CROCODYLIA — CROCODILIANS

***CROCODYLUS PALUSTRIS* (Mugger Crocodile). SIGNALING BEHAVIOR.** Although *Crocodylus palustris* is a common and well-studied species, the signaling behavior of adults during the mating season has never been studied. Observations on *C. palustris* were made during the mating season at three locations in India: in the wild in Sasan Gir National Park (Gujarat, 21.13°N, 70.78°E, January 2007) and Katerniaghat Wildlife Sanctuary (Uttar Pradesh, 28.34°N, 81.42°E, March 2007), and in captivity in Madras Crocodile Bank (Tamil Nadu, 12.74°N, 80.25°E, December 2006). At the first two locations, the crocodiles inhabited rivers of varying size and small forest ponds. At the third location, they were kept in concrete ponds within bare-ground enclosures.

Observations in the wild were conducted *ad libitum* by locating large individuals (the most likely to be males) and watching them and other crocodiles in view from a distance of at least 50 m. At each location, continuous 24-h observation was initially attempted to determine the approximate time of day when signaling behavior was most likely to occur. As soon as that time period was determined, observational efforts were concentrated with that time frame. At Madras Crocodile Bank, the animals were observed from 1600 to 1200 h, with two 5-min breaks.

The crocodiles produced roars and headslaps, performed in arched-back posture at the water's edge, and these behaviors were accompanied with body vibrations and "water dance" effects indicative of infrasound pulse, as described for the Nile Crocodile (*C. niloticus*) and the American Crocodile (*C. acutus*) (Garrick et al. 1978. Bull. Am. Mus. Nat. Hist. 160:153–192). Mugger roars are similar to those of Nile Crocodiles (pers. obs.), but louder (audible to a human observer at more than 1 km under ideal conditions) and longer (up to five sec in duration, as seen on spectrograms). Unlike Nile and American crocodiles (Dinets, in prep.), roars were used more frequently than headslaps; eight roars vs. two headslaps at Katerniaghat (in five days of observation), six roars vs. three headslaps at Sasan Gir (in seven days of observation), and one roar at Madras Crocodile Bank (in one day of observation).

Roaring on land was not observed in wild individuals, however, the only roar observed at Madras Crocodile Bank was produced by a male on land. Two smaller crocodiles (probably females) immediately approached the male and initiated courtship behavior (chin touching).

All roars and headslaps were produced by animals more than 2 m long (by visual estimate), and never by animals known from mating observations to be females. In most cases, roars and headslaps were produced within one hour before or after sunrise, and before the animals left the water to bask onshore. The only exceptions were the abovementioned roar on land and one roar in the water, produced by a male in Sasan Gir three hours after sunrise, following two hours of basking onshore on an exceptionally cold morning (minimum air temperature 11°C). Another male at the same location once produced a roar without an arched-back display immediately after (and possibly in response to) a roar by a lion (*Panthera leo*) half an hour before sunrise. In both cases the sex of each individual was known from observed matings.

I thank Gaurav Bhatnagor, Dabeer Hasan, Krishna Kumar Mishra, Pradeep, Kabir Sharma, Gopi Shindar, Nikhil Whitaker, and Romulus Whitaker for assistance, advice, and access to permits.

VLADIMIR DINETS, Department of Biology, University of Miami, Coral Gables, Florida 33146, USA; e-mail: dinets@gmail.com.

***MELANOSUCHUS NIGER* (Black Caiman). SIGNALING BEHAVIOR.** Observations presented herein on *Melanosuchus niger* were made between 15–19 August 2008 in Rupununi River and an adjacent oxbow lake near Karanambu Ranch, Region 9, Guyana (3.75°S, 59.26°W), and on 21–22 December 2010 at Laguna Añangucohoa in Yasuni National Park, Orellana Province, Ecuador (0.55°S, 76.45°W). In Guyana, three caimans were observed from shore or boat for one 16-h period each, from one hour before sunset to three hours after sunrise. In Ecuador, one caiman was observed from shore for three 11-h periods, from one hour after sunset to sunrise. During each observation period there was only one caiman in sight. The minimum observation distance was 50 m. The animals did not show any sign of disturbance or awareness of the observer's presence. No artificial light was used because moonlight was sufficient for observation (full moon on 16 August 2008 and on 21 December 2010). All caimans were visually estimated to be 3–3.5 m long. Animals of that size were most likely adult males (Herron 1991. Biol. Conserv. 55:103–113).

The animals performed roaring and head-slapping displays in arched-back posture, as described for the American Alligator (*Alligator mississippiensis*) (Garrick et al. 1978. Bull. Am. Mus. Nat. Hist. 160:153–192; Vliet 1989. Am. Zool. 29:1019–1031). Two roaring and four head-slapping displays were observed in Guyana; one roaring and two head-slapping displays in Ecuador. To a human observer, Black Caiman roars sound similar to roars of Spectacled (*Caiman crocodylus*), Yacare (*C. yacare*), and Broad-snouted (*C. latirostris*) caimans (pers. obs.), but are louder (probably audible at more than 300 m in ideal conditions) and longer (estimated to last for 1–1.5 sec). Body vibrations and "water dance" effect indicative of infrasound production (Garrick et al., *op. cit.*) accompanied all displays. All signaling behavior was observed at night (between 1 h after sunset and 20 min before sunrise).

