a *C. guttata* population often cross a moderate-flow stream while moving among wetland patches, as well as an observation of apparent use of the stream as a travel corridor.

In spring of 2018, we conducted a radiotelemetry study using six *C. guttata* in a 20-ha wetland complex in Hampshire County, West Virginia, USA (specific location withheld in compliance with state of West Virginia sensitive species data practices). The wetland complex consists of a matrix of seasonally flooded shallow grassy marshes, forest ponds, and dry upland grassland and forest. The wetland complex is bisected by a small, moderate-flow stream (2–4 m wide, 0.2–1.2 m deep, ca. 0.029 cm/s flow rate during the study period). *C. guttata* were outfitted with 3.6-g glue-on radiotransmitters (Advanced Telemetry Systems [ATS], Isanti, Minnesota), and tracked from 5 April to 7 May using a R410 scanning receiver (ATS) and 3-element folding yagi antenna. Each individual was located a minimum of three times per week.

During the study, five of the *C. guttata* made stream crossings to access additional wetlands. The females (N = 2) crossed the stream to access a wetland adjacent to the one previously occupied, whereas the males (N = 3) appeared to use the stream as a corridor to move to other wetlands. For example, on 1 May 2018, a male *C. guttata* was tracked into a shallow grassy

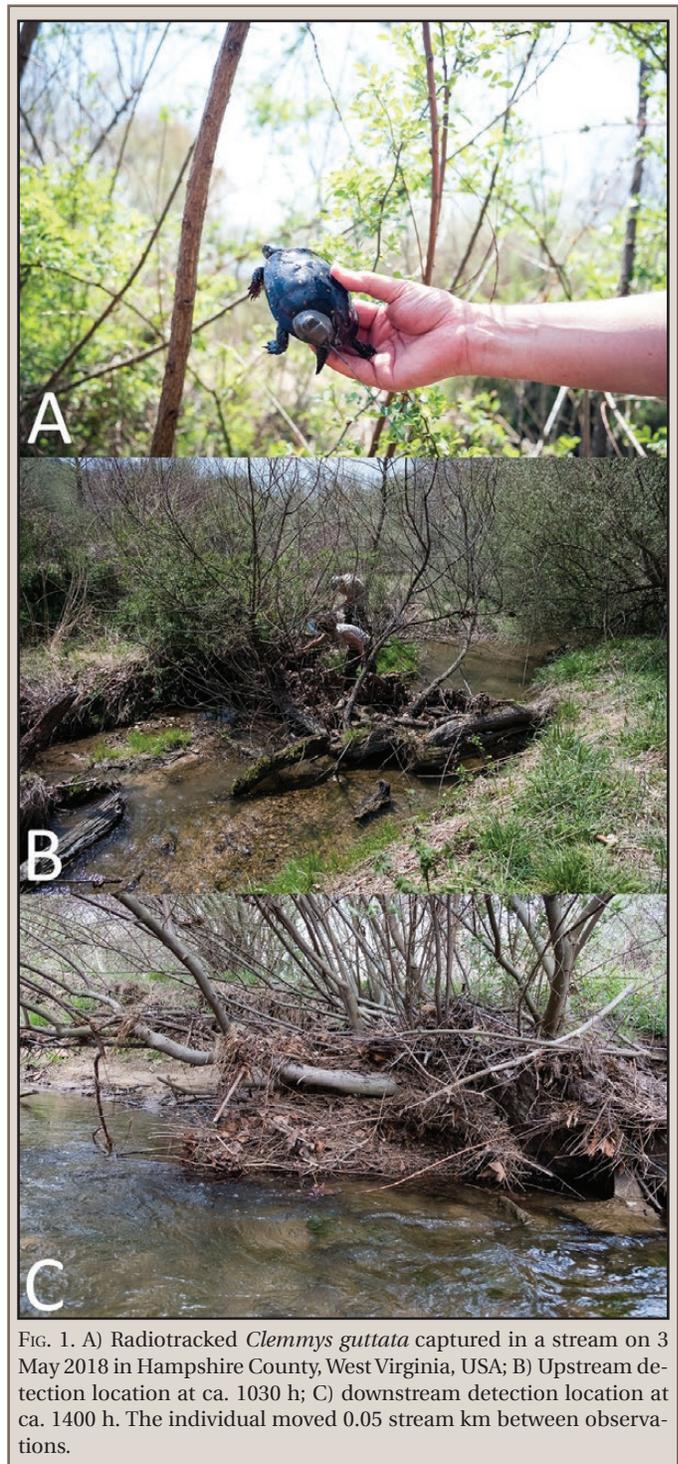


FIG. 1. A) Radiotracked *Clemmys guttata* captured in a stream on 3 May 2018 in Hampshire County, West Virginia, USA; B) Upstream detection location at ca. 1030 h; C) downstream detection location at ca. 1400 h. The individual moved 0.05 stream km between observations.

marsh. On 3 May 2018, at ca. 1030 h, the same individual was tracked a straight-line distance of 0.04 km into the stream and located among a collection of wood and debris that had been trapped by a tree limb that had fallen across the water (Fig. 1). At ca. 1400 h on the same day, the individual was tracked 0.05 km downstream from its previously tracked location, into another wood and debris collection that had developed among the vegetation growing along the bank of the stream. On 4 May 2018, the individual was located in a temporary shrub-sedge wetland, a straight-line distance of 0.05 km from the previously tracked location. On 7 May 2018, the individual was then tracked back

to the original shallow grassy marsh, 0.13 km from the previous location.

