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DIET AND TROPHIC ECOLOGY OF THE MASCARENE GRASS FROG, *PTYCHADENA MASCARENIENSIS* (ANURA: PTYCHADENIDAE), IN THE EHOTILE ISLANDS, SOUTHEASTERN CÔTE D'IVOIRE

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ABSTRACT

This study aimed to characterize the diet of *Ptychadena mascareniensis* (Anura: Ptychadenidae) in the Ehotilé Islands, southeastern Côte d'Ivoire, and to assess trophic variations according to sex and habitat type. The stomach contents of captured individuals were analysed using the Index of Relative Importance (IRI). Overall, insects constituted the predominant prey category (IRI = 60.31%), mainly represented by Coleoptera (17.88%) and Hemiptera (17.42%), followed by molluscs (16.08%). Trophic differences were observed between sexes: males preferentially consumed molluscs (IRI = 39.38%), whereas females fed more extensively on insects (IRI = 30.52%), annelids (16.71%), and crustaceans (16.27%). Diet composition also varied among habitats. In lowland sites (S-BAS), the diet was diverse and dominated by insects (50.34%). In coconut plantations (S-PAL), molluscs constituted the principal food resource (54.96%). In contrast, individuals from cultivated areas (S-CUL) exhibited an almost exclusively insectivorous diet (92.94%), with a predominance of Hemiptera (41.54%) and Coleoptera (24.05%). These findings reveal substantial trophic plasticity in *P. mascareniensis*, which likely enhances its ability to exploit a wide range of habitats within the Ehotilé Islands. They also highlight the potential ecological role of this species in regulating invertebrate populations, particularly phytophagous insects in insular agroecosystems.

Keywords: *Ptychadena mascareniensis*; Diet; Trophic ecology; Insular habitats; Ehotilé Islands

1 INTRODUCTION

Amphibians play a crucial role in the functioning of both terrestrial and aquatic ecosystems because of their intermediate position within food webs. Anurans, in particular, exert significant predation pressure on invertebrates, especially phytophagous insects and agricultural pests, thereby contributing to the maintenance of ecological balance and the natural regulation of insect populations [1], [2],[3]. Moreover, their high sensitivity to environmental disturbances makes them excellent bioindicators of habitat quality.

The study of diet is a fundamental aspect of amphibian ecology because it provides valuable insights into trophic interactions, resource use, and the mechanisms by which species adapt to environmental variability. In anurans, feeding patterns are generally influenced by prey availability, habitat structure, developmental stage, and sex [4], [5], [2]. Consequently, many anuran species exhibit considerable trophic plasticity, enabling them to exploit the most abundant and accessible food resources within their environment.

Ptychadena mascareniensis is a widely distributed species throughout sub-Saharan Africa and occurs in a broad range of habitats, including wetlands, mangroves, and agricultural landscapes [6], [7]. Despite its wide distribution and potential ecological importance, information on its feeding ecology remains scarce in West Africa, particularly in Côte d'Ivoire. Furthermore, recent studies have demonstrated that habitat alteration and agricultural practices strongly influence the availability of trophic resources and the composition of amphibian communities [8], [9]. The Ehotile Islands, located in southeastern Côte d'Ivoire, comprise a mosaic of habitats, including mangrove forests, agricultural areas, and transitional environments that are likely to influence the trophic behaviour of amphibians. However, no detailed study has yet investigated the diet of *Ptychadena mascareniensis* within this archipelago. Therefore, the present study aimed to characterise the diet of this species by identifying the prey categories consumed, assessing their relative importance, and examining dietary variation by developmental stage, sex, and habitat type. This study contributes to a better understanding of the trophic ecology of amphibians in Côte d'Ivoire. It provides new insights into the ecological role of *P. mascareniensis* in the insular ecosystems of the Ehotilé Islands.

2 MATERIAL AND METHODS

2.1 Study Area

The study was conducted in the Etuessika area, located in the Adiaké Department, southeastern Côte d'Ivoire. The study site is adjacent to the Ehotilé Islands National Park, an archipelago of six islands situated within the Aby Lagoon, near the Atlantic Ocean [10].

The vegetation is characterised by a mosaic of mangrove forests, coastal forests, wetlands, and secondary forest formations. The climate is sub-equatorial, with a mean annual rainfall ranging from 1,800 to 2,000 mm. The mean annual temperature is approximately 26.4 °C, while the average annual relative humidity is around 80%, with higher values recorded during the rainy seasons. These ecological conditions promote the persistence of humid habitats that are highly favorable for amphibian communities, particularly the Mascarene Grass Frog, *Ptychadena mascareniensis*.

