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Food rate of *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis*, three Anura of degraded areas of Banco National Park, Côte d'Ivoire

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Abstract

Food rhythms of *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis* were studied in Banco National Park (Côte d'Ivoire) during the dry and rainy seasons. The food intake of the species of *Ptychadena* genus takes place in the morning from 6h to 12h and in the evening between 18h and 24h with peaks located at 12h and 24 h respectively. *Hoplobatrachus occipitalis* feeds on 3h to 9h and from 15h to 21h with peaks located at 9h and 21h. Most of the food bolus in both species of *Ptychadena* genus corresponding to the peaks is composed of Insects. *Hoplobatrachus occipitalis* is mainly feeds on amphibians at 9h and molluscs at 21h.

Keywords: Banco national park, feeding rhythm, *Ptychadena mascareniensis*, *P. pumilio*, *Hoplobatrachus occipitalis*, Côte d'Ivoire

1. Introduction

The frogs are a very important source of food in Africa ^[1]. This resource, as animal protein, is a power supply base of rural communities. In addition, operation of the frogs is a means of livelihood for these people who fight daily for income generating activities. According to ^[2], the trade of frogs is very prosperous in many West African countries, including Burkina Faso, Benin and Nigeria where these animals are sold dried or fried. In Ivory Coast, *Ptychadena pumilio*, *P. mascareniensis* and *Hoplobatrachus occipitalis* are the most commonly consumed species; particularly the latter species is the most prized. Large amounts of frogs used in feed and for trade are taken from the natural environment. Besides, ^[3] reports that the international market for human consumption is filled by wild frogs caught. The same author reports that annual imports of anurans for United States, France and Italy amounted 20000, 2000 and 500 tonnes respectively. Moreover, in western Cameroon and in the eastern part of Nigeria, tadpoles are captured even for food ^[4], indicating an overexploitation of this resource. However, remember that to date, no regulation only governs the exploitation of these animals in the Sub-Saharan region. Thus, raniculture appears to be an alternative to ensure the sustainability of natural resources. In Côte d'Ivoire, frog breeding trials initiated in Biankouma region (western locality) in 2001 did not yield the expected results (<http://fr.allafrica.com/stories/200507140765.html>). This failure would probably linked to the non-control of the ecology of selected species. Data on diet and reproduction of *Hoplobatrachus occipitalis* ^[5-7], *P. mascareniensis* and *P. pumilio* ^[8] are Recent. Also, the present study on the feeding rhythm of these three edible Anurans provide essential data to their rearing.

2. Material and methods

2.1. Study site

The Banco National Park (Figure 1) with an area of 3474 hectares ^[9], is a protected forest located in the Abidjan city, economic capital of Côte d'Ivoire. It contains the "Banco" river which originates in the northern border of the forest and flows in Southern in the lagoon "Ebrié". This park is influenced by the warm and humid tropical climate. It's characterized by two dry seasons and two rainy seasons. The main dry season lasts four months (December to March) and the short, two months (August-September). Regarding the long rainy season, it extends from April to July and the short rainy season, from October to November ^[10].

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In this ecosystem, according to the criteria of accessibility and abundance of specimens of *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis*, the fish farm (Figure 1) was selected for the present study. This habitat (05 ° 23' N and 04 ° 03' W) is located in the center of the park at around 3.5 kilometers from the bay. In this park, these three species of Anura encountered in the degraded areas, were very rare in the primeval forest.

