**Stereocyclops incrassatus** (Brazilian Dumpy Frog).


At ca. 1700 h on 12 March 2009, we observed the defensive behavior of an adult male *S. incrassatus* (44 mm SVL) against a predation attempt by an adult colubrid snake, *Liophis miliaris merremi* (559 mm SVL, 127 mm TL). The animals were found in the vicinity of the municipality of Itacaré, Bahia state, Brazil (WGS84, 14.2888128°S, 38.984219°W; elev. ca. 10 m). The snake was trying to swallow the frog head (WGS84, 14.2888128°S, 38.984219°W; elev. ca. 10 m). The snake was trying to swallow the frog head first. With the head already inside of snake’s mouth, the frog was displaying the following defensive position: the head was pressed against the ground, the back was raised, the body inflated, and the fore and hind limbs were strongly retracted against the body, giving the frog a solid and round shape. When we approached, the snake regurgitated the frog and we noticed that its mouth and a small part of the frog’s body was covered by a glue-like secretion produced by the frog. The secretion was visibly sticky, as it adhered sand grains to both animals. It was not apparently whitish, but the adhered sand might influence our perception of the color of the secretion. The secretion made it difficult for the snake to open its mouth for approximately a minute. After several unsuccessful attempts, the snake was finally able to open its mouth by itself. During that time, the frog remained in the position described above until, in the hands of one of us, it flattened its body and stretched out its four limbs. When placed on the ground it raised its head and remained in this flattened position for more than a minute (Fig. 1).

This is the first description of defensive behavior for *S. incrassatus*. This is the first time that a defensive posture with all the limbs pressed against the body and the head pressed against the ground has been reported for a Brazilian microhyliid. Flattening the body and stretching all the limbs at the same time has also not been previously described for any Brazilian microhyliid. We did not see any color in the *S. incrassatus* secretion. Secretion of sticky substances is a useful defensive tactic, as it causes almost immediate liberation of the prey (Evans and Brodie. 1994. J. Herpetol. 28:499–502). All these data support the idea that many anurans may combine secretions with different body positions to increase defense success.

The specimens are deposited in the herpetological collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil (*Liophis miliaris merremi*, MZUSP 17732, and *S. incrassatus*, MZUSP 141343). We thank IBAMA for collection permits (14555-1).

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**Crocodylia — Crocodilians**


We searched for nests around the main rivers and secondary tributaries of El Cajon Reservoir (15.01078ºN, 87.71149ºW, datum: WGS84, elev. 285 m) in February–April 2005. We found 30 nests of *C. acutus*: two on the Yure River, 16 on the Humuya River, and 12 on the Sulaco River. Nest holes were constructed by *C. acutus* that were found in the shoreline vegetation and elevated areas away from shoreline and creeks. The nest areas were characterized by very steep slopes and the presence of sandy and rocky soil. We observed hatchlings at each nest site during May and June. The number of hatchlings varied from 10 to 21 per nest on the Yure River, 10 to 27 on the Humuya River, and 10 to 33 on the Sulaco River. Successful nests were determined by the presence of eggshell membranes indicating the nests were excavated by the nesting female. Platt and Thorbjarnarson (2000, op. cit.) observed that females defend nests from predators but parental care was minimal or non-active. In El Cajon Reservoir, we observed active parental care during our surveys.

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Dissection of Sample 1 and Sample 2, revealed a few arthropod territorial (Moore et al. 2009. J. Herpetol. 43:570–578). make it unlikely to be the same individual, as this species is highly degraded original forest patches on Stephens Island (Mulder and Kawakawa is a common understory shrub in the regenerated and unique assemblage of plants and limited animal species in New Zealand, as on many isolated islands, has allowed novel seed dispersal relationships to evolve (Valido and Olesen 2007. In Dennis et al. [eds.], Seed Dispersal: Theory and its Application in a Changing World, pp. 124–147. CAB International, Wallingford). Seed dispersal is essential for gene flow and maintaining ecological structure in plant communities. Our understanding of these systems and their dispersal vectors are vital for the conservation of native ecosystems with nearly 70% of woody species in New Zealand possessing fruit suitable for vertebrate seed dispersal (Clout and Hay 1989. New Zealand J. Ecol. 12:27–33). Some New Zealand plants exhibit growth forms that are thought to be conducive to lizard-mediated seed dispersal (Lord and Marshall 2001. New Zealand J. Bot. 39:567–576). Twelve species of frugivorous lizards in New Zealand have been identified as potential seed dispersers (Whitaker 1987. New Zealand J. Bot. 25:315–328). New Zealand’s largest lepidosaurian, Sphenodon punctatus, has been characterized as a generalized opportunistic carnivore that subsists primarily on beetles, insect larvae, arachnids, and weta (Ussher 1999. New Zealand J. Zool. 26:117–125; Walls 1981. New Zealand J. Ecol. 4:89–97). Seeds in tuatara scat and stomach contents (Ussher 1999, op. cit.; Walls 1981, op. cit.; Southey, cited in Whitaker 1987, op. cit.) have been dismissed as instances of reptile frugivory and seed dispersal because they were thought to be indirectly or accidentally consumed (Valido and Olesen 2007, op. cit.). Here we provide the first evidence for intentional frugivory by the tuatara and report on its implications for effective seed dispersal.