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**EMYDOIDEA BLANDINGII** (Blanding's Turtle). **VOCALIZATIONS.** Traditionally it was generally presumed that all turtles were silent and deaf (Pope 1955. *The Reptile World*. Knopf, New York. 325+xiii pp.), and that any sounds they did produce were likely just noises made during breathing or nesting (Mrosovsky 1972. *Herpetologica* 28:256–258; Wever 1978. *The Reptile Ear: its Structure and Function*. Princeton University Press, Princeton, New Jersey. 1038 pp.; Cook and Forrest 2005. *Herpetol. Rev.* 36: 387–390). In 2009 this paradigm was broken by the description of purposeful vocalizations in *Chelodina colliei* (Giles et al. 2009. *J. Acoustic Soc. America* 126:434–443). The vocal repertoire of other species of freshwater and marine turtles has now been described, documenting the importance of underwater acoustic communication for both social and reproductive behavior (Ferrara et al. 2012. *J. Comp. Psychol.* 127:24–32; Ferrara et al. 2014a. *Copeia* 2014:245–247; Ferrara et al. 2014b. *Chelon. Conserv. Biol.* 13:110–114; Ferrara et al. 2014c. *Herpetologica* 70:149–156; Vogt 2014. *The Tortoise* 1:118–127; Ferrara et al. 2017 *Copeia* 105:29–32). For example, in *Podocnemis expansa*, postnatal parental care was documented using acoustic communication studies (Ferrara et al. 2012, *op. cit.*). Furthermore, several studies have demonstrated the ability of both marine and freshwater turtles to perceive aerial and underwater low-frequency sounds (Ridgway et al. 1969; Lenhardt et al. 1996. NOAA Technical Memorandum NMFS-SEFSC-387; Christensen-Dalsgaard et al. 2012. *Proc. Royal Soc. B* doi:10.1098/rspb.2012.0290). Although acoustic communication has been documented in marine turtles (above references) and the Pig-nosed Turtle (*Carettochelys insculpta*) (Ferrara et al. 2017, *op. cit.*), it has yet to be documented in other freshwater cryptodires. The purpose of this note is to document that another freshwater cryptodire, *Emydoidea blandingii*, also emits underwater vocalizations.

We recorded *E. blandingii* for 23 h during April 2009, where M. Pappas has been conducting a long-term population study of this species for the last 40 years, at McCarthy Wildlife Management Area near Weaver Dunes, Minnesota, USA. We initially recorded six individuals (three females and three males) for six hours in captivity to obtain a baseline of the sounds they were emitting (if they were emitting sounds, we needed to know the structure and frequency of the sounds so that we could detect these sounds in nature and distinguish them from the other environmental noises), and to help us adjust the recording equipment for recording these frequencies. We then recorded wild turtles for a total of 17 h during four sessions within the hours of 0900–1200 over a four-day period, in a vernal pool where Blanding's Turtles come year after year to court and copulate in the McCarthy Wildlife Management Area. We chose this area because it is one of the few times and places during the year where we are certain to find the turtles, and, presumably, they are more likely to produce sounds when they are in the presence of other turtles than if they are alone. All sound recordings were made using a Fostex FR-2 recorder adjusted to 48 kHz at 24 bits. The underwater recordings were made with a Reson (TC4043) omnidirectional hydrophone



FIG. 1. Adult *Emydoidea blandingii* on basking log in the breeding vernal pool in Hastings Wildlife area. Note male with inflated throat and elevated head posture.



FIG. 2. Adult *Emydoidea blandingii* on basking log in the breeding vernal pool in Hastings Wildlife area. Note male with open mouth posture.

with sensitivity of 2 Hz–100 kHz  $\pm$  3 dB. Airborne sounds were recorded using a Sennheiser K6 unidirectional microphone with a Sennheiser ME-66 windscreen. While recording at the surface of the water, the microphone was positioned 30 cm above the water and pointed towards a floating log 40 cm away where the turtles were frequently noted basking (Figs. 1, 2), to capture the sounds as the heads of the turtles were breaking the surface and during basking. We inserted the hydrophone 0.5 m from the bottom of the pool (depths varied from 1 to 1.5 m) and 40 cm from the bank of the pool. We monitored the recordings in real time using Sony MDR-7506 headphones and adjusted the recording level manually to maximize the signal-to-noise ratio and to prevent distortions (“clipping”) caused by excess gain.

Raven Pro 1.3 (Cornell Laboratory of Ornithology) was used to analyze the recordings using the following spectrographic parameters: window type—Hamming; window size—512 samples. Sounds with similar characteristics of published turtle sounds (Giles et al. 2009, *op. cit.*; Ferrara et al. 2012, *op. cit.*) and within the hearing range of turtles (Ridgway et al. 1969. *Proc. Nat. Acad. Sci.* 64:884–890) were detected manually by two experienced researchers using visual and aural inspection of the recordings.