

Notes on morphology, biology and domestic consumption of *Pelusios niger* (DUMÉRIL & BIBRON, 1835) from Forcados River, Nigeria

Tortoise and freshwater turtles are popular bushmeat in tropical Africa, with Nigeria being one of those countries where domestic consumption of chelonians occurs on a regular basis, especially in the southernmost regions, including the extended marshy and swampy riverine areas of the River Niger Delta (LUISELLI 2003; LUISELLI et al. 2003, 2013) and the states of Akwa-Ibom and Cross River (ENIANG et al. 2006).

Within the Niger Delta region, the rural town of Patani, located on the east-west highway segment in Delta State, is the major bushmeat market for freshwater turtles in southern Nigeria (AKANI, PETROZZI, SEGNIAGBETO & LUISELLI, unpublished observations). These chelonians are usually abundant during the wet season from March to September, when they are displayed for sale (AKANI, PETROZZI, SEGNIAGBETO & LUISELLI, unpublished observations). The numbers of traded turtles in this market has been monitored by the authors for several years. The unusual abundance of turtles offered in the market in 2012 was the main reason for conducting the present study, because it gave the opportunity to collect natural history data on the traded specimens. This paper, presents data on morphometrics and other ecological aspects of *Pelusios niger* (DUMÉRIL & BIBRON, 1835) sold in the market.

The study was conducted between May and November, 2012, at Aven (05°18'30" N; 06°25'0" E), situated at the Forcados River (a tributary of the Niger River) in Patani Local Government Area (Delta State, southern Nigeria). Both Forcados River and the adjacently discharging Nun River often inundate their banks during the wet season. The study area is a typical Niger Delta wetland characterized by thick riparian forests, with a mean annual rainfall of 3,800 mm and average of 180 rainy days/yr.

The authors surveyed the bushmeat market at Aven, where local fishermen and hunters send *P. niger* for sale. Data was acquired during the above-mentioned period by boating along the Forcados River



Fig. 1: Specimens of *Pelusios niger* (DUMÉRIE & BIBRON, 1835) displayed for sale at Aven bushmeat market, in Patani Local Government area, Nigeria.

twice per month (14 daily surveys in total). With permission of the dealers, investigations on the turtles displayed for sale included morphometric measurements and collecting other natural history data. Turtle body mass was measured using a top-loading balance (range: 50-5,000 gr) and carapace length by calipers (± 1 mm), followed by visual sex determination. Dead individuals were dissected. From these, the stomach contents and female fecundity status (including number of eggs) were recorded. Considering the response of some turtles to water quality in the Niger Delta region (LUISELLI et al. 2006a, 2006b), some hydrobiology data of Forcados River at the capture areas was acquired, using Standard Methods recommended by APHA (American Public Health Association < <http://www.apha.org> >) and ASTM (American Society for Testing and Materials < <http://www.astm.org> >) (see ABAM 2001). In the text, means are followed by \pm one Standard Deviation. All tests were two-tailed and with alpha set at 5%. All analyses were performed by using SPSS Ver. 11 software. Sex-ratio of the studied population was analyzed by observed-versus-expected χ^2 test;

mean body size differences between males and females were tested by Student t-test after log-transformation, and the linear correlation between two morphometric variables was calculated by Pearson's correlation coefficient. Analysis of Covariance (ANCOVA) was used to test whether the slopes of the general regressions of (i) carapace length against carapace width, or (ii) carapace length against body mass, differed between sexes.

Overall, during the survey period, 206 turtles in the possession of 47 fishermen, and 431 additional individuals of *P. niger* displayed in the bushmeat market (Fig. 1) were observed. On average, 45.5 ± 4.5 turtles were recorded per day during the survey period. Since traders restricted the access to the study materials, only a subsample of this large number of turtles was available to obtain the relevant data. Adult sex ratio of *P. niger* was 1 : 1.3 (total $n = 157$), not significantly different from equality ($\chi^2 = 1.157$, $df = 1$, $p = 0.282$). Similar unbiased sex-ratios, with slight preponderance of females, were reported for two other Pelomedusidae turtle species in wild populations from Togo, *Pelusios castaneus*

Table 1: Summary table of the morphometric data of *Pelusios niger* (DUMÉRIL & BIBRON, 1835) from the Forcados River at Aven, Nigeria.

| | Males | | | Females | | |
|------------|----------------------|---------------------|----------------|----------------------|---------------------|----------------|
| | Carapace length (cm) | Carapace width (cm) | Body mass (kg) | Carapace length (cm) | Carapace width (cm) | Body mass (kg) |
| N | 32 | 32 | 32 | 37 | 37 | 37 |
| Min. | 19.2 | 16.9 | 0.61 | 18.8 | 16 | 0.6 |
| Max. | 31.1 | 24.7 | 2.2 | 31.1 | 24.6 | 2.3 |
| Mean | 23.35 | 20.38 | 1.28 | 25.77 | 21.15 | 1.51 |
| Std. Error | 0.82 | 0.53 | 0.10 | 1.07 | 0.73 | 0.14 |
| Std. Dev. | 3.38 | 2.22 | 0.42 | 4.44 | 3.01 | 0.57 |
| Median | 22 | 20 | 1.3 | 25.5 | 21.2 | 1.4 |

(SCHWEIGGER, 1812) and *Pelomedusa subrufa* (BONNATERRE, 1789) (SEGNIAGBETO et al. 2015).

