

for Tropical Biology and Conservation, Universiti Malaysia Sabah.

On the same night, 7 other *L. kuhlii* were sampled along the same river (range 27–81 mm SVL, mass range 1.7–61.6 g). Two specimens were larger than 75 mm SVL (HEP00960, 81 mm SVL, mass 61.6 g; and HEP00963, 77 mm SVL, mass 39.5 g).

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**LITHOBATES CATESBEIANUS** (American Bullfrog). **DIET.** *Lithobates catesbeianus* has been introduced globally. In Argentina, the species has been introduced in several provinces including San Juan (Sanabria et al. 2005. *Muldequina* 14:65–68), Misiones (Pereyra et al. 2006. *Cuad. Herpetol.* 20:37–40), Buenos Aires (Barrasso et al. 2009. *S. Amer. J. Herpetol.* 4:69–75), Córdoba (Akmentins et al. 2009. *Cuad. Herpetol.* 23:25–32), and Salta (Akmentins and Cardozo 2009. *Biol Invasions DOI* 10.1007/s10530-009-9515-3). These introductions have had negative impacts on the native fauna.

During March 2004, in the Calingasta department (coordenadas), San Juan Province, we captured 18 *L. catesbeianus* (145 ± 6.5 mm SVL). The diet consisted of ten prey categories, which were dominated by decapods. Table 1 provides a summary of these data.

We thank V. Videla and S. Segovia for help with field work.

TABLE 1. Stomach contents of the American Bullfrog, *Lithobates catesbeianus*, from San Juan Province, Argentina. N = total number of prey; % N = percentage of the total prey; % V = percentage of the total volume; % FO = percentage of the frequency of occurrence; IRI = Index of relative importance of each category.

	N	% N	% V	% FO	IRI
Anura	2	3.7	0.12	8.6	17.04
Decapoda (Aeglidae), <i>Aegla</i> sp.	54	67.5	98.1	47.8	7919.2
Hymenoptera - Formicidae	6	7.5	0.01	8.7	65.3
Hymenoptera - Others	1	1.2	0.17	4.3	6.2
Coleoptera - Adults	2	2.5	0.03	8.6	22
Coleoptera - Larvae	2	2.5	0.1	4.3	10.9
Isoptera	8	10	0.1	4.3	44
Diptera	1	1.2	0.002	4.3	5.4
Hemiptera	1	1.2	0.001	4.3	5.4
Araneae	3	3.7	0.12	8.6	33.7
Total	80	100	100	100	

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**LITORIA NANNOTIS** (Australian Waterfall Frog). **FOOT FLAGGING.** Visual displays, including those involving movements of the feet, may act as a substitute for vocal communication in streamside environments where noise may interfere with detection of vocal signals (Heyer et al. 1990. *Arq. Zool.* 31:231–410). Foot flagging behavior by male *Litoria nannotis* has only been observed in the presence of conspecific males, and the display was presumed to be related to male-male aggression (Richards and James 1992. *Mem. Queensland Mus.* 32:302). In this note we describe, for the first time, foot flagging by a male *L. nannotis* in the presence of a female.

We observed the courtship at 22:00 h AEST 2 Sept 2009 on Cloudy Creek (18.9926167°S; 146.2103833°E; ca. 530 m elev.) in north Queensland, Australia. A male and female *L. nannotis* were observed on the vertical face of a granite boulder (ca. 0.6 m in diameter) near a small waterfall. The rock surface was barely wet, only just within reach of the splash zone. The pair were separated by a distance of ca. 30 cm; the female facing away from the male. The male was heard to call (a low growl) seven times at intervals of 3–5 minutes. When lit with shielded light, the male was seen to foot flag while calling; extending the left rear leg perpendicular to the body and rapidly vibrating the foot on a vertical plane with toes outstretched before returning the leg to the side of the body. The right leg was not involved. The female did not display any responses to the male, and did not move during our 45 minutes of observations. Although no other males were observed nearby, it is unknown if the intent of the foot flagging was to attract the female's attention, or discourage potential male rivals. We did not follow the behavior of the pair longer due to potential disturbance, as the male would cease foot flagging and calling with extended exposure to artificial light.

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**OSTEOPILUS SEPTENTRIONALIS** (Cuban Treefrog). **PREY.** *Osteopilus septentrionalis* is native to Cuba, Cayman Islands, and Bahamas (Meshaka et al. 2004. *The Exotic Amphibians and Reptiles of Florida*. Krieger Publ. Co., Malabar, Florida. 155 pp.), and has been introduced into five states in the United States, but is established only in Florida (Barbour 1931. *Copeia* 1931:140; Crother 2008. *Scientific and Standard English Names of Amphibians and Reptiles of North America*. SSAR Herpetol. Circ. 37. 84 pp.). In Florida, *O. septentrionalis* is known to prey primarily on roaches (Dictyoptera), but has also been documented consuming lizards (anoles and geckos), frogs (including its own



FIG. 1. Non-native Cuban Treefrog (*Osteopilus septentrionalis*) preying upon native Ring-necked Snake (*Diadophis punctatus*).

species) (Meshaka et al. 2004, *op. cit.*), and the Florida Brown Snake (*Storeria victa*) (Maskell et al. 2003. *Herpetol. Rev.* 34:137). Herein, we report *O. septentrionalis* preying upon a native Ring-necked Snake (*Diadophis punctatus*) in Florida.

In Sept 2008 at 2100 h, an *O. septentrionalis* (ca. 6.3 cm SVL) was observed on SE Island Way, 0.08 km NE Loxahatchee River Road, Jupiter, Martin County (26.973996°N, 80.137637°W; WGS84, elev. <1 m) on a sidewalk holding a *Diadophis punctatus* (ca. 15 cm SVL) in its mouth. After being photographed (photographic voucher UF 154586), the frog continued to hold onto the snake without ingesting it entirely for more than 40 min, at which time the frog was left alone. This is the second record of this nonindigenous frog preying upon a native snake in Florida.

