



FIG. 1. Histological view of gonad removed from the presumed female American Alligator. A) Scanning view of gonadal tissue consistent with testicular tissue in reptiles. The seminiferous tubules (ST) are dispersed far from each other in cross section with a thick interstitial space (IN). Blood vessels (BV) are often large and dilated most likely because of the presence of mast cells (white arrowheads) within or near the seminiferous tubules. Bar = 50 μ m. B) Higher power of a single seminiferous tubule showing details of the seminiferous epithelium. The epithelium is being shed (SE) into the lumen (L) and contains mostly spermatogonia and spermatocytes. Spermatids (S2) appear normal when present and spermatogonia A/B (dSpA, dSpB) and spermatocytes (preleptotene, dPl) are hypertrophied and apoptotic in appearance. Sertoli cell nuclei (dSc) are atrophied and mast cells (Ma) are common. SpA, normal spermatogonium; Black arrowheads, basement membrane of seminiferous epithelium. Bar = 5 μ m.

animal at a length of 307.3 cm, although this male clearly was abnormal reproductively, it is not likely an age-related senescence as it had not obtained the extreme length common in very old male alligators.

Alligators exhibit temperature-dependent sex determination (TSD) (Ferguson and Joanen 1982. *Nature* 296:850–853); we have no knowledge of the nest cavity temperatures to which this alligator was exposed. A recent case of intersexuality has been noted in a captive adult African Dwarf Crocodile (*Osteolaemus tetraspis*); the crocodile had a male-typical phenotype, but upon necropsy the gonads were histologically detected as ovotestes, possibly as a result of development in the transition range of temperature for a species with TSD (S. Langer, pers. comm.). There may have been a gene mutation that controls sexual differentiation having an adverse effect on the gonadal/phallus development in this alligator. We are not aware of documented cases of congenital absence of the phallus in crocodilians.

A detailed anatomical study of the normal penile anatomy of the adult American Alligator has been published (Kelly 2013, *op. cit.*). Recent reports have documented reduction in penis size (Guillette et al. 1996. *Gen. Comp. Endocrinol.* 101:32–42) and abnormalities of gonadal morphology in juvenile alligators of both sexes (Guillette et al. 1994. *Environ. Health Perspectives* 102:680–688) related to endocrine disruption from environmental contaminants in Florida lakes. We have no evidence that a similar mechanism was a factor in this case.

The alligator described herein had loss of a lower limb, possibly due to aggressive intraspecific courtship encounters during breeding, which often involves bites sustained at the base of the hind legs and tail (Joanen and McNease 1975. *Proc. SE Assoc. Game and Fish Comm.* 29:407–451). Alternatively, trauma such as this specimen's injury may have occurred from a boat propeller strike resulting in limb amputation; it is possible a penile injury or amputation may have transpired at the same time as the limb trauma. Indeed, we have observed partial penile amputations in captive juvenile alligators provided feed on platforms on commercial alligator farms; we suspect when

alligators crawled onto the feeding platform the penis was extruded and bitten by other alligators attempting to gain access to the food. We hypothesize bites to the penis may have become infected and subsequently partially sloughed away, as remnant “nubs” of the penile shaft were palpated in the cloaca of these alligators. Prolapse of the copulatory organ has been described in captive reptiles; the exposed tissues may become swollen and traumatized, leading to desiccation and necrosis (DeNardo 1991, *op. cit.*; Frye 1991. *Biomedical and Surgical Aspects of Captive Reptile Husbandry*. Krieger Publ. Co., Malabar, Florida. 712 pp.).

In the case of this alligator, without the benefit of necropsy to visualize gonads and confirmation of male gender by histology, we would have incorrectly noted the alligator as a near record-size female if only cloacal palpation had been undertaken. It is possible (though likely very rare) that unusually large “female” alligators noted in field studies might also have been males, as in the present case. Conversely, on three occasions we captured live adult alligators (223.5 cm, 228.6 cm, and 248.9 cm TL) at nest sites, which we would have anticipated to be females in nest defense, whereupon cloacal palpation were determined to be males. Caution must be exercised in assuming the gender of an alligator or other crocodilians in the field based solely on size or location.

We acknowledge Craig Sagrera and Velma Stelly for assistance with obtaining the viscera on the alligator harvested, and thank Steven G. Platt for helpful discussion about these findings.

