

Diet of the Softshell turtle, *Trionyx triunguis*, in an Afrotropical Forested Region

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Large freshwater chelonians of the family Trionychidae may play important roles in the dynamics of freshwater ecosystems (e.g., see Pritchard, 1979), but, apart from a few species from temperate regions of North America, their ecology has attracted little attention by scientists. In particular, the ecology of Afrotropical species has been largely overlooked.

The African softshell turtle, *Trionyx triunguis* (Trionychidae), is a very large freshwater species widespread in Africa (Iverson, 1992). Its food habits are little known in the wild, especially in west Africa (e.g., see Villiers, 1958; Pritchard, 1979; Ernst and Barbour, 1989), although it is probably an important species in regional freshwater ecosystems. This paper presents quantitative data on the diet of free-ranging *T. triunguis*, captured in several localities of southeastern Nigeria, inside one of the major regions of remnant rainforest of the Gulf of Guinea area.

In this region, *T. triunguis* is found mainly in large rivers with heavily forested banks, but also inhabits brackish waters with mangroves, and is sometimes found along the seacoast (Luiselli et al., 2000).

Materials and Methods. — Data were collected in Nigeria between September 1996 and May 2000, in six localities of Rivers State: Rumuji (04°57'N, 06°46'E), Ogbemakoku (04°47'N, 06°35'E), Aseingbene (05°05'N, 06°19'E), Old Sangama (04°43'N, 06°39'E), Egunughan (04°56'N, 06°36'E), and Itelema (04°50'N, 06°49'E), in one locality of Akwa-Ibom State (Eket, 04°50'N, 07°59'E), and in two localities of Cross River State (Calabar, 04°48'N, 08°21'E; Itu, 05°14'N, 07°59'E). Detailed habitat descriptions of these localities are presented by Powell (1993, 1994), Akani et al. (1999), and Luiselli et al. (2000). Additional data came from free-living specimens captured in imprecise localities of Rivers State characterized by brackish water (N. Banadap, pers. comm.), and then housed in the Port Harcourt Zoo and in the Port Harcourt Tourist Beach.

This study is based both on stomach analysis of dead specimens and fecal analysis of living specimens. Stomach contents of dead turtles sold in local bush-meat markets (Akani et al., 1998) or by fishermen were examined, and the species present identified. No specimen was specifically killed or injured by the researchers. Masses of filamentous algal mats were commonly found in the stomachs, but we assumed this material was ingested secondarily. The same was true for sand, gravel, and presumably parasitic nematodes.

Feces were collected by handling of free-ranging specimens. Several of these specimens were captured by local fishermen and hunters in traditional traps used for fish, and several specimens were captured by hand in small ponds when water was very low during the dry season.

Results and Discussion. — Stomach contents were analyzed from 31 specimens, and 28 (8 adult males, 13 adult females, and 7 juveniles) of them contained identifiable prey items. The food remains (Table 1) indicated that *T. triunguis* is mainly carnivorous, although plants, fruits, and seeds were also eaten. Fish occurred in 61%, and anuran tadpoles in 53% of the dissected specimens, and thus constituted the major dietary sources for these *T. triunguis*. Several specimens contained meat of undetermined vertebrates in the stomachs. It is likely that this meat derived from scavenging upon large carcasses. In fact, we sighted several live softshells (> 20 specimens, of a wide range of sizes) feeding on carcasses of a goat and a bush-pig along the Sombreiro River banks, and local fishermen confirmed the scavenging capabilities of this species.

Feces were collected from 41 specimens (15 males, 15 females, and 11 juveniles) (Table 2). Data recovered from feces were in general similar to stomach analysis, but anuran tadpoles were not found, possibly because they were completely digested. Fish constituted the major portion of the diet assessed by fecal analysis, and also other vertebrate

Table 1. Frequency of occurrence of food types (as number of turtles with that food type, and percent of the number of stomachs examined in each category) in stomachs of 28 free-ranging *Trionyx triunguis* (8 males, 13 females, 7 juveniles) for sale in local markets of southern Nigeria.

Food Item	Males		Females		Juveniles		Total	
	n	%	n	%	n	%	n	%
Plant Matter								
Fruits and seeds	-	-	4	30.8	1	14.2	5	17.9
Aquatic plants	1	12.5	3	23.1	-	-	4	14.3
Invertebrates								
Bivalvia	-	-	4	30.8	1	14.2	5	17.9
Gastropoda	3	37.5	2	15.4	-	-	5	17.9
Crustacea	-	-	3	23.1	-	-	3	10.7
Insecta	1	12.5	1	7.7	1	14.2	3	10.7
Vertebrates								
Fish	6	75.0	10	76.9	1	14.2	17	60.7
Tadpoles	4	50.0	8	61.5	3	42.8	15	53.6
Frogs	3	37.5	2	15.4	-	-	5	17.9
<i>Pelusios</i> sp.	-	-	1	7.7	-	-	1	3.6
Meat*	2	25.0	5	38.5	2	28.6	9	32.1

* turtle specimens with undetermined meat had probably eaten carcasses of large vertebrates.

Table 2. Frequency of occurrence of food types (as number of turtles and percent with that food type) in feces of 41 free-ranging *Trionyx triunguis* from southern Nigeria.

Food Item	<i>n</i>	%
Plant Matter		
Fruits and seeds	6	14.6
Aquatic plants	3	7.3
Invertebrates		
Gastropoda	5	12.2
Crustacea	11	26.8
Insecta	11	26.8
Vertebrates		
Fish	33	80.5
Bird	1	2.4
Mammals (Rodentia)	2	4.9

items were recorded. Arthropods (both insects and crustaceans) were frequently consumed.

Collection of large sets of field data on *T. triunguis* is very difficult in the freshwater environments of southern Nigeria, where this species is apparently rare or at least extremely elusive (Luiselli et al., 2000). Thus, these data are a significant contribution to knowledge of this species' ecology. General carnivorous habits, with some tendency towards omnivory, have already been reported for *T. triunguis* (Branch, 1988; Ernst and Barbour, 1989), and, in particular, the tendency to feed upon carcasses is well known in some other softshell species (Taskavak and Atatür, 1998). We suggest that *T. triunguis* could be one of the principal scavengers in the freshwater ecosystems of southern Nigeria, and that, therefore, it may be a keystone species for these fragile ecosystems. Terrestrial vertebrates (e.g., birds or mammals) other than obviously scavenged ones were rarely found inside softshell stomachs and feces, but cases of predation have been well known in other softshells, including *Apalone ferox* (Dalrymple, 1977; Moler and Epstein, 1994). However, the presence of fruits and plants in stomachs of free-ranging specimens and the ready consumption of fruits (mainly bananas and pawpaws) in captive specimens recently removed from the wild (e.g., specimens at Port Harcourt Zoo; N. Banadap, pers. comm.) is clear evidence that fruit may be important in the dietary spectrum of Nigerian *T. triunguis*. Sexual and ontogenetic changes in dietary composition seem to be minor in our study case, but the sample is too small to be sure. Such differences have already been highlighted in other Trionychids, e.g., *Apalone mutica* (Plummer and Farrar, 1981).

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