Chelonian Conservation and Biology, 1998, 3(1):106–107

Food Habits of the Pelomedusid Turtle *Pelusios castaneus castaneus* in Southeastern Nigeria

LUCA LUISELLI[1]

[1]*Institute of Environmental Pollution Research "Demetra S.p.A.", via dei Cochi 48/B, 00133 Rome, Italy [Fax: 39-6-8411964]*

Most studies of food habits of free-ranging pelomedusid turtles have addressed South American species of the genera *Podocnemis* and *Peltocephalus* (e.g., Neill, 1965; Ramo, 1982; Almeida et al., 1986; Pérez-Eman and Paolillo, 1997). Despite their wide distribution across sub-Saharan Africa, very little is known of the diet and foraging ecology of Afrotropical species of the genera *Pelomedusa* and *Pelusios*. This paper presents a detailed account of the food habits of two Nigerian populations of *Pelusios castaneus castaneus*. I highlight whether noteworthy differences in feeding between sexes and between populations occur in this turtle, and briefly compare my data with those available for other species of the same family from elsewhere.

Methods. — This study was conducted through several discrete field research missions from September 1996 to September 1997 in two areas of southeastern Nigeria: 1) Elem-Sangama forest along the Lower Orashi River course, Rivers State (04°44'N; 06°38'E), and 2) Eket forest, Akwa-Ibom State (04°50'N; 07°59'E). The climate is typical for a tropical sub-Saharan country, with well-marked dry and wet seasons with relatively modest monthly fluctuations in maximum and minimum temperatures. The dry season extends from November to April and the wet season from May to October (with some year-to-year variations). Mean monthly maximum temperatures range between 27 and 34°C, while minima vary between 22 and 24°C. Both areas are characterized by black water rivers, but the environments show marked differences in the two areas. In Elem-Sangama, turtles were found in a major creek along the Orashi River, and habitually occupy waters 0.5–10 m deep; in Eket, turtles were found in small ponds (0.2–1 m deep) of the swamp rainforest. In both areas the turtles were extremely abundant.

Turtles were captured by hand, by means of traps of indigenous design, and by using pitfall traps also used for capturing snakes (Luiselli and Akani, in press). Sex was determined only in adults, since sexing was not reliable for subadults and juveniles. Thus, several unsexable individuals (Elem-Sangama: $n = 24$; Eket: $n = 45$) were removed from analysis concerning sex. Straight-line carapace length was recorded for each turtle captured and each specimen was individually marked by notching marginal scutes. Stomach contents were obtained by dissection of those specimens killed by local people and by stomach flushing of living animals (Legler, 1977). No turtle was specifically killed for the purposes of this study. A dissecting microscope and reference collections were used to classify the food remains. All statistical tests were two-tailed with alpha set at .05, using Statistica for Windows (version 4.5).

Results and Discussion. — At Elem-Sangama 65 animals were captured, with 38 recaptures, and at Eket 92 animals were captured, with 62 recaptures. Considering only the specimens easily sexable (Elem-Sangama: $n = 41$; Eket: $n = 47$), the apparent sex ratio was close to 1:1 (♂:♀) in both the study areas (0.78:1 at Elem-Sangama, and 1:1 at Eket). There was no statistically significant difference in mean carapace length between sexes in either Elem-Sangama (males = 15.2 ± 6.3 cm, females = 17.2 ± 6.1 cm; unpaired t-test, $p = 0.19$) or Eket (males = 14.8 ± 6.9 cm, females = 15.5 ± 8.0 cm; unpaired t-test, $p = 0.69$), although the carapace length of females slightly exceeded that of males in both areas. The mean carapace length of males did not differ significantly between the two areas (unpaired t-test, $p = 0.82$), nor did females (unpaired t-test, $p = 0.29$).

Dietary analysis included 103 turtles from Elem-Sangama and 154 turtles from Eket, including initial captures and subsequent recaptures. Thirty-one turtles from Elem-Sangama (30.1%) and 32 turtles from Eket (20.8%) had empty stomachs. The frequency of animals with empty stomachs was significantly higher in Elem-Sangama than in Eket ($\chi^2 = 9.39$, df = 1, $p < 0.0001$), but did not differ significantly between sexes in either areas (Elem-Sangama: $\chi^2 = 1.48$, df = 1, $p > 0.1$; Eket: $\chi^2 = 1.02$, df = 1, $p > 0.5$). Capture technique did not influence the frequency of empty stomachs in either areas ($\chi^2 = 1.89$, df = 2, $p > 0.1$; and $\chi^2 = 1.63$, df = 2, $p > 0.1$, respectively).

Frequency of occurrence of each food category in the two populations is presented in Table 1. The diet composi-

Table 1. Frequency of occurrence of food categories (as percentage of turtles with food in their stomachs) in two populations of *Pelusios castaneus castaneus* in Nigeria.

Food item	Elem-Sangama		Eket	
	n	%	*n*	%
Plant Matter				
Algae	1	1.4	8	6.6
Fruits and seeds	11	15.3	28	22.9
Aquatic plants	38	52.8	47	38.5
Invertebrates				
Oligochaeta	6	8.3	6	4.9
Gastropoda	21	29.2	44	36.1
Crustacea	8	11.1	11	9.0
Insecta				
Diptera	0	0.0	1	0.8
Coleoptera	1	1.4	0	0.0
Hemiptera	0	0.0	6	4.9
Arthropoda	8	11.1	6	4.9
Vertebrates				
Fish	33	45.8	9	7.4
Amphibia	4	5.6	22	18.0
Stomachs with Food	72	69.9	122	79.2
Empty Stomachs	31	30.1	32	20.8
Totals	103		154	

tion of the two populations was relatively similar, and included both plant and animal matters. However, there were some differences: algae and amphibians (tadpoles and metamorphs) were taken significantly more frequently by turtles from Eket ($p < 0.04$), whereas aquatic plants and small fish were taken significantly more frequently by turtles from Elem-Sangama ($p < 0.01$). Sexes did not differ significantly in diet in the two areas ($P > 0.3$).