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**PHYSALAEEMUS SPINIGER** (Iguape Dwarf Frog).

**PREDATION.** Anuran eggs, tadpoles, and post-metamorphic individuals are known to be preyed upon by vertebrates, invertebrates, and even carnivorous plants (Toledo et al. 2007. *J. Zool.* 271:170–177). Herein we here report dipteran maggot predation of *Physalaemus spiniger* eggs in a foam nest and spider (Theraphosidae) predation of an adult male. *Physalaemus spiniger* is a small frog (mean SVL males 18.8 mm; mean SVL females 21.1 mm) (Haddad and Pombal Jr. 1998. *J. Herpetol.* 32:557–565) that calls on the forest floor near temporary ponds. The eggs are laid in a foam nest that is deposited on the water surface near the edges of ponds, on the humid leaf litter near ponds, or in the axils of terrestrial bromeliads (Haddad and Pombal 2008, *op. cit.*). *Physalaemus spiniger* is known from the states of Paraná (Guaraqueçaba) and São Paulo (Ilha do Cardoso, Cananéia, Estação Ecológica da Juréia, Iguape, Caverna do Diabo, Iporanga, Jacupiranga), southern and southeastern Brazil

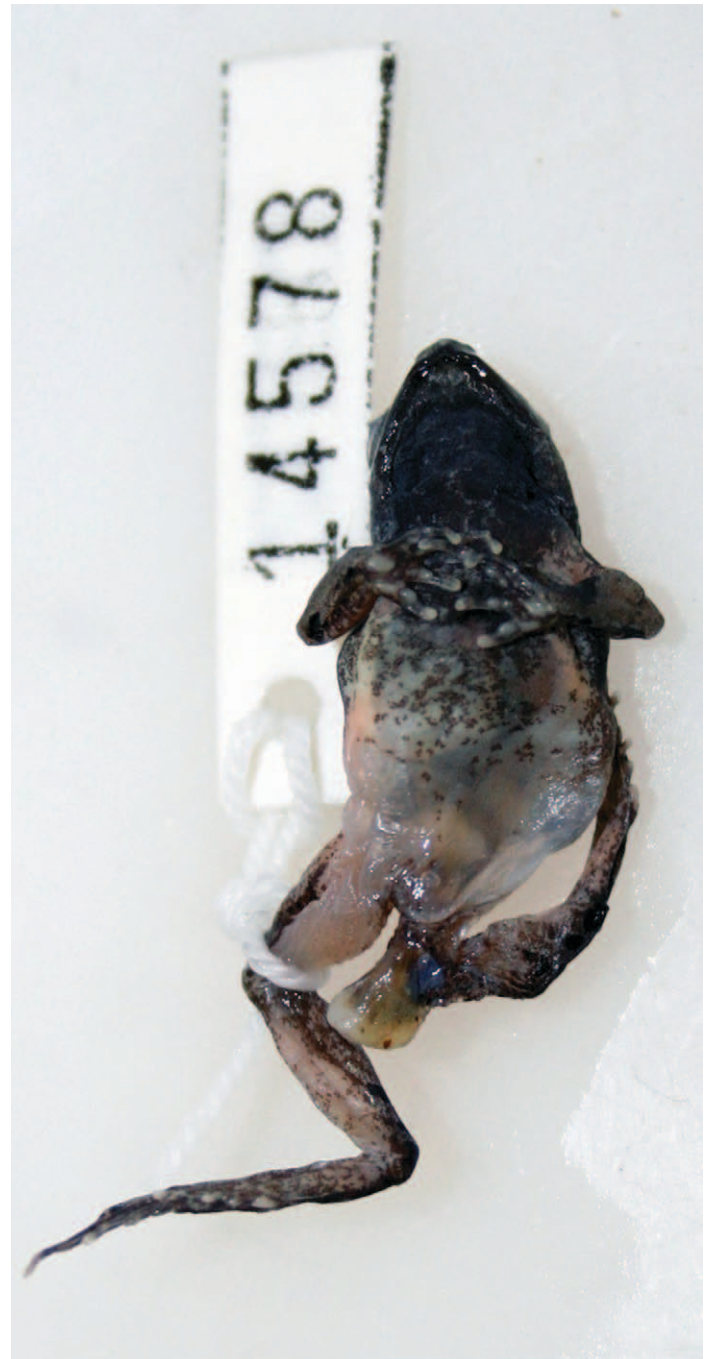


FIG. 1. *Physalaemus spiniger* preyed upon by a spider (Theraphosidae). The partially digested left leg is indicated by an arrow.

(Haddad and Pombal 2008, *op. cit.*). The risk of predation by invertebrates is greater during the breeding season (Toledo 2005. *Herpetol. Rev.* 36:395–400). Spiders are the most important invertebrate predator of post-metamorphic anurans (Toledo et al. 2007, *op. cit.*), and dipteran maggots are common predators of eggs and embryos (Menin and Giaretta 2003. *J. Zool.* 261:239–243). Reports of predation by invertebrates upon *Physalaemus* spp. have been published (Brasileiro et al. 2003. *Herpetol. Rev.* 34:137; Toledo 2003, *op. cit.*; Toledo 2005, *op. cit.*), and there is a report of spider predation (Lycosidae) upon *P. spiniger* (Toledo et al. 2007, *op. cit.*). On 27 October 2008 we found a *P. spiniger* foam nest with dipteran maggots that were feeding on the eggs. The following night we observed an adult male *P.*