2.2 Sampling Sites and Site Characteristics

We selected three sampling sites to investigate the diet of *Ptychadena mascareniensis*. These sites were chosen based on their accessibility and the occurrence of the target frog species. Table 1 summarises the main characteristics of the selected study areas.

Table 1: Characteristics of the sampling sites selected for the study of the diet of *Ptychadena mascareniensis* in the Ehotilé Islands, southeastern Côte d'Ivoire

Site	Geographic coordinates	Site characteristics	Anthropogenic activities
Lowland site (S-BAS)	05°11.0115’N; 003°19.1483’W ; Alt. 12m	- Open and humid habitat - presence of streams and shrubs; - vegetation dominated by Chinese bamboo (*Bambusa vulgaris*), palms, and coconut trees	Intense
Mangrove site (S-PAL)	05°10.7595’ N; 003°19.2478 W ; Alt. 20m	- Open and humid site; - swampy area; - presence of mangroves, - coconut trees, and shrubs	Intense
Vegetable-cropping site (S-CUL)	05°10.7905’N 003°19.5251’W Alt. 12m	Open and humid habitat; swampy area; vegetable crops (tomato, okra, eggplant, and cabbage), cassava and maize cultivation; presence of trees and shrubs	Very intense

2.3 Specimen Collection

Frogs were captured using the time-constrained visual encounter survey (VES) method described by Crump and [11]. Sampling was conducted between 17:00 and 23:00 h. A team of four observers systematically surveyed the transects by thoroughly searching the different habitat types. Acoustic surveys were also employed to detect calling individuals. All observed individuals were captured by hand, identified to species level, and subjected to biometric measurements.

2.4 Identification of Prey Items

Stomach contents were removed and spread in Petri dishes containing alcohol. Prey items were then sorted by morphological similarity and examined under a stereomicroscope. Identification of prey items was carried out using the taxonomic keys of [1] [13].

2.5 Determination of Dietary Indices

- **Vacuity index (VI):** The vacuity index (VI) was calculated as the percentage of empty stomachs relative to the total number of stomachs examined [14]. This index provides information on periods of low or high feeding activity in the studied frog population.

VI (%) = Ne /Nt ×100; Ne: number of empty stomachs; Nt: total number of stomachs examined.

- **Numerical percentage (%N):** This parameter quantifies the number of individuals belonging to a given prey category (*i*) within a sample [15]. It expresses the proportion of individuals of a given prey category relative to the total number of prey items identified in all stomachs examined. The numerical percentage is expressed as a percentage of the total number of prey items recorded

%Ni = ni/N ×100; ni: number of individuals belonging to prey category *i*, and (N): total number of prey items recorded in all stomachs examined.

- **Gravimetric percentage (%P):** This parameter quantifies the importance of each prey category by its mass. It expresses the proportion of the weight of a given prey category to the total weight of all identified prey items.

%P = Wi / Wt x 100; Wi: weight of prey category i; Wt: total weight of all prey items recorded in the stomachs examined.

- **Frequency of occurrence (%F):** This index is used to determine the number of stomachs in which a given prey category occurs. It is expressed as the percentage of the total number of non-empty stomachs containing that prey category [16].

% F = Si / St X 100; Si: number of stomachs containing prey category *I;* St: total number of non-empty stomachs examined.

2.6 Index of Relative Importance (IRI):

The dietary indices described above provide only a partial assessment of feeding habits when considered separately [17]. The Index of Relative Importance (IRI) provides a more comprehensive evaluation of each prey category's contribution to the diet. According to[18], the IRI was calculated as follows:

IRI = [(%Ni+%Pi) x %Fi]; %Ni is the numerical percentage of prey category *i*; (%Pi) is the gravimetric percentage of prey category *i*; (%Fi) is the frequency of occurrence of prey category *i* in the diet.

- **Classification of prey categories:** Consumed prey were classified according to the method proposed by Rosecchi and Nouazé [19]. This approach is based on the percentage contribution of the Index of Relative Importance (IRI), with prey categories ranked in descending order of their IRI values. Prey categories whose cumulative IRI percentages accounted for at least 50% of the total IRI were considered preferred prey. Categories whose cumulative IRI values, when added to those of the preferred prey, reached at least 75% of the total IRI were classified as secondary prey. All remaining prey categories were considered accessory prey.