RUTH M. ELSEY (e-mail: relsey@wlf.la.gov) and **RYAN KING**, Louisiana Department of Wildlife and Fisheries, Rockefeller Wildlife Refuge, 5476 Grand Chenier Highway, Grand Chenier, Louisiana 70643, USA; **KEVIN GRIBBINS** and **DAVID E. LIKE**, Wittenberg University, Ward Street at North Wittenberg Avenue, Springfield, Ohio 45501, USA; **VALENTINE LANCE**, San Diego State University, Graduate School of Public Health, 5500 Campanile Drive, San Diego, California 92182, USA.

CROCODYLUS ACUTUS (American Crocodile). FRUGIVORY.

Because crocodilians are generally assumed to be obligate carnivores (Neill. 1971. *The Last of the Ruling Reptiles: Alligators, Crocodiles, and Their Kin*. Columbia Univ. Press, New York. 486 pp.), frugivory among this group has been under-reported and received little attention in comparison to other reptiles (Platt et al. 2013. *J. Zool.* 291:87–99). On 6 June 2010, two of us (CCR, VR) captured a large adult male *Crocodylus acutus* (total length = 336 cm) in Ambergris Lake, near San Pedro Town on Ambergris Cay, Belize (17.906764°N, 87.976528°W; datum WGS84). Ambergris Lake is a shallow, man-made lake fringed by mangrove swamp. Local authorities deemed the crocodile a threat to public safety after it attacked and consumed several household pets, and requested the animal be translocated to an area remote from San Pedro. The crocodile died the following day (7 June 2010) while being restrained for translocation. A necropsy performed later that day was inconclusive, but death likely resulted from fatal acidosis, which occasionally occurs when large crocodiles are restrained (Seymour et al. 1987. *In* Webb et al. [eds.], *Wildlife Management: Crocodile and Alligators*, pp. 253–257. Surrey Beatty & Sons, Chipping Norton, NSW). An examination of the esophagus and stomach during the necropsy revealed one Mango (*Mangifera indica*; Anacardiaceae; Fig. 1) and three Sea Almond (*Terminalia catappa*; Combretaceae) seeds, in addition to the remains of domestic dogs (*Canis lupus familiaris*), chickens (*Gallus sp.*; probably fed by tourists), a mass of unidentified vegetation, and 11 stones of various sizes.

To our knowledge, this is the first reported occurrence of *M. indica* or *T. catappa* seeds among the gastric contents of *C. acutus*



FIG. 1. Mango (*Mangifera indica*) seed found among the gastric contents of an adult male *Crocodylus acutus* collected near San Pedro Town, Ambergris Cay, Belize.

or any other crocodylian (Platt et al. *op. cit.*). In a recent review of frugivory among the Crocodylia, Platt et al. (*op. cit.*) found 34 families and 46 genera of plants represented among fruits and seeds reportedly consumed by crocodylians. The inclusion of *M. indica* and *T. catappa* increases this total to 36 families and 48 genera. The fruits of *M. indica* and *T. catappa* are classified as drupes, and fleshy fruits (aggregate, berry, and drupe) comprise the bulk (52.1%) of reported frugivory among the Crocodylia (Platt et al. *op. cit.*). Our findings in Belize complement previous observations of frugivory in *C. acutus*, which is known to consume fruits of *Rhizophora mangle* (Platt et al., *op. cit.*) and *Brysonima crassifolia* (Platt et al. 2013. *J. Herpetol.* 47:1–10); unidentified seeds have also been recovered from fecal samples (Casas-Andreu and Quiroz 2003. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoológica* 74:35–42).

Because gastric contents analyses reveal only the composition of the diet and not the foraging mode (DeVault and Rhodes 2002. *Acta Theriol.* 47:185–192), it is possible the seeds we recovered from the stomach of *C. acutus* resulted from behaviors other than deliberate consumption of fruits as food. Crocodylians may ingest seeds accidentally during prey capture (Diefenbach 1979. *Copeia* 1979:162–163), floating seeds could be mistaken for swimming prey (Webb and Manolis 1989. *Crocodyles of Australia*. Reed Books Pty., Ltd., French Forest. 160 pp.), or hard seeds might be consumed as gastroliths (Platt et al. 2002. *Herpetol. J.* 12:81–84). Seeds found among stomach contents could also result from secondary ingestion, i.e., the acquisition of items contained in the gut of primary prey (Cott 1961. *Trans. Zool. Soc. London* 29:211–357). However, secondary ingestion can probably be ruled out in our case because the co-occurring prey (dogs and chickens) are incapable of consuming the large intact fruits or seeds of Mango and Sea Almond.

