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Reptilia: Testudines

Preliminary notes on caudal prehensility in the Hicatee, *Dermatemys mawii* (Testudines: Dermatemydidae)

Dermatemys mawii is a Critically Endangered freshwater turtle that inhabits rivers, lagoons, and oxbow lakes in southeastern Mexico, Guatemala, and Belize (Vogt et al., 2016). As a fully-aquatic, non-basking, and frequently nocturnal species that is capable of remaining submerged for extended periods due to its ability to uptake oxygen underwater through buccopharyngeal respiration (Winokur, 1988; Vogt et al., 2011), this species can be difficult to observe in nature (Davy and Fenton, 2013). Aside from descriptions of its foraging behavior (Moll, 1989), little information is available on its behavioral repertoire. As the only extant member of the family Dermatemydidae, whose divergence from its closest living relatives, the kinosternids, dates back more than 72 million years (Knauss et al., 2011), *D. mawii* may possess unique or unusual behavioral attributes that are not represented in other extant chelonians.

Although uncommon in zoological collections (Smith, 2015; Mendyk and Smith, 2016), captive specimens of *D. mawii* maintained in zoological parks offer valuable opportunities for studying aspects of the species' behavior that otherwise would be difficult to observe in the field.

Captive Observations

The Jacksonville Zoo and Gardens presently maintains an adult trio of *Dermatemys mawii*, comprised of a 40+ year-old male and two 20+ year-old females (Mendyk and Smith, 2016). The group is maintained together in a ca. 151,000-L pool located inside a walk-through aviary, with a maximum water depth of ca. 160 cm. Heat exchangers maintain the pool's water temperature between 25.5 and 27.7°C, and filtration is accomplished through a combination of high pressure sand filters and a slipstream ozone system. In addition to aquatic and wading birds that regularly utilize the pool, several other Neotropical chelonians, including *Trachemys venusta*, *Chelus fimbriatus*, and *Mesoclemmys gibba* are housed together with the *D. mawii*, as well as several large Pirapatinga (*Piaractus*

brachypomus) and suckermouth catfish (*Pterygoplichthys* spp.). Several submerged logs and branches resting at the bottom of the pool provide cover for some of the turtle species. The staff adds weekly cuttings of mulberry branches (*Morus* spp.) to the pool; the leaves are consumed by many of the pool's inhabitants, including *D. mawii*, and also provide additional refuge. All of the behavioral observations described below occurred between 0730 and 1800 h.

Historically, a single female *D. mawii* (JZG #403307) had been maintained in the exhibit pool since October of 2004. In October of 2015, a male (JZG #415327) was acquired from another zoo and introduced to the exhibit with the original female, after a 30-day quarantine period. The male showed immediate interest in the female, approaching her from behind when resting on the bottom of the pool and investigating her cloacal region and rear limbs with his nares, in what appeared to be heavily-focused olfactory behavior similar to what has been described in *Rhinoclemmys pulcherrima* (Hidalgo, 1982). Over the next two months, the male showed continued interest in the female, following her around the pool, investigating her cloaca and rear limbs, and occasionally biting at the supracaudal scutes of her carapace, leading to two noticeably degraded depressions in the shell. Most observed interactions between these individuals occurred while both animals were walking along the bottom of the pool, and in most cases the male approached or trailed the female from behind. If and when detected by the female, the male would turn around and quickly retreat, even though no aggressive or defensive movements or displays were made by the female. Occasionally, the male would approach the female head-on, usually stopping at a distance of around 1 m or more, but maintained eye contact with the female; in some cases, such staring behavior was observed while the male was floating in the water column. Some unusual courtship behaviors were observed between this pair on several occasions, particularly tandemized swimming, in which the male swims directly underneath the female and mirrors the female's swimming movements at top speeds around the exhibit pool. Although copulation was not observed between this pair, a clutch of 12 eggs was deposited by the female on 25 March 2016, with an additional egg laid in the pool a few days later.

On one occasion on 16 February 2016 at around 1100 h, the male was observed slowly approaching the female head-on along the bottom of the pool. At a distance of around 0.6 m and in full visual contact with the female, the male halted his approach and floated his body upward at an inclination of ca. 45 degrees, with all four limbs outstretched to the sides. The male remained motionless and maintained eye contact with the female, maintaining his suspended positioning in the water column through the use of his tail, which partially was wrapped around a submerged tree limb ca. 10 cm in diameter. After ca. 20 s of motionless visual contact with the female in this position, the male released his grip from the limb, turned back, and quickly swam away from the female. After noticing this peculiar usage of the tail, further observations were made of the male using his tail to gently grip onto submerged tree limbs as he passed over them. When walking along the bottom of the pool, the tail often is angled downward so that it catches, or comes into contact with, submerged tree limbs as he passes over them, and occasionally gripping onto them. This behavior appears to contrast that described in other long-tailed aquatic turtles, such as *Chelydra serpentina*, in which the tail is extended outward as a counterbalance to the head while traveling along the bottom of a pool (Willey and Blob, 2004). Caudal prehensility has not been observed in either female *D. mawii* at JZG, and due to the substantially shorter tails of female *D. mawii* (Campbell, 1972; Fig. 1), we doubt whether females of this species are capable of physically using the tail in this capacity.

Discussion

These observations provide the first description of caudal prehensility in *Dermatemys mawii*. Caudal prehensility has been documented in several other chelonians, although tail usage varies widely between taxa. For example, *Platysternon megacephalum* and *Chelydra serpentina* have been reported to use their muscular, prehensile tails to assist with righting themselves when flipped over (Ashe, 1970; Finkler and Claussen, 1997). In sea turtles, prehensile tails are used in intraspecific signaling (Schofield et al., 2007) and to block rival males from gaining access to a female during copulation (Booth and Peters, 1972). In other species, males utilize a prehensile tail in forced insemination (Berry and Shine, 1980). The present account of caudal prehensility in *D. mawii* appears to be the first documented example of a turtle using its tail to grasp onto physical elements of its environment, although Brode (1958) speculated such "fifth limb" usage in nature for *C. serpentina* and *Macrochelys temminckii*.

Since female *D. mawii* do not possess large tails that would be capable of grasping objects in their environment, and younger males do not develop longer, thicker tails until maturity (RWM, pers. observ.; J. Marlin, pers. comm.), the primary function of caudal prehensility in *D. mawii* unlikely is for grasping onto submerged objects

within their environment or it would be expected to occur in both sexes. Instead, caudal prehensility likely serves some role in courtship and/or copulation. *Dermatemys mawii* does share common ancestry with the kinosternids, of which males of several genera including *Sternotherus*, *Kinosternon*, and *Staurotypus* have been reported to use their tails in forced insemination (Berry and Shine, 1980). Attempted copulation was observed at JZG on one occasion between the male and a second female (JZG# 416300), shortly after her introduction to the exhibit in April of 2016. Smaller in overall size than the female, the male appeared to use its strong, muscular tail to forcibly access the female's tail for copulation, although actual intromission could not be observed. The female did not appear to be receptive to the male's advances, and retreated shortly thereafter. No further copulation attempts were observed, and as of September 2016, no eggs have been produced by this female.

Further observations on captive *D. mawii* at JZG might shed additional light on the potential role and importance of caudal prehensility in courtship and copulation in this species, as well as other aspects of its behavioral repertoire.



Fig. 1. Tail length comparison between an adult male (left) and female (right) *Dermatemys mawii* at the Jacksonville Zoo and Gardens. 📷 © Robert W. Mendyk

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