

samples from one or more of three adult box turtles, although it was impossible to discern the individual turtle(s) responsible as they were temporarily housed together. This suggests that *P. japonica* may already be a common prey item for this population. *Popillia japonica* is among the most widespread and common invasive insects in the eastern United States (Potter and Held. 2002. Annu. Rev. Entomol. 47:175–205), widely overlapping in geographic range with *T. carolina* and inhabiting many of the same habitat types. While the competitive relationships between *P. japonica* and native arthropods in the United States are poorly understood, *P. japonica* could emerge as an important food source should native species exhibit population declines due to competition or anthropogenic factors. *Popillia japonica* have been documented as a common prey item for some populations of *Glyptemys muelenbergii* (Bog Turtle) and may already be a regular part of *T. carolina* diets in the eastern USA (Melendez et al. 2017. Herpetol. Conserv. Bio. 12:272–278).

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TRACHEMYS SCRIPTA (Red-eared Slider) and PSEUDEMYX GORZUGI (Rio Grande Cooter). FISH HOOK INGESTION and SHOOTING. Recreational fishing has contributed to a decline of turtle populations in both marine and freshwater habitats due to boat collisions (Bennett and Litzgus 2014. J. Herpetol. 48:262–266), entanglement in traps and fishing lines (Grosse et al. 2009. Chelon. Conserv. Biol. 8:98–100), and ingestion of fish hooks (Nemoz et al. 2004. Biologia 59:185–189). Due to opportunistic foraging behavior of some turtles, using baited traps or hooks increases the probability of catching turtles as bycatch (Cartabiano et al. 2015. J. Freshw. Ecol. 30:407–415). Incidents of fish hook ingestion have been reported in many turtle species such as *Macrochelys temminckii* (Alligator Snapping Turtle; Trauth et al. 2017. Herpetol. Rev. 48:836), *Phrynop geoffroanus* (Geoffroy's Side-necked Turtle; Borges Da Rocha et al. 2018. Herpetol. Rev. 49:321–322), *Caretta caretta* (Loggerhead Sea Turtle; Hoarau et al. 2014. Mar. Pollut. Bull. 84:90–96), and *Lissemys punctata* (Flapshell Turtle; Sivana-ayan et al. 2014. Intas Polivet 15:178–179). Steen et al. (2014. PLoS ONE 9:e91368) reported that ca. 5% of 438 freshwater turtles of four different species (*Sternotherus odoratus* [Eastern Musk Turtle], *Chelydra serpentina* [Snapping Turtle], *Trachemys scripta*

[Red-eared Slider], *Apalone spinifera* [Spiny Softshell]) in Tennessee and 3.5% of 170 *C. serpentina* in Virginia contained fish hooks. Furthermore, Sack et al. (2017. J. Zoo. Wildl. Med. 48:716–724) reported that 2.3% of all turtles (N = 1847) rescued between 2005–2014 had injuries from ingestion of fish hooks.

In 2017, during a long-term, mark-recapture study of *Pseudemys gorzugi* (Rio Grande Cooter) on the Black River, Eddy County, New Mexico, USA, one female *P. gorzugi* was found with a fishing line protruding from its mouth and a hook embedded in the throat (Waldon et al. 2017. Herpetol. Rev. 48:837). In this case the hook was safely removed, but injuries from fishing gear could pose a risk for a state-threatened species such as *P. gorzugi*. In addition, carcasses of *P. gorzugi* and *T. scripta* have been found in New Mexico with evidence of gunshots, although the frequency is unknown (Pierce et al. 2016. In Rhodin et al. [eds.], Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group, pp. 100.1–100.12). In New Mexico, *P. gorzugi* can be found in the Pecos River and its tributaries, including the Black River. The river is used for irrigation, cattle ranching, oil industry, and for public recreation (i.e., swimming and fishing). Due to the conservation sensitivity of the species and the overlap between its habitat and recreational fishing areas, an assessment of the prevalence of fish hook ingestion and gunshot wounds is needed.