Given these caveats, there is no doubt that some fruit consumption is attributable to accidental or secondary ingestion; however, there are no *a priori* reasons to assume that fruits are not deliberately eaten by crocodylians as food. Despite early reports to the contrary (Coulson and Hernandez 1983. *Alligator Metabolism: Studies on Chemical Reactions in vivo*. Pergamon Press, New York. 182 pp.), crocodylians are capable of digesting carbohydrates, plant-based proteins, and vegetable fats

(Coulson et al. 1987. *Biochem. Physiol.* 87A:449–459; Staton et al. 1990. *J. Nutr.* 120:775–785), strongly suggesting that nutritional benefits accrue from frugivory (Platt et al., *op. cit.*). Our observations of frugivory by *C. acutus* in Belize add to the growing body of evidence suggesting crocodylians should be considered “occasional frugivores” (*sensu* Willson 1993. *Oikos* 67:159–176), i.e., generalist predators that complement an otherwise carnivorous diet with fruit, which is consumed infrequently but not always in small quantities (Platt et al., *op. cit.*). Whether or not crocodylians play any role as aquatic seed dispersal agents has yet to be determined, and this topic is a worthwhile avenue for future investigation (Platt et al., *op. cit.*).

We thank Josh Buettner and the residents of San Pablo Village, San Pedro, Belize for assisting with the capture and necropsy of this crocodile. Carls Belize provided logistical support, and Tamara Sniffin photographed the seeds. Lewis Medlock brought several important references to our attention. Support for this project was provided by the Rufford Small Grants Foundation and the American Crocodile Education Sanctuary (ACES). Research and collection permits were issued to CCR by the Belize Forest Department. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

STEVEN G. PLATT, Wildlife Conservation Society, Myanmar Program, Office Block C-1, Aye Yeik Mon 1st Street, Hlaing Township, Yangon, Myanmar (e-mail: sgplatt@gmail.com); **CHERIE CHENOT-ROSE** and **VINCENT ROSE** (e-mail: acespo@hughes.net), American Crocodile Education Sanctuary (ACES), P.O. Box 108, Punta Gorda, Toledo District, Belize, Central America; **THOMAS R. RAINWATER**, U.S. Fish and Wildlife Service, Charleston Field Office, 176 Croghan Spur Road, Suite 200, Charleston, South Carolina 29407, USA (e-mail: trrainwater@gmail.com).

PALEOSUCHUS PALPEBROSUS (Cuvier's Smooth-fronted Caiman). HABITAT USE. *Paleosuchus palpebrosus* occurs along the Orinoco and Amazon River drainages and the Atlantic Coast drainage that lies between these two rivers in Colombia, Ecuador, Peru, western Bolivia, Venezuela, Brazil, French Guiana, Guiana, and Surinam (Magnusson and Campos 2010. *In* Manolis and Stevenson [eds.], *Crocodyles. Status Survey and Conservation Action Plan*, 3rd ed., pp. 40–42. Crocodile Specialist Group, Darwin, Australia; Rueda-Almonacid et al. 2007. *Las Tortugas y los Cocodrilianos de los Países del Trópico. Serie de Guías Tropicales de Campo* No. 6. Conservation International, Bogotá, Colombia. 538 pp.). In Brazil this species is also found in the Paraguay, Paraná and São Francisco Basins (Magnusson and Campos 2010, *op. cit.*; Rueda-Almonacid et al. 2007, *op. cit.*), with small populations occupying the upper Paraguay River drainage in Paraguay (Medem 1958. *Field. Zool.* 39:227–247; Scott et al. 1990. *Vida Silvestre Neotropical* 2:43–51). *Paleosuchus palpebrosus* is found in shallow muddy streams along a dry forest area at high elevations (620 m), as in small lakes and dams in the lower altitude areas along the Poti River. This generalist occurs in a wide variety of aquatic habitats, including flooded forests, quiet stretches of large rivers and around rapids in Central Amazonia (Magnusson 1985. *Amazonia* 9:193–204; Magnusson and Campos 2010, *op. cit.*), palm swamps, and streams lined by gallery forests in Venezuela and in headwater rivers and streams of ridges with waterfalls around the Pantanal (Campos et al. 1995. *Herpetol. J.* 5:321–322; Campos et al. 2010. *Amphibia-Reptilia* 31:439–442).

Considered one of the least known New World crocodylian species (Magnusson and Campos 2010, *op. cit.*), ecological data