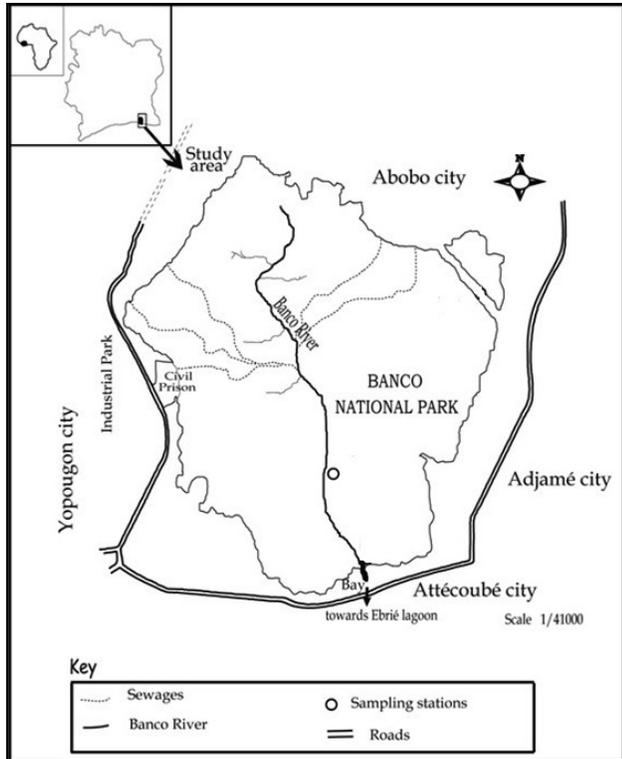


Fig 1: Map of the Banco National Park showing the sampling station

2.2. Sampling and data analysis

Specimens of *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis* were captured during a 24 hours cycle in the dry season (February 2005) and rainy season (June 2005). A dip net (opening diameter: 40 cm, height of fall: 50 cm, mesh: 5 mm) was used for sampling and aquariums have served for collection of specimens. A torch was used to identify the specimens overnight. After dissection (opening the ventral side) of the frog, the stomach is removed and weighed to the nearest milligram. Each stomach sampled is conserved in ethanol 70%. In the laboratory, weighed stomach is opened throughout its length. The content of extract is slurried in water in a petri dish. The various feed particles contained therein are separated under a binocular lens. After identification on the basis of the keys of [11-13]. These items are weighed to the nearest milligram. The weight of food in the stomachs contents were treated with the software Maxims 74MOQB. This software, used in fish [14, 15], gives the estimated values of the food consumption indices such as the daily food ration, the feed intake per hour along with the percentage of residues [16]. We used it for the first time in frogs.

3. Results

3.1. Nychthemeral variations of the diet in adult frogs.

Figure 2 illustrates the quantitative and qualitative changes in the different components in food bowls of *P. mascareniensis*,

P. pumilio and *Hoplobatrachus occipitalis* during a 24 hours cycle. In the two species of *Ptychadena* (Figure 2a and 2b), the high proportions of food in stomachs are recorded at 12 h and 24 h. At these two moments of the day, the alimentary bolus is constituted predominantly of Insects at a rate of 0.23 g ie 82.75% (12 h) and 0.25 g representing 100% (24 h) in *P. mascareniensis*. The corresponding values in *P. pumilio* are 0.18 g (62%) and 0.26 g (84%), respectively. As for low amounts, they are observed at 6 h and 15 h in *P. mascareniensis* (ie respectively 25% and 75% of Insects) and at 3 h and 18 h in *P. pumilio* (100% and 66.67% of Insects). With regard in *Hoplobatrachus occipitalis* (Figure 2c), the high amount of food in stomachs were observed at 9 h and at 21 h. The abundant food in the stomach at these hours are respectively Amphibians (1.70 g ie 56%) and Mollusca (1.69 g ie 55%). Food at 3h and 12h corresponding to the rest, the alimentary bolus is composed respectively of Myriapods (0.18 g; 98%) and Insects (0.38 g; 83%).

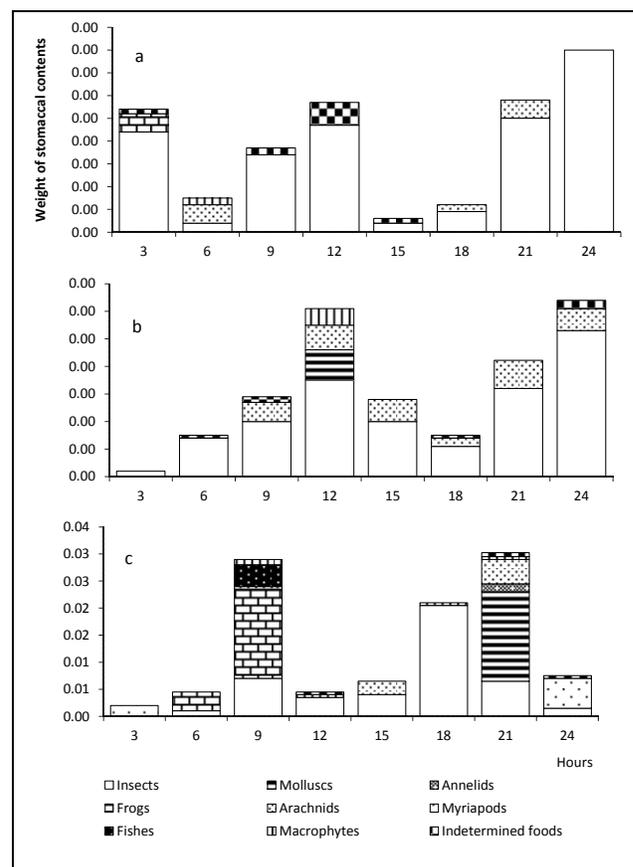


Fig 2: Diurnal Variations in the relative abundance of foods in the diet of adults *Ptychadena mascareniensis* (a), *P. pumilio* (b) and *Hoplobatrachus occipitalis* (c) on a 24-hours cycle.