Black Caimans breed during the rainy season: August in Guyana (Peter Taylor, pers. comm.) and in June in Ecuador (Serverio Pachac, pers. comm.). The observations in Ecuador were made during a two-week period of exceptionally heavy rains; this probably explains why the animal was displaying outside the mating season. To my knowledge, signaling behavior of the Black Caiman has never before been described in literature.

I thank Mariela Cardenas, Serverio Pachac, Peter Taylor, and the McTurk family for their assistance in this study.

VLADIMIR DINETS, Department of Biology, University of Miami, Coral Gables, Florida 33146, USA; e-mail: dinets@gmail.com.

***MELANOSUCHUS NIGER* (Black Caiman). LONG DISTANCE MOVEMENT.** The Black Caiman (*Melanosuchus niger*) is the largest of the four crocodilian species found in the Amazon River basin. Despite its economic and ecological importance, relatively little is known of its ecology and behavior (Vasquez 1991. Cat. Amer. Amphib. Rept. 530.1–530.4). Commercial hunting for caiman skins was common throughout the Amazon until the 1960s (Smith 1980. Biol. Conserv. 19:177–187) and in Brazil it was prohibited in 1967. However, over the last 20 years, *M. niger* populations have been recovering in many parts of the species' range, and today it is abundant in many parts of Brazilian Amazonia (Da Silveira 2002. *In* Larriera and Verdade [eds.], La Conservación y el Manejo de Caimanes e Cocodrilos de América Latina, pp. 61–78. C. N. Editoria, Piracicaba, São Paulo, Brazil).

As part of an evaluation of the Black Caiman population in the Mamirauá Sustainable Development Reserve (1,124,000 ha) in the western Brazilian Amazon (Da Silveira et al. 2008. Copeia

2008:425–430), we captured adults and subadults for a radio-telemetry study of movement patterns. Caimans were captured at night using a pole with a breakaway noose from a 4.7-m aluminum boat with a 15-hp motor (Da Silveira and Da Silveira 1997. Newsletter Crocodile Specialist Group – IUCN/SSC 16[2]:18–20). Caimans were marked by a monel toe web tag attached at the right rear foot and equipped with Advanced Telemetry Systems (ATS) transmitters (164 MHz) fixed with Kevlar® line to the dorsal surface of the tail between the double rows of caudal scutes, immediately anterior to the single scale row of caudal scutes (Da Silveira et al. 2010. J. Herpetol. 44:418–424).

On 26 September 1997, we captured a small adult male *M. niger* (167 cm SVL, 335 cm TL and 98 kg) in Lago Mamirauá (02.9847°S, 064.9167°W). After capture the caiman was marked, radio-equipped, and released one hour later. The radio-equipped male was located on 62 occasions between its capture and 24 April 1999 (= 580 days). Sixty percent of the subsequent movements were of ≤ 100 m, 76% were ≤ 500 m and 11% were between 2400 and 3900 m (mean = 614; SD = 887), totaling at least 38.1 km.

The *M. niger* used two core areas, a dry season core range in Lago Mamirauá and a wet season core range in Lago Acácio, an intermittent water body adjacent to Lago Mamirauá that dries entirely during the dry season. The Lago Mamirauá core area was composed of 16 locations between 57 and 1400 m (mean = 664, SD = 348) from the release site. Forty locations formed the Acácio core area, which had its center located 4.7 km from the capture site. After 29 April 1999 we lost the radio signal and assumed that the transmitter's battery had run out.

Four years and seven months later, on 1 December 2003, the male was killed in the Lago Atapi (02.8796°S, 064.6388°W) in the Amanã Sustainable Development Reserve, 33 km (straight-line distance) NE from the original capture site and 33.8 km (straight-line distance) from the last observed location in Lago Acácio. The caiman was killed by people from the community of Nova Jerusalém, and it was detected by the Hunting Monitoring Program of the Mamirauá and Amanã Reserves. The radio-transmitter and the monel toe web tag were still attached to the animal's body. At that time, the Black Caiman measured 380 cm (TL) and produced 60 kg of dried, salted meat for sale, probably to Colombian traders, a practice common in the upper Amazon River (called Solimões in Brazil) during the 1990s (Da Silveira and Thorbjarnarson 1999. Biol. Conserv. 88:103–109). Other body characteristics were not available, but we estimated an approximate SVL of 186.5 cm and weight of ca. 117 kg (Mendonça 2009. A Caça Comercial de Jacarés no Baixo Rio Purus e suas Implicações no Manejo Sustentável na Reserva Piagaçu-Purus, Amazônia Central. Unpubl. Masters thesis. Instituto Nacional de Pesquisas da Amazônia/Universidade Federal do Amazonas. Manaus, Amazonas, Brazil. 52 pp.).