2.7 Statistical Analyses

Non-parametric Kruskal–Wallis and Mann–Whitney tests were used to compare dietary composition among frog groups. The Kruskal–Wallis test was first applied to assess overall differences among groups. When significant differences were detected ($P < 0.05$), pairwise comparisons were subsequently performed using the Mann–Whitney U test to identify the groups responsible for these differences. All statistical analyses were conducted using STATISTICA version 7.1 [20].

Principal Component Analysis (PCA) was performed using R software version 4.4.3 to examine patterns in the distribution of prey items across the three habitat types: lowland sites (S-BAS), mangrove sites (S-PAL), and cultivated sites (S-CUL).

3 RESULTS

3.1 General Diet Composition

The stomach contents of 90 specimens of *Ptychadena mascareniensis* collected from the Ehotilé Islands were examined. Of these, 72 stomachs contained food, whereas 12 were empty, resulting in a vacuity index of 13.33%. Snout–vent length (SVL) of the examined individuals ranged from 29.8 to 48.2 mm.

A total of seven major prey categories were identified in the stomach contents of this frog species, namely insects, arachnids, annelids, molluscs, myriapods, crustaceans, and animal debris. In addition to these prey categories, macrophyte fragments and sand grains were also recorded.

Based on the Index of Relative Importance (IRI), insects were identified as the preferred prey category, accounting for 60.31% of the total IRI. Molluscs were classified as secondary prey, representing 16.08% of the total IRI. All remaining food categories were considered accessory prey. Within the insect prey category, ten orders were identified: Coleoptera, Hemiptera, Trichoptera, Heteroptera, Lepidoptera, Isoptera, Diptera, Orthoptera, Dermaptera, and Odonata. Among these, Coleoptera and Hemiptera were the most important prey groups, with IRI values of 17.88% and 17.42%, respectively. They were followed by Isoptera (IRI = 6.50%) and Lepidoptera (IRI = 5.71%). The overall composition of the diet is presented in Table 2.

Table 2: General diet composition of *Ptychadena mascareniensis* in the Ehotilé Islands, southeastern Côte d'Ivoire.

Prey items	F (%)	N (%)	P (%)	IRI (%)
Insects				
Coleoptera	9.62	15.03	9.52	17.88
Hemiptera	9.62	16.06	7.84	17.42
Trichoptera	3.85	3.89	11.25	4.41
Heteroptera	2.88	3.63	3.26	1.51
Lepidoptera	5.29	5.96	8.29	5.71
Isoptera	7.21	7.51	4.38	6.50
Diptera	3.85	4.15	3.79	2.31
Orthoptera	3.85	3.37	3.58	2.02
Dermaptera	2.40	2.33	2.50	0.88
Odonata	3.85	3.63	2.07	1.66
∑ Insects	52.40	65.54	56.47	60.31
Arachnids	3.37	2.59	7.20	2.50
Annelids	5.77	5.70	7.16	5.62
Molluscs	11.54	7.51	10.88	16.08
Myriapods	5.29	4.40	6.43	4.34
Crustaceans	6.25	2.07	8.69	5.10
Animal debris	3.85	3.11	1.57	1.36
Macrophytes	6.25	4.40	1.23	2,67
Sand	5.29	4,66	0,37	2,02
Total	100	100	100	100

F = frequency of occurrence (%); N = numerical percentage (%); P = gravimetric percentage (%); IRI = Index of Relative Importance

3.2 Diet Composition According to Age Class

Table 3 summarises the diet composition of adult and juvenile *Ptychadena mascareniensis*. In adult frogs, insects (IRI = 29.57%) and molluscs (IRI = 27.61%) were identified as the preferred prey categories. Crustaceans and annelids were classified as secondary prey, with IRI values of 10.70% and 10.45%, respectively, whereas all remaining prey categories were considered accessory prey.

In contrast, juveniles exhibited a highly specialised diet dominated by insects, which accounted for 97.39% of the total IRI. All other prey categories were classified as accessory prey. Within the insect category, Coleoptera, Hemiptera, and Isoptera were the most important prey groups consumed by juvenile individuals of *P. mascareniensis*. Despite the observed differences in prey composition, no significant difference in overall diet composition was detected between adult and juvenile individuals (Mann–Whitney U test: $n_1 = 18$, $n_2 = 15$, $U = 124.00$, $Z = -0.398$, $P = 0.691$).