From 15 May to 17 August 2018, we captured turtles using traditional hoop net traps baited with canned sardines. We focused on two accessible stretches of the Black River. The first stretch is ca. 1500 m long, located upstream near the Black River headwaters and is managed by the Bureau of Land Management (BLM). The second stretch is ca. 3000 m long and is about 30 km downstream from the first stretch; this stretch is located within natural gas and oil industry sites as well as private properties. Captured turtles were transported to Desert Willow Veterinary Services and Wildlife Rehabilitation Center to assess the presence of ingested fish hooks using x-radiograph.

We radiographed 288 turtles: 152 female *P. gorzugi* (117–278 mm SCL), 120 male *P. gorzugi* (125–238 mm SCL), a male *Chrysemys picta* (Painted Turtle; 158 mm SCL), four female *T. scripta* (153–244 mm SCL), 10 male *T. scripta* (123–195 mm SCL), and one *Chelydra serpentina* (298 mm SCL). Of all x-rayed individuals, six turtles were found with signs of injuries caused by anthropogenic activities. Two female *T. scripta* (205, 244 mm SCL) and one female *P. gorzugi* (278 mm SCL) each had a fish hook in the mouth (Fig. 1A). Hooks appeared to be J-type hooks with the size ranging from 8.9–31 mm long. The hooks were removed safely by hand after examination. Unexpectedly, we also found three female *P. gorzugi* with, respectively, a bullet in the hind leg, bullet fragments in the front leg, and a metal piece in the throat region (251, 173, 240 mm SCL, respectively; Fig. 1B). Individuals shot appeared to be in good condition and only had minor scars on their legs.

Our findings showed a relatively low proportion of turtles with ingested fish hooks on the Black River (1%). However, the ingestion of fish hooks could be species and sex specific. Sack et al. (2017, *op. cit.*) noted that the common species likely found with ingested fish hooks were *T. scripta* and *C. serpentina*. Moreover, in *C. serpentina*, the percentage of females with ingested fish hooks could be as high as 33% (Steen et al. 2014, *op. cit.*). It is worth pointing out that all individuals with gunshot wounds and ingested fish hooks were adult females, two of which were reproductively mature (i.e., contained shelled-eggs or oviductal follicles). Ingestion of fish hooks may lead to severe injuries such as lead poisoning and intestinal perforations (Borkowski 1997. J. Zoo. Wildl. Med. 28:109–113).



FIG. 1. X-radiograph images taken at Desert Willow Veterinary Service and Rehabilitation Center. A) female *Trachemys scripta* with a J-type fish hook in the mouth and B) a female *Pseudemys gorzugi* with bullet fragments in the left front leg.

Individuals that ingested fish hooks had a 1.2–11% chance of mortality (Steen and Robinson 2017. *Conserv. Biol.* 31:1333–1339). Due to common life history traits of turtles (i.e., late maturing and high mortality of young and eggs), loss of adult females may have a negative effect on the future of the population. Steen and Robinson (2017, *op. cit.*) suggested that fish hooks should be included as one of the threats to turtle populations, especially when the turtles' distribution and habitat overlap with recreational fishing. Although we did not find any carcasses with gunshot wounds, the potential threat posed by shooting should not be neglected. Educating anglers and hunters about the ecological importance of turtles could minimize the misconception that turtles are a nuisance and reduce illegal shooting and killing of turtles.