This study demonstrates that *Pelusios castaneus castaneus* from southeastern Nigeria is omnivorous and consumes a wide variety of food items, including fruit, plants, algae, invertebrates, fish, and amphibians. This result is not surprising, as available data suggest that African pelomedusids are omnivorous (Rodel, 1997), and the same is true for South American species as well (Pérez-Eman and Paolillo, 1997). The two turtle populations differed significantly in terms of frequency of utilization of some food categories. These differences were not related to different age or size structure of the two populations, since the interpopulational differences were minor in this respect. The simplest explanation for the observed differences is that habitat and floristic composition of the different sites influenced the diets. For example, fish were more frequently taken in the deep-water creek of Elem-Sangama than in the small shallow ponds of Eket, probably because of their higher abundance in the former area. Absence of sexual dietary differences are attributable to lack of sexual body size differences and microhabitat use (L. Luiselli et al., unpubl. obs.). In reptiles, major size differences between sexes are frequently correlated with remarkable sexual dietary differences (Shine, 1986) and these differences may be related to sexual differences in microhabitat utilization (Plummer and Farrar, 1981). The significant difference between the two turtle populations in the proportions of empty stomachs is intriguing, but the reasons for such a difference are obscure at present.

The dietary records indicate that these turtles foraged almost exclusively in water. However, I occasionally observed turtles moving on land apparently foraging for small organisms in mud or under leaf litter. I hypothesize that foraging on land could be important in temporarily inundated swamp forest patches during the dry season when water is not otherwise readily available. However, it should be noted that other pond turtles usually aestivate when their natural ponds become dry (Gibbons et al., 1983; Cloudsey-Thompson, 1985; Naulleau, 1991) and it is possible that *Pelusios castaneus* also utilizes this strategy.

Acknowledgements. — I am gratefully indebted to T.S.K.J. Nigeria Ltd., Ecosystem s.r.l., Aquater S.p.A., and Amertex Oil and Gas Ltd. for having supported my field research in Nigeria. Special thanks go to Jennifer S. Ekanem (Calabar) for showing some remarkable sites for observing turtles, and to Godfrey C. Akani (Port Harcourt University) and Francesco M. Angelici (Rome) for helping with the identification of taxa of food organisms. Edoardo Politano (Aquater, S. Lorenzo in Campo) and Zena Tooze (Cercopan, Calabar) are thanked for their friendly collaboration, and my friends Cynthia, Ubong, Lynne, and Henry (Calabar) are thanked for help and field companionship in Eket. Anders G.J. Rhodin, Peter C.H. Pritchard, Godfrey C. Akani, Francesco M. Angelici, and two anonymous referees critically commented on previous drafts of this manuscript.

Literature Cited

ALMEIDA, S.S. DE, SÁ, P.G.S., AND GARCIA, A. 1986. Vegetais utilizados como alimento por *Podocnemis* (Chelonia) na região do baixo Rio Xingu (Brasil-Pará). Bol. Mus. Pará Emilio Goeldi Ser. Bot. 2:199-211.

CLOUDSEY-THOMPSON, J.L. 1985. Does *Emys orbicularis* aestivate on land? Brit. Herp. Soc. Bull. 13:39.

GIBBONS, J.W., GREENE, J.L., AND CONGDON, J.D. 1983. Drought related responses of aquatic turtle populations. J. Herpetol. 17:242-246.

LEGLER, J.M. 1977. Stomach flushing: a technique for chelonian dietary studies. Herpetologica 33:281-284.

LUISELLI, L., AND AKANI, G.C. In press (a). Habitats of snakes in the rainforests of Eket (Akwa-Ibom State, southeastern Nigeria). Herpetozoa.

LUISELLI, L., AND AKANI, G.C. In press (b). Food resource partitioning of a community of snakes in a swamp rainforest of south eastern Nigeria. J. Zool., London.

NAULLEAU, G. 1991. Adaptations ecologiques d'une population de cistudes (*Emys orbicularis* L.) (Reptilia, Chelonii) aux grandes variations de niveau d'eau et à l'assechement naturel du milieu aquatique frequente. Bull. Soc. Herp. France 58:11-19.

NEILL, W.T. 1965. Notes on the five Amazonian species of *Podocnemis* (Testudinata: Pelomedusidae). Herpetologica 21:287-294.

PÉREZ-EMAN, J.L., AND PAOLILLO O., A. 1997. Diet of the pelomedusid turtle *Peltocephalus dumerilianus* in the Venezuelan Amazon. J. Herpetol. 31:173-179.

PLUMMER, M.V., AND FARRAR, D.B. 1981. Sexual dietary differences in a population of *Trionyx muticus*. J. Herpetol. 15:175-179.

RAMO, C. 1982. Biologia del galapago (*Podocnemis vogli* Müller, 1935) en el Hato El Frio, Llanos de Apure (Venezuela). Doñana Acta Vert. 9:1-161.

RODEL, M.-O. 1997. Lebensraume und Etwicklung junger Starrbrust-Pelomedusen *Pelomedusa subrufa olivacea* (Schweigger, 1812) im Comoe-Nationalpark, Elfenbeinkuste. Herpetozoa 10:23-33.

SHINE, R. 1986. Sexual differences in morphology and niche utilization in an aquatic snake, *Acrochordus arafurae*. Oecologia 69:260-267.

Received: 15 November 1997
Reviewed: 3 May 1998
Revised and Accepted: 2 June 1998