Table 3: Diet composition according to age class in *Ptychadena mascareniensis* from the Ehotilé Islands.

	IRI (%)	
Prey items	**Adults n = 59**	**Juveniles n = 19**
Insects		
Coleoptera	10.58	23.22
Hemiptera	11.74	20.36
Trichoptera	1.86	8.09
Heteroptera	0.46	3.15
Lepidoptera	1.86	10.77
Isoptera	1.53	16.29
Diptera	0.12	5.40
Orthoptera	0.62	4.59
Dermaptera	0.17	2.42
Odonata	0.63	3.08
∑ Insects	**29.57**	**97.39**
Arachnids	3.00	0.87
Annelids	10.45	0.08
Molluscs	27.61	0.86
Myriapods	6.64	0.55
Crustaceans	10.70	0.00
Animal debris	1.92	0.24
Macrophytes	5.74	0.00
Sand	4.37	0.00
Total	**100**	**100**

n: number of stomachs containing food

3.3 Diet Composition According to Sex

The diet of male and female *Ptychadena mascareniensis* (Table 4) comprised eight prey categories, in addition to sand grains.

In males, molluscs and insects were identified as the preferred prey categories, with IRI values of 39.38% and 28.31%, respectively. All remaining prey categories were classified as accessory prey. In contrast, females primarily consumed insects (IRI = 30.52%), annelids (IRI = 16.71%), and crustaceans (IRI = 16.27%), which were classified as preferred prey. Molluscs were considered secondary prey (IRI = 13.23%), whereas prey categories with IRI values below 10%

were classified as accessory prey. Statistical analysis revealed no significant difference in diet composition between males and females (Mann–Whitney U test: $n_1 = 19$, $n_2 = 18$, $U = 166.00$, $Z = -0.152$, $P = 0.879$).

Table 4: Diet composition of male and female *Ptychadena mascareniensis* from the Ehotilé Islands, southeastern Côte d'Ivoire. *n* = number of non-empty stomachs examined

	IRI (%)	
Prey items	**Males n = 38**	**Females n = 21**
Insects		
Coleoptera	13.24	6.43
Hemiptera	5.10	19.68
Trichoptera	0.99	2.69
Heteroptera	0.72	0.18
Lepidoptera	3.65	0.21
Isoptera	2.01	0.85
Diptera	0.09	0.13
Orthoptera	0.78	0.36
Dermaptera	0.53	0.00
Odonata	1.20	0.14
∑ Insects	28.31	30.52
Arachnids	0.24	9.14
Annelids	5.16	16.71
Molluscs	39.38	13.23
Myriapods	5.47	6.91
Crustaceans	5.69	16.27
Animal debris	0.86	3.25
Macrophytes	8.11	2.44
Sand	6.77	1.39
Total	100	100

3.4 Diet Composition According to Habitat

The diet of *Ptychadena mascareniensis* was examined across the three sampling habitats (S-BAS, S-PAL, and S-CUL). Except for the S-PAL habitat, insects constituted the dominant prey category in all habitats (Table 5).

In the S-BAS habitat, insects were identified as the preferred prey category (IRI = 50.34%). Myriapods (IRI = 15.45%) and annelids (IRI = 13.18%) were classified as secondary prey, whereas all remaining prey categories were considered accessory prey.

In the S-PAL habitat, molluscs were the preferred prey category, accounting for 54.96% of the total IRI. Insects (IRI = 23.57%) were classified as secondary prey, while all other prey categories were considered accessory prey.

In the S-CUL habitat, insects overwhelmingly dominated the diet, accounting for 92.94% of the total IRI. All remaining prey categories were classified as accessory prey.

Despite these variations in prey composition among habitats, no significant differences in overall diet composition were detected among the three sampling sites (Kruskal–Wallis test: $n_1 = 17$, $n_2 = 18$, $n_3 = 16$, $P = 0.253$).