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CROCODYLIA — CROCODILIANS

CAIMAN YACARE (Yacare Caiman). DIET. *Caiman yacare* has an extensive distribution in South America and it attains high density in the Pantanal wetlands, western Brazil (Mourão et al. 2000. *Biol. Cons.* 92:175–183). A detailed study found that the food items of *C. yacare* in the Pantanal varied with age, size, and habitats of individuals sampled (Santos et al. 1996. *Herpetol. J.* 6:111–117). Juveniles (< 50 cm SVL) rely more heavily on aquatic invertebrates (mainly insects) while adults (> 71 cm SVL) rely more heavily on fish. Birds and mammals were rarely recorded in the diet of *C. yacare*, with only one record each for 196 individuals sampled in the Pantanal. It is believed that the main aquatic behavior of *C. yacare* is responsible for the scarcity of birds and mammals in its diet. Here we report two instances of bird predation by adult *C. yacare* in the Brazilian Pantanal, including one on land. Both records were obtained during observations of a congregation of aquatic birds nesting in a mixed species colony (rookery, locally known as *ninhal*) in Rio Negro Ranch, southern Pantanal (19.5902°S, 56.2166°W; SAD 69). The colony had ca. 500 nests in trees (1–67 nests per tree) distributed in an area ca. 0.5 ha of gallery forest facing the right riverbank of the Rio Negro, a 30-m wide perennial black water river. The bottom of the rookery bordered an oxbow lake that was draining to the main river channel as the dry season progressed. The reproductive bird colony was quite noisy and included active nests of Neotropical Cormorant (*Phalacrocorax brasilianus*), American Anhinga (*Anhinga anhinga*), and White-necked Heron (*Ardea cocoi*). Several caimans congregated in the waters close to the riverbank bordering the nesting colony. Juvenile birds commonly exercised their wing muscles at the edge of nests, while adults and nestlings often performed aggressive behavior towards individuals of close nests, and displacements of subordinate individuals were common. On 11 May 2002, we observed a juvenile *P. brasilianus* (similar size to an adult bird

and completely feathered) fall down from a nest at the edge of the rookery to the river channel beneath. The bird was promptly captured by an adult *C. yacare* that was in the water surface. After being disturbed by other individuals, the caiman crossed the river to feed on the bird on the shallow waters of the opposite riverbank. On 19 May 2002, another fallen juvenile *P. brasilianus* was observed walking beneath the trees in the center of the rookery. An adult caiman that was laying on the ground within the gallery forest beneath the trees ran up and grabbed the bird with a vigorous bite. The caiman could have been moving on land from the shrinking oxbow lake towards the main river channel (Campos et al. 2003. *Copeia* 2003:628–634) when it found the bird. Adult *P. brasilianus* weigh from 1.11–1.95 kg (Monteiro et al. 2011. *Parasitol. Res.* 109:849–855). The consumption of such aquatic birds may constitute a substantial energy input for adult caimans in terms of biomass and nutritional content. As far as we know, this is the first published record of *C. yacare* preying on birds on land within a forest. Caimans can move extensive distances in the Brazilian Pantanal (Campos et al. 2006. *Herpetol. J.* 16:123–132) and their movement away from drying pools may also provide opportunistic encounters with prey on land such as those described here.

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CROCODYLUS ACUTUS (American Crocodile). CANNIBALISM. *Crocodylus acutus* primarily inhabits coastlines, cays, and coastal lagoons throughout its wide range along the Pacific and Atlantic coast of Mexico, Central America, and northern South America as well as Cuba, Jamaica, Hispaniola and the southern tip of Florida (Thorbjarnarson 1989. *In* Hall [ed.], *Crocodiles: Their Ecology, Management, and Conservation*, pp. 228–258. IUCN, The World Conservation Union Publication, Gland, Switzerland). Recently in Belize, individuals and populations of *C. acutus* have been observed further inland in what was considered typical *Crocodylus moreletii* (Morelet's Crocodile) habitat, likely reflecting the loss of quality (nesting) habitat on the cays and the coast due to a rise in development (Tellez and Boucher 2018. *Herpetol. Rev.* 49:492–498). The habitat modification and human encroachment in coastal environments possibly could contribute to changes in population dynamics and population distribution of *C. acutus*, consequently producing areas with higher densities and potentially triggering aggressive behavior, such as cannibalism (Thorbjarnarson 1989, *op. cit.*; Platt and Thorbjarnarson 2000. *Copeia* 2000:869–873). Cannibalism is understood to be a common phenomenon among crocodilians and is presumed to be an important population regulation mechanism (Rootes and Chabreck 1993. *Herpetologica* 49:99–107; Delany et al. 2011. *Herpetologica* 67:174–185).

As part of an ongoing nationwide *C. acutus* population survey, we witnessed an occurrence of cannibalism in *C. acutus* in the Bourdon Canal, Belize District during a nocturnal eyeshine survey on the night of 19 July 2019 at 2316 h. Upon close examination, we observed a subadult *C. acutus* (estimated total length = 1.2 m) feeding on the carcass of a juvenile crocodile (estimated total length = 0.8 m). It is unknown whether the death of the juvenile crocodile was as a direct result of predation by the subadult, or if