

First Evidence of Elasmobranch Predation by a Waterbird: Stingray Attack and Consumption by the Great Blue Heron (*Ardea herodias*)

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Abstract.—A Great Blue Heron (*Ardea herodias*) foraging on an Atlantic Stingray (*Dasyatis sabina*) was observed off coastal Mississippi. Although elasmobranchs have been previously reported in the diets of birds, this observation was the first documenting the attack and consumption behavior by a bird on an elasmobranch. The behaviors in the event mirror previous observations of *A. herodias* attacking large and unwieldy prey items. Consumption of a high trophic-level fish by *A. herodias* further emphasizes its role as a top predator in shallow marine food webs. Received 2 February 2010, accepted 18 October 2010.

Key words.—Atlantic Stingray, elasmobranch, Great Blue Heron, predation.

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The Great Blue Heron (*Ardea herodias*) stalks its aquatic prey by waiting motionlessly for erratic movements, or slowly tracking prey through shallow waters (Kushlan 1976; Butler 1997). Prey is primarily captured between open mandibles by a snapping behavior from a coiled, S-shaped position of the neck. Serrations along the bill assist with procurement of small fishes, which are transported back into the mouth by a tossing motion and swallowed whole (Butler 1995). Using these foraging behaviors, Great Blue Herons exploit small benthic fishes distributed in vegetated habitats (e.g. *Zostera marina*) and bare marine tidal flats (Custer and Osborn 1978; Butler 1997). However, diet has been known to vary extensively in *A. herodias*, with mature individuals exhibiting more opportunistic behaviors (Butler 1997). Prey items also generally increase in size with larger herons, which learn to manage more cumbersome fishes through practice (Gutsell 1995). Mature Great Blue Herons can thus handle and consume spiny fish species such as sticklebacks, sculpins and catfish (Forbes 1982; Butler 1995; Glahn *et al.* 2000), though elasmobranchs (sharks, skates and rays) have never been reported in the diet.

Here, we present a single observation of a Great Blue Heron capturing and consuming an Atlantic Stingray (*Dasyatis sabina*) off the coast of Mississippi. Though Great Blue Herons and Atlantic Stingrays are common

year-round inhabitants of shallow waters of the northern Gulf of Mexico (Toups and Jackson 1987; Parsons 2006), no studies have previously documented interactions between these two species. Our observation of Atlantic Stingray consumption by the Great Blue Heron is consistent with past accounts of *A. herodias* feeding on large or unwieldy prey items (Langdale 1897; Ryder 1950; Willard 1977; Peifer 1979; Wolf and Jones 1989; Rivers and Kuehn 2006), and has been reported by wildlife photographers from other regions of the Gulf of Mexico (e.g. Tampa Bay, S. Leach, pers. comm., <http://www.flickr.com/photos/fastball95/2829130139/>).

METHODS

The observation took place off Biloxi, Mississippi, USA (30°40'N, -88°88'S) on 15 November 2009. A solitary Great Blue Heron was sighted at 0800 approximately 30 m from shore in shallow (30 cm depth) water (Fig. 1a). The observer (DD) immediately began taking photographs (Nikon @D300, Lens: Nikkor @70-200 mm 2.8) while the heron was exhibiting foraging behaviors.

RESULTS AND DISCUSSION

The Great Blue Heron was initially observed submerging its head repeatedly and striking underwater without successful capture. At 08:19 the heron propelled its neck downward (Fig. 1B), remaining underwater for a longer period than previous attempts

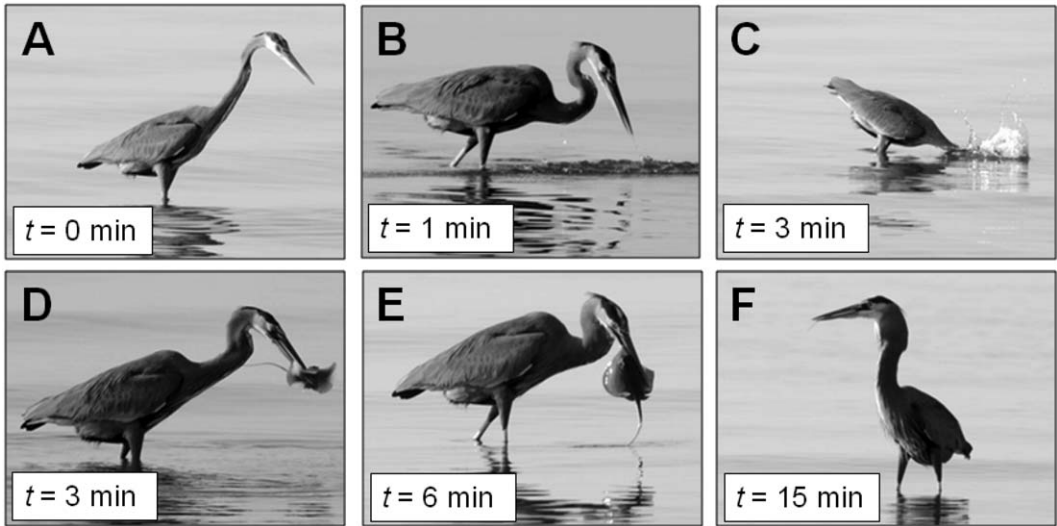


Figure 1. Photographic sequence of the capture (A-C) manipulation (D-E) and swallowing (F) of *Dasyatis sabina* by *Ardea herodias*. Time (t) from the first observation is noted on lower left of each photo. Photo credit (D. Dolan).