Movements between the Mamirauá and Amana Reserves have also been reported for the Amazonian Manatee (*Trichechus inunguis*) (Arraut et al. 2009. J. Zool. 2009:1–10), and for the Six-tubercled Amazon River Turtle (*Podocnemis sextuberculata*) (Fachín-Terán 1999. Ecologia de *Podocnemis sextuberculata* (Testudines, Pelomedusidae), na Reserva de Desenvolvimento Sustentável Mamirauá, Amazonas, Brasil. PhD thesis. Instituto Nacional de Pesquisas da Amazônia/Universidade Federal do Amazonas. Manaus, Amazonas, Brazil. 189 pp.). All three species are commonly hunted for subsistence or illegal commercial trade in the Mamirauá and Amanã Reserves, and *M. niger* meat is also used as bait for *Calophysus macropterus*, a pimelodid catfish sold in Colombian markets (Da Silveira and Viana 2003. Crocodile Specialist Group Newsletter 22:16–18). Although movement patterns of *M. niger* are unknown aside from the data provided here, such a long-distance movement was unexpected.

Together, the Mamirauá and the Amanã Reserves comprise an area of 3,474,000 ha, representing an enormous and contiguous block of protected Amazonian habitats. The movement of the *M. niger* between these reserves reinforces the ecological importance of megareserves (> 1 Mha) for the effective conservation of populations of Amazonian top predators.

RONIS DA SILVEIRA, Departamento de Biologia, Instituto de Ciências Biológicas, Universidade Federal do Amazonas, Avenida General Rodrigo Otávio 3000, 69.077-000, Manaus, Amazonas, Brazil (e-mail: ronis@ufam.edu.br); **JOÃO VALSECCHI DO AMARAL,** Instituto de Desenvolvimento Sustentável Mamirauá, Av. Brasil 197, Juruá, Cx. Postal 38, 69470-000, Tefé, Amazonas, Brazil (e-mail: joao.valsecchi@mamiraua.org.br); **WILLIAM E. MAGNUSSON,** Coordenação de Pesquisas em Ecologia, Instituto Nacional de Pesquisas da Amazônia, CP 478, 69011-970, Manaus, Amazonas, Brazil (e-mail: bill@inpa.gov.br); **JOHN B. THORBJARNARSON**†, Wildlife Conservation Society, Gainesville, Florida. †deceased February 2010.

SQUAMATA — LIZARDS

***AMBLYRHYNCHUS CRISTATUS* (Galápagos Marine Iguana). PREDATION.** On 18 December 2003, GM observed a large male Galápagos Sea Lion (*Zalophus wollebaeki*) prey on an adult-sized (>23 cm SVL) *Amblyrhynchus cristatus* at Bahia Paraiso on the island of Santa Fe, Galápagos (90.028°W, 0.829°S, datum: WGS84, elev. <1 m). The iguana was captured while walking on land 3 m from the shoreline, bitten at the base of the tail, and shaken back and forth for about 1 min in a manner similar to that employed by sea lions when preying on large fish (Everitt et al. 1981. Murrelet 62:83–86). The iguana was then bitten several more times and swallowed whole. Two additional predatory episodes were observed during the same morning, involving the same male sea lion biting and shaking adult-sized iguanas, but we were unable to observe whether these individuals were also consumed. Galápagos Sea Lions are frequently found in the vicinity of marine iguanas, but predation on iguanas has not previously been observed. Galápagos Marine Iguanas are thought to have evolved in the absence of terrestrial predators; this is the first record of predation on adult marine iguanas by any native predator that uses terrestrial habitat at least some of the time.

MAREN N. VITOUSEK, Department of Ecology and Evolutionary Biology, Princeton University, Princeton, New Jersey 08544, USA, and (current address) Department of Ecology and Evolutionary Biology, UCB 334, University of Colorado, Boulder, Colorado 80309, USA (e-mail: vitousek@colorado.edu); **GABRIELA MALDONADO,** Departamento de Biologia, Pontificia Universidad Católica del Ecuador, Apartado 17-01-2184, Quito, Ecuador.

***AMEIVA AMEIVA* (Giant Ameiva). PREDATION.** Despite its extensive distribution in South America (Vitt and Colli 1994. Can. J. Zool. 72:1986–2008) with various aspects of its natural history described (Colli 1991. Copeia 1991:1002–1012), there are few known predators for *Ameiva ameiva* (Martins and Oliveira 1998. Herpetol. Nat. Hist. 6: 78–150). Hence, we add to the limited data on *A. ameiva* predators with an observation of predation by Gray Hawk (*Buteo nitidus*).

On 16 June 2008, while conducting an ornithological survey as a part of the monitoring study of the Faxinal II Hydroeletric Power Plant in Mato Grosso state, Brazil, we collected an adult *B. nitidus* with a pressure gun from a grassland area of Aripuanã,