During fieldwork on Stephens Island (40.67°S, 174.00°E) in March 2009, two Sphenodon punctatus scat samples were discovered that contained a large number of seeds. The first sample (Sample 1) was freshly deposited on 11 March inside the collection bag of an adult male tuatara (SVL = 230 mm, mass = 370 g) and the second sample (Sample 2) was discovered on 23 March deposited by an unknown tuatara on a concrete pathway roughly 75 meters from Sample 1. The distance between these samples make it unlikely to be the same individual, as this species is highly territorial (Moore et al. 2009. J. Herpetol. 43:570–578). Dissection of Sample 1 and Sample 2, revealed a few arthropod body fragments, identified as common small beetle species with the majority of the sample being comprised of seeds and several stems. Comparison with collected seed samples identified the seeds as Kawakawa (Macropiper excelsum), and thorough counts yielded at least 407 intact seeds in Sample 1 and 1343 intact seeds and 41 seed fragments in Sample 2. Seed fragments were considered any seed that had sustained damage that exposed the endosperm. Kawakawa is a common understory shrub in the regenerated and*K*kealed original forest patches on Stephens Island (Mulder and Keall 2001. Oecologia 127:350–360), and was fruiting in abundance in March 2009. Kawakawa possess bright orange, aromatic, aggregate fruit spikes which can contain up to 150 seeds per spike (Burrows 1995. New Zeal J Bot. 33:131–140). When Sample 1 was collected it had a distinct orange-tinge aiding in the plant’s identification. Comparison with fresh fruit spikes shows that the stems found in the fecal samples were the central stems of the aggregate fruit with three and nine stems found in Sample 1 and Sample 2, respectively. The fruit spikes can fall intact to the ground when the plant is agitated and fruit are ripe (K. C. Burns, pers. comm.) making them available to terrestrial animals. The presence of the fruit spike stems in the scat samples provides evidence for direct consumption of several whole fruit spikes since other frugivores (e.g., geckos and Weta) with smaller mouths remove the fruit flesh from the central stem (pers. obs.). In order to ingest the large number of seeds found in each sample, the number of whole fruit spikes that would need to be consumed is at least two and nine, respectively, for Sample 1 and Sample 2. The absence of large prey remains, the presence of fruit spike stems and the large number of seeds all suggest the direct consumptions of fruit spikes by tuatara. To examine the viability of these seeds, germination trials were performed on two subsets of seeds that were deemed intact under 10x magnification from fecal Sample 1 (N = 53, 50) and Sample 2 (N = 65, 50), along with two sets of controls comprising defleshed seeds from ripe Kawakawa fruit spikes (N = 66, 50). Once removed from the island, seeds were stored in plastic petri dishes in a cool refrigerator. For the trials, seeds were placed in glass petri dishes with a saturated filter paper substrate and placed under 12-h light: dark timer controlled fluorescent grow lights. The first sets were started on 16 April 2009 with the second sets beginning on 30 June 2009. Seeds were checked weekly over the following seven weeks by performing counts of radicle and cotyledon emergence. The control, Sample 1, and Sample 2 average percent emergence rates of radicle (93.2%, 79.1%, 99.1%, respectively) and cotyledon (49.5%, 31.3%, 43.1%, respectively) were roughly similar between samples. Critically, this indicates that many seeds passed by the tuatara are still viable. Excretion of viable seeds provides the possibility of seed dispersal by tuatara regardless of the method of consumption or germination rate. Other examples of seed dispersal by traditionally carnivorous animals have been documented in recent years (Calviño-Cancela et al. 2007. Écoscience 14: 529–534; Otani 2002, Ecol Res. 17:29–38). It has even been suggested that a carnivore’s dentition lend them to be more effective seed dispersers than herbivores because they cause less damage to seeds during mastication (Otani 2002, op. cit.). Tuatara should not be disregarded as a potential seed dispersal vector because of their primary diet. A whole suite of potential questions raised by this observation can be divided into two general groups. The first group is those questions about the biology of tuatara: How frequent is this behavior? What implication does this have for the diet of tuatara? With the dense population of tuatara on Stephens Island (Moore et al. 2007. Biol Conserv. 135:181–188), could frugivory be an alternative feeding strategy due to intense resource competition? These fecal samples were found during the mating season of the tuatara; could a high caloric demand be leading to fruit consumption? If tuatara are intentionally eating the Kawakawa fruit, are...