Table 5: Diet composition of *Ptychadena mascareniensis* across the three habitat types (S-BAS, S-PAL, and S-CUL) in the Ehotilé Islands, southeastern Côte d'Ivoire

Prey items	IRI (%)		
	S-BAS n 1= 21	S-PAL N2 = 32	S-CUL N3 = 26
Insects			
Coleoptera	9.94	9.27	24.05
Hemiptera	1.94	5.25	41.54
Trichoptera	20.16	1.63	0.00
Heteroptera	1.18	0.16	2.51
Lepidoptera	4.13	1.47	5.69
Isoptera	2.58	2.63	10.45
Diptera	0.78	0.91	4.00
Orthoptera	4.50	0.32	1.38
Dermaptera	0.00	0.20	3.23
Odonata	5.14	1.72	0.08
∑ Insects	**50.34**	**23.57**	**92.94**
Arachnids	2.67	7.00	0.33
Annelids	13.18	1.37	3.20
Molluscs	1.22	54.96	0.52
Myriapods	15.45	3.29	0.21
Crustaceans	10.51	0.68	0.00
Animal debris	1.23	3.37	0.24
Macrophytes	3.76	4.92	0.42
Sand	1.64	0.84	2.14
Total	100	100	100

3.5 Principal Component Analysis of Diet Composition Across Habitats

The dietary spectrum of *P. mascareniensis* across the three selected habitats comprised seven prey categories, in addition to macrophyte fragments and sand grains. The Principal Component Analysis (PCA) revealed that the first two principal axes (Axes 1 and 2) accounted for 28.18% and 21.03% of the total variance, respectively, yielding a cumulative explained variance of 49.21% (Figure 1A). The correlation circle (Figure 1B) showed that crustaceans and myriapods were strongly and positively associated with Axis 1. Similarly, insects, molluscs, arachnids, and macrophytes were positively correlated with Axis 2. The PCA ordination plot (Figure 1C) illustrates the distribution of prey categories according to sampling sites. Axis 1 clearly discriminated prey items associated with the cultivated habitat (S-CUL), which were positioned on the negative side of the axis.

