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Diet of Juvenile Aquatic Caecilians, *Typhlonectes compressicauda*

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Caecilians are elongate, limbless amphibians of pantropical distribution. Whereas most caecilians are highly adapted for burrowing, a few have adapted to partial or fully aquatic habits (Taylor, 1968). Very little information is available about the natural history of caecilians, probably the least-known order of Tetrapoda. Concerning feeding habits, anecdotal information derived from gut content analyses indicate that caecilians generally feed on elongate prey (Duellman and Trueb, 1986) or earthworms and insect larvae (Wake, 1992). Among semi-aquatic and aquatic species, the typhlonectid *Chthonerpeton indistinctum* was reported to feed on crabs and insects (Gudynas and Williams, 1986; Gudynas et al., 1988); guts of individuals transported downriver amid waterlily mats also

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TABLE 1. Dietary composition of juvenile *Typhlonectes compressicauda* (N = 18). Numbers in parentheses are the number of guts in which each food item was observed. [1] Larva, [2] Pupa, [3] Naiad, [4] Egg.

Food items			Relative frequency
NEMATODA			0.05 (1)
OLIGOCHAETA	Ocnerogliridae		0.27 (5)
	Glossoscolecidae		0.22 (4)
	Unidentified		0.22 (4)
	TOTAL OLIGOCHAETA		0.56 (10)
INSECTA	Odonata[3]	Zigoptera	0.05 (1)
		Anisoptera	0.05 (1)
	Orthoptera	Caelifera	0.05 (1)
	Heteroptera		0.05 (1)
	Homoptera	Aphididae	0.05 (1)
		Cicadellidae	0.05 (1)
		Cercopidae	0.05 (1)
		Unidentified	0.22 (4)
	Hymenoptera	Flormicidae	0.11 (2)
	Lepidoptera[1]		0.11 (2)
	Coleoptera	Curculionidae	0.05 (1)
		Elateridae	0.05 (1)
	Diptera	Culicidae[1,2]	0.44 (8)
		Chironomidae[1]	0.27 (5)
		Empididae[1]	0.11 (2)
		Stratiomyidae[1]	0.05 (1)
		Tipulidae[2]	0.05 (1)
		Unidentified	0.11 (2)
	Unidentified		0.11 (2)
	TOTAL INSECTA		0.89 (16)
Amphibia	Anura	*Leptodactylus macrosternum*[1]	0.22 (4)
		Leptodactylus macrosternum[4]	0.05 (1)
	TOTAL AMPHIBIA		0.27 (5)
Plant matter			0.50 (9)
Unidentified			1.00 (18)

contained spiders, odonate naiads, and remains of an adult frog (Prigioni and Langone, 1983). *Chthonerpeton haydee* was reported to feed on small fish (Lancini, 1969). *Typhlonectes compressicauda* guts contained shrimp and other arthropods (two individuals; Moodie, 1978) and pupae identified as coleopterans (two individuals; Wake, 1978). The species was also suggested to feed on dead fish (Exbrayat and Delsol, 1985).

Based on *Typhlonectes compressicauda*, we herein provide what is to our knowledge the most detailed information on the diet of any caecilian. Specimens were collected between 2200 and 2300 h of 6–7 February, 1991 in the Paraná do Araçá, municipality of Careiro, 32 km south of Manaus, Central Amazonia, Brazil (3°27'S, 60°00'W). Paraná do Araçá is a sediment-rich, white-water river belonging to the Solimões drainage. We collected caecilians were actively swimming amid herbaceous vegetation on the clayish, sandy bottom along the margins of the river. Thirty-three caecilians were collected, 18 of which were randomly chosen and immediately preserved for gut content analysis. Specimens were deposited in the collections of Museu de Zoologia da Universidade de São Paulo (MZUSP) and Instituto Nacional de Pesquisas da Amazônia (INPA).

The individuals collected ranged from 104–177 mm in total length (144.55 ± 20.44 mm, N = 18). Literature data on size at birth (fetuses measuring 115 ± 19.4 mm, Moodie, 1978; normal neonates measuring up to 190–200 mm, Parker and Dunn, 1964) indicate that these individuals were juveniles.

Table 1 summarizes the composition of the species' diet. All guts contained food items. The most frequent items were aquatic oligochaete worms (found in 56% of the guts), aquatic insects (61%), especially culicid (44%) and chironomid larvae (27%), and terrestrial insects (50%). Tadpoles of the leptodactylid frog *Leptodactylus macrosternum* (developmental stage 27; Gosner, 1960) were found in four guts (22%). One gut (5%) contained anuran eggs, identified as *L. macrosternum* because of egg morphology, and because calling males and foam nests were observed at the site during the time of collection. Nine out of 18 guts (50%) contained unidentifiable, decomposing plant matter, which may either have been ingested accidentally or indicate partial detritivorous habits as suggested for other caecilians (Hebrard et al., 1992). The single nematode found is probably parasitic. Light to heavy infections by nematodes in caecilians has been reported for *Afrocaecilia taitiana, Boulengerula uluguruensis*, and *Chthonerpeton indistinctum* (Loveridge, 1936; Ubelaker, 1966;

Prigioni and Langone, 1983; Gudynas and Williams, 1986; Hebrard et al., 1992).

Based on the observation that a few guts of *Typhlonectes compressicauda* contained pupae, rocks and wood, and on the spatulate dentition of the species, Wake (1978) suggested that *T. compressicauda* (under the junior synonym *T. obesus*) might forage at least occasionally at the water surface, where it might be morphologically specialized in scraping sedentary prey from rocks or logs. Wilkinson (1991) questioned this interpretation, stating that captive individuals fed more successfully underwater and that the morphology of the rostrum and dentition clearly indicated little efficiency in scraping. The habits of prey consumed by *T. compressicauda* in our study reveal an opportunistic prey capturing strategy. Individuals were observed actively foraging in shallow water at night. The presence of decomposed plant material and an anisopteran odonate naiad indicates that the caecilians foraged close to the bottom; however culicid larvae were the most common insect prey taken and typically are surface dwellers. The frequent finding of well-preserved, terrestrial insects such as ants, curculionid and elaterid beetles, heteropterans, homopterans, and orthopterans suggests that these prey were captured at the surface. Surfacing for air breathing (94% of gaseous exchanges are derived from pulmonary respiration; Sawaya, 1947) may increase the encounter rate of *Typhlonectes* with surface-dwelling and fallen terrestrial prey.

To our knowledge, our study is the first report of caecilians preying on anuran eggs and larvae. This interaction may be comparatively more frequent in the floating meadows, an important calling and breeding habitat for several anuran species with aquatic eggs and/or tadpoles (Hödl, 1977), and in which underwater root-zone *Typhlonectes* occurs (LCS pers. obs.). Consumption of mobile prey such as the nektonic, actively moving and schooling (Dixon and Staton, 1976) tadpoles of *Leptodactylus macrosternum* contradict the suggestion of Wake (1978) that *T. compressicauda* feeding habits might be restricted to sedentary prey.

The type of prey and the great variety of food items (up to 12 different identifiable items in a single individual) found in guts of juvenile *Typhlonectes compressicauda* demonstrate that this species is, at least in this age class, carnivorous and generalistic, in agreement with the anecdotal caecilian dietary information found in the literature.

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