3.2. Alimentary rhythm

The figure 3 obtained from MAXIM 74 MQB software (model 2, 1) represents the nychthemeral variations of taking foods in the three anurans. In *P. mascareniensis* (Figure 3a) and *P. pumilio* (Figure 3b), the food consumption curve is upward from 6 h to 12 h and from 18 h to 24 h, with two peaks at 12 h and 24 h. The weight of the food gathered in stomachs corresponding to these two moments for each species are respectively 0.39g and 0.29g (12 h) and 0.41g and 0.30g (24 h). Regarding the food intake in *H. occipitalis* (Figure 3c), it extends from 3 h to 9 h (with a peak at 9 h) and

from 15 h to 21 h with the peak at 21 h. The weights of food corresponding to those two peaks are 2.70g and 2.73g respectively. The daily feed rations and the estimated consumption parameters are reported in Table I. The daily ration of *H. occipitalis* (14.02%) is higher than that of *P. mascareniensis* (1.78%) and *P. pumilio* (1.05%). These

numbers represent 10.38%, 8.95% and 8.24% of their respective body weight. The quantity of food consumed by time band in *H. occipitalis* (1.17g/h) is higher than that of *P. mascareniensis* (0.15 g/h) and *P. pumilio* (0.09 g/h); it is the same for the rejection percentage which is respectively 0.39; 0.04 and 0.01.

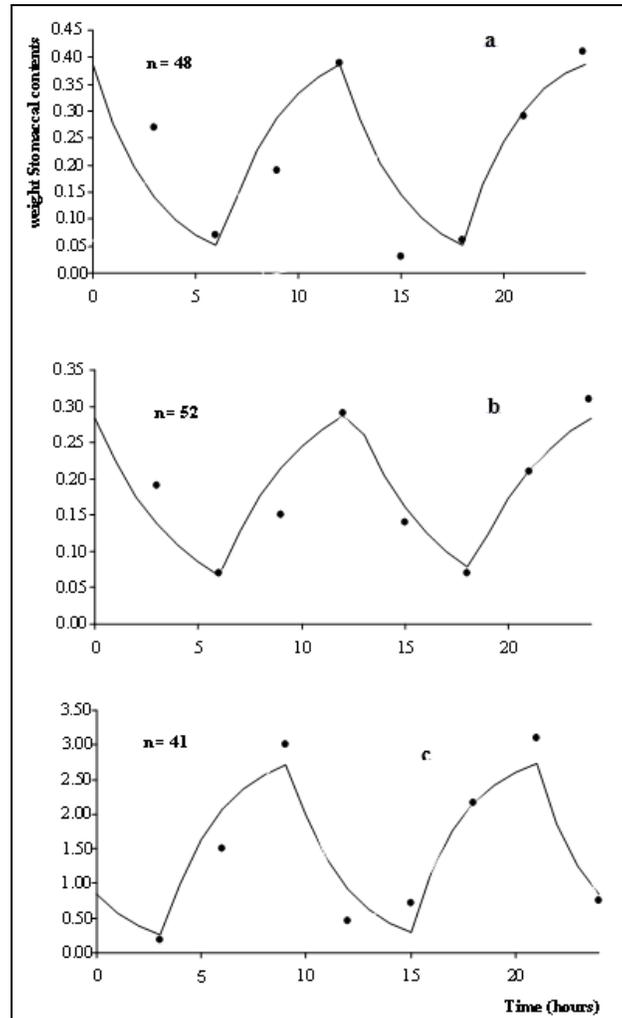


Fig 3: Curves MAXIMS of food pace in specimens of *Ptychadena mascareniensis* (a), *P. pumilio* (b) and *Hoplobatrachus occipitalis* (c) during a 24-hour cycle in the Banco National Park, Côte d'Ivoire.

Table 1: Parameters relating to consumption and the estimated daily food ration in adult specimens of *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis* during a 24h cycle in the Banco National Park

Parameters	<i>Ptychadena mascareniensis</i>	<i>Ptychadena pumilio</i>	<i>Hoplobatrachus occipitalis</i>
Average weight (g)	19,91 ± 2,38	12,68 ± 1,34	131,46 ± 13,43
Daily feed ration (g)	1,78	1,05	14,02
Daily ration estimated by frog (% weight)	8,95	8,24	10,38
Ingestion rate (g.h ⁻¹)	0,15	0,09	1,17
Evacuation Rate (h ⁻¹)	0,04	0,01	0,39

4. Discussion

The nycthemeral changes in food intake in *Ptychadena mascareniensis*, *P. pumilio* and *Hoplobatrachus occipitalis* reveals that these anurans feed on both day and night. Species in the genus *Ptychadena* feed on 6 to 12 h and from 18 to 24 h. As to *H. occipitalis*, its feed intake has from 3 to 9 h and 15 to 24 h. Our data corroborate the results of [17] in the Comoé National Park. A similar result was reported by [18] in North Africa and [19] in the Delta area of the Natural Reserve of Rusizi (Burundi) in *Hoplobatrachus occipitalis*. Furthermore,

[20] noted that this species feeds continuously. The time recorded for the maximum repletion in *H. occipitalis* precedes that of the 2 species of *Ptychadena*. This time offset might be an adaptive strategy enabling these two Ptychadenidae to escape the predation of *Hoplobatrachus occipitalis*. Indeed, [21] and [6] have already observed frogs in the diet of this species.

Furthermore, our data reveal that the daily ration varies from one species to another. Such variation could be explained by the sizes of specimens. In particular, the mean size of

individuals decreases from *Hoplobatrachus occipitalis* to *Ptychadena pumilio* passing through *P. mascareniensis*.

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