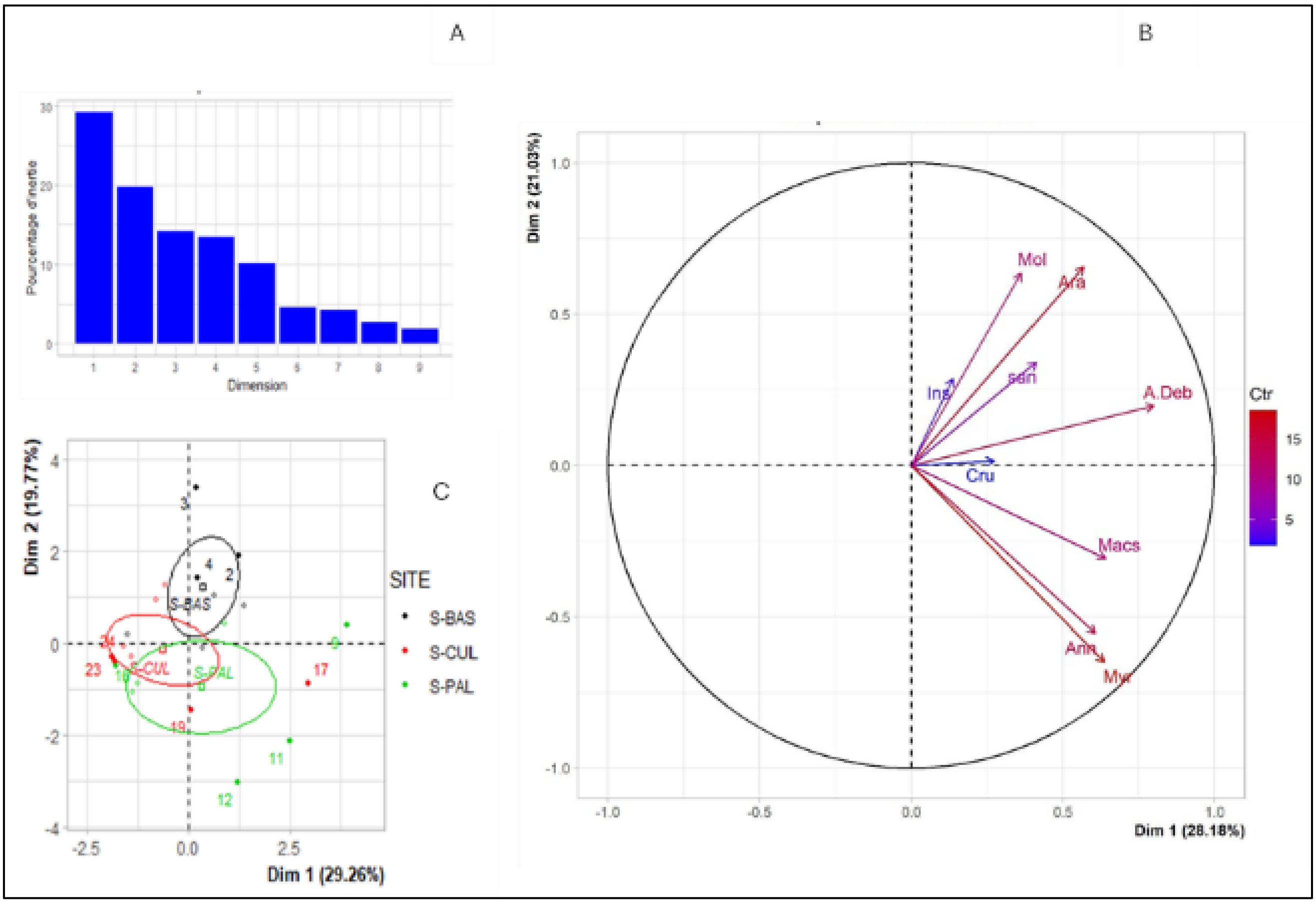

Figure 1: Principal Component Analysis (PCA) of prey categories recorded in *Ptychadena mascareniensis* from the Ehotilé Islands, southeastern Côte d'Ivoire: (A) Scree plot of eigenvalues; (B) Correlation circle of variables on the first two principal components (PC1 and PC2); (C) Spatial distribution of prey categories

4 DISCUSSION

The analysis of the diet of *Ptychadena mascareniensis* in the Ehotilé Islands revealed a clear predominance of insects (IRI = 60.31%), primarily Coleoptera and Hemiptera. This high insect consumption confirms the species' predominantly insectivorous feeding habit. Similar findings have been reported for several West African anurans, particularly species of the genus *Ptychadena* and *Hoplobatrachus occipitalis*, whose diets are largely dominated by insects, especially Coleoptera, Orthoptera, Hemiptera, and Diptera [6]. According to [2], the predominance of insects in anuran diets is generally associated with their abundance, high seasonal availability, and substantial energetic value.

The high representation of Coleoptera and Hemiptera observed in the present study may be explained by the ecological characteristics of the Ehotile Islands. Coleopterans are particularly abundant in leaf litter and soils rich in organic matter, whereas hemipterans are commonly associated with herbaceous vegetation and cultivated habitats. Similar patterns have been reported for several amphibian species inhabiting West African forests and agroecosystems [6], where these insect groups constitute some of the most abundant and readily available food resources. The predominance of these prey groups suggests that *Ptychadena mascareniensis* mainly forages in terrestrial microhabitats, where insects associated with leaf litter, low vegetation, and cultivated areas are particularly abundant. This feeding strategy may enhance the species' ability to exploit locally available resources and adapt to the heterogeneous habitats found within the Ehotile Islands.

Molluscs represented the second most important prey category (IRI = 16.08%). Their relatively high contribution to the diet may be related to the humid environmental conditions that characterize the Ehotile Islands, particularly mangrove ecosystems and habitats rich in organic litter. Gastropods are generally abundant in tropical wetland ecosystems and constitute a significant food resource for several anuran species [2]. The occurrence of crustaceans, annelids, and myriapods further highlights the opportunistic feeding behaviour of *Ptychadena mascareniensis* and its ability to exploit a wide range of trophic resources.

The low vacuity index (13.33%) indicates that most examined individuals (86.67%) contained prey in their stomachs. This finding reflects intense feeding activity and suggests a high availability of trophic resources within the study area.

According to [21], low vacuity indices are generally associated with favourable ecological conditions and abundant prey availability. Similar low vacuity indices have been reported in several African amphibian species inhabiting tropical wetlands [22]. Overall, these results suggest that the Ehotile Islands provide suitable foraging conditions that support regular feeding activity in *P. mascareniensis*.

The ontogenetic analysis of diet composition revealed marked differences between juvenile and adult individuals. Juveniles exhibited a diet almost exclusively composed of insects (IRI = 97.39%), whereas adults exploited a broader range of food resources, including molluscs, crustaceans, and annelids. Such ontogenetic shifts in diet are common among amphibians and generally reflect a progressive expansion of the trophic niche with growth and development [4], [2]. The small body size and limited gape width of juveniles restrict their ability to capture large prey, leading them to feed predominantly on small insects. In contrast, adults, owing to