(Fig. 1C), and emerged with an Atlantic Stingray (*Dasyatis sabina*). The stingray was impaled dorsoventrally with the distal tips of both upper and lower mandibles of the heron protruding through the pectoral fin (disk) and the ray's mid-line (Fig. 1D). Impaled, the ray wriggled and whipped its tail and venomous spine back and forth. The heron repositioned the stingray and then intermittently dipped the ray in the water and masticated it with its mandibles. This manipulation behavior was repeated until the stingray became motionless. Holding its prey from the cranial region (Fig. 1E), the heron ingested the tightly folded stingray into its mouth and expanded esophagus (Fig. 1F). At 08:31, approximately 12 min after the initial capture, the stingray appeared to have been completely swallowed. Following consumption, the heron took flight and traveled a distance of roughly 300 m away from the capture location and landed on a pylon post. The heron was observed for another 10 min, and did not reject the recently consumed stingray during this period.

Contrary to typical procurement of fish prey (i.e. open mandible strike; Butler 1995), the Great Blue Heron we observed initially struck at the stingray with closed mandibles ("bill stabbing" or "skewering").

Bill stabbing has been observed in Great Blue Herons foraging on the Eared Grebe (*Podiceps nigricollis*) (Rivers and Kuehn 2006), pufferfish (Recher and Recher 1972) and a multitude of other spiny fish species (Forbes 1982). Bill stabbing has also been reported in the related Goliath Heron (*Ardea goliath*) when foraging on large (>30 cm) lake fishes (Mock and Mock 1980). Combined with our observation of stingray predation, these past studies indicate that bill stabbing may function to secure large and spiny prey items that cannot be grasped between the mandibles, or those items that require significant manipulation and processing prior to swallowing. The intermittent submerging and mastication of prey observed here was also documented in Great Blue Heron predation upon the Eared Grebe (Rivers and Kuehn 2006), and may serve to facilitate swallowing. Often these manipulations are required to remove dangerous spines or other morphological features that may disrupt ingestion of the prey (Forbes 1982). Extensive manipulation behaviors have also been observed in heron consumption of Pacific Staghorn Sculpin, another species replete with spiny appendages (Krebs 1974).

Great Blue Herons capture larger fishes than other herons (Willard 1977), and also

attack animals such as frogs (Langdale 1897), bull-heads (Bent 1926), snakes (Cottam 1938), small terrestrial mammals (Peifer 1979), carp (Ryder 1950) and Pacific Sea Lamprey (Wolf and Jones 1989). However, with the exception of small mammals (Peifer 1979), the ingestion of these large animals has been shown to cause mortality of the heron by choking. While the Atlantic Stingray likely represents another large prey item to consume, no evidence of choking or obstruction (e.g. distended neck) was observed several minutes after swallowing. Consumption of small stingrays by herons is thus a likely occurrence as rays are largely sedentary, present a minor threat to being consumed, and are morphologically similar to flatfishes (e.g. flounder) previously reported in the diet elsewhere (Tyler 1971; Cook 1978; Raffaelli *et al.* 1990). Furthermore, in addition to our observation, foraging on stingrays by herons has been reported several times in Tampa Bay, FL, with nearly identical attack and manipulation behaviors observed (S. Leach, pers. comm.).

Documented predators of elasmobranchs include Killer Whales *Orcinus orca* (Fertl and Acevedo-Gutierrez 1996; Visser 1999), Cape Fur Seals *Arctocephalus pusillus* (Martin 2004), Giant Grouper *Epinephelus lanceolatus* (Randall 1992) and a suite of large (total length > 2m) sharks (Strong *et al.* 1990; Ebert 1991; Compagno 2001; Chapman and Gruber 2002). Birds have also been recognized as potential predators of elasmobranchs, though there has been no evidence of direct predation. For example, elasmobranch remains (i.e. placoid scales) were reported in the gut of a migrating Common Merganser (*Mergus merganser*) in Oklahoma (Heard and Curd 1958). In addition, a Brown Pelican (*Pelicanus occidentalis*) was found dead off the coast of California with multiple ray species in its pouch (Bostic and Banks 1966). Skate remains have been recovered in Bald Eagle (*Haliaeetus leucocephalus*) nest sites off Cape Breton Island, Nova Scotia (Cash *et al.* 1985). More recently, Martin (2004) reported consumption of Puffadder Shysharks (*Haploblepharus edwardsii*) via kleptoparasitism by Black-backed Kelp Gulls

(*Larus dominicanus*). Thus, despite these reports of elasmobranchs in the diets of birds, no studies have separated scavenging from predation on a live animal. Our encounter with a Great Blue Heron foraging on an Atlantic Stingray represents the first concrete evidence of predation on an elasmobranch by a bird.

The documented predation event provides insight into how herons utilize their morphological characteristics to capture large and unwieldy prey items. These physical and behavioral attributes of foraging may allow resident herons to consume larger items like stingrays during cooler months where primary prey (small fishes) availability decreases (Kushlan 1978). Stingray predation lends further support to the Great Blue Heron's role as a top predator in aquatic food webs (Steinmetz *et al.* 2003), along with large fishes (i.e. sharks) and marine mammals. We anticipate that the predator-prey interaction observed here will be taken into consideration with future investigations of nearshore ecology and food-web relationships.

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