The summary of the morphometric data (carapace length, carapace width, and body mass) of the sampled population, and for both males and females, is presented in Table 1. The sexes did not differ significantly in terms of carapace length ($t = -1.785$, $p = 0.084$), carapace width ($t = -0.849$, $p = 0.402$), or body mass ($t = -1.407$, $p = 0.169$). Expectably, the (log) carapace length and (log) carapace width were significantly positively correlated in both males ($r = 0.976$, $p < 0.0001$) and females ($r = 0.927$, $p < 0.01$), and the slopes of the regression lines relative to their relationships between carapace length and width did not differ significantly (one-way ANCOVA: $F = 0.986$, $df = 1, 32$, $p = 0.329$). The (log) carapace length and (log) body mass were also positively correlated in both males ($r = 0.974$, $p < 0.0001$) and females ($r = 0.916$, $p < 0.001$), and the

slopes were not significantly heterogeneous (ANCOVA: $F = 0.405$, $df = 1, 32$, $p = 0.529$).

No juvenile turtle was found displayed in the market, clearly because the people do not collect small-sized turtles for eating and/or such sizes would not attract much pay. Fifteen out of a total of 17 (88.2 %) dissected females were gravid at the examination time. This reveals at least an annual frequency of reproduction for adult female *P. niger*. The same annual frequency of reproduction was observed in conspecifics of the adjacent Nun River (Niger Delta; AKANI, PETROZZI, SEGNIAGBETO & LUISELLI unpublished data), where people from shoreline towns such as Sampou, Agberi and Gbaratoru (Bayelsa State) collect many females and their eggs for domestic consumption.

The number of eggs counted as the hunters butchered gravid turtles ($N = 15$) ranged from 18 to 28 ($\bar{x} = 25 \pm 2$); they measured 3-4 cm in diameter ($\bar{x} = 3.55 \pm 0.4$ cm). The turtles' nesting sites were fre-

Table 2: Physicochemical water quality data of the Forcados River (Nigeria) at capture sites of *Pelusios niger* (DUMÉRIL & BIBRON, 1835). Samples were taken between May and November, 2012 at 100 cm distance from the banks. The river's water regime varies remarkably. Flood waters can be strong during the wet season and include heavy floodings in adjacent areas. Both high and low water regimes were sampled during the surveys. Sewage effluents are strongly present around the main towns (Patani area).

| Parameter (and unit) | Analytical method | No. of samples | Range | Mean | Standard deviation |
|--------------------------------|---|----------------|-------------|------|--------------------|
| Surface water temperature (°C) | Mercury thermometer | 10 | 24.0 - 31.2 | 27.2 | ± 0.5 |
| pH | pH-meter | 10 | 5 - 7.1 | 6.2 | ± 0.8 |
| Secchi disc transparency (cm) | Secchi disc | 15 | 35 - 50 | 46.8 | ± 2.5 |
| Salinity (‰) | Salinometer | 10 | 0.2 - 0.7 | 0.5 | ± 0.2 |
| Dissolved oxygen (mg/l) | Alkali-iodide-azide method (Winkler method) | 12 | 4.5 - 14.8 | 11.9 | ± 0.7 |
| Total alkalinity (ppm) | | 10 | 12.2 - 18.0 | 15 | ± 2.1 |

quently found to be in muddy burrows at the shoreline. Hunters report that every year, during the flood season, people who know how to identify their nests come along the shore to search and catch both adults and eggs in the nests.

Food items found in the stomachs of dissected turtles included snails (found in 13 of 32 analyzed stomachs), insects (found in 22 of 32 stomachs), fishes (21), oil palm fruits (4), pawpaw (3) and banana (3), suggesting that this turtle is predominantly carnivorous. This food item spectrum is in agreement with information in the literature available for conspecifics of other areas in the Niger Delta region (LUISELLI et al. 2004), as well as with data on the feeding habits of *P. castaneus* in the same study area (LUISELLI 1998).

The physicochemical characteristics of the aquatic sites where turtles were captured in the Forcados River are reported in Table 2. Since there is no comparative information available in the literature, commenting on this data was avoided, hoping that future studies will clarify the relevance of any of these water characteristics for the turtle ecology in tropical areas.

The meat of the terrapin is cherished as a delicacy at least locally, whereas in other regions of southern Nigeria people clearly prefer *Kinixys* tortoise meat (LUISELLI 2003). *Pelusios niger* is sold in the surveyed bushmeat market and at roadsides of the study area at high rates. The high cash reward encourages hunters / fishers to catch many of them. For instance, a fully grown individual (> 1.2 kg) costs 6,000 – 10,000 N (about 35 to 50 Euro). *Pelusios niger* is also considered useful in the traditional medicine of the Aven and Patani culture. Hunters reported that the carapace is burnt to ashes and given to pregnant women whose developing fetus in the womb is failing to 'kick'. The ash is also used to heal a baby whose fontanelle has failed to seal up. On the other hand, the ash of the plastron serves as treatment of stubborn and old sores.

In conclusion, this report indicates that *P. niger* females ovideposit annually on the shorelines of Forcados River, at the edge of riparian forest, where they are exposed to the hunters' trailing and catching activities. The medium and long-term impact of fish-

ermen activities on turtle nesting should be monitored by competent authorities because this species is suspected to be declining in relevant areas of its range, and indeed it has been listed as NT (Near Threatened) during the continental workshop of IUCN/SSC Tortoises and Freshwater Turtles Specialist Group, held in Lomé (Togo) in August, 2013. In addition, shoreline modification projects such as during dredging, reclamation, sandfilling and shoreline protection are potentially capable of interfering with *P. niger* homing behaviors, and may be even causing failure in turtle spawning. Sediment pollution and oil pollution from extractive industries, which are rampant in the area (OPUKRI & IBADA 2008), are other conservation challenges faced by the terrapins in the Forcados River (LUISELLI et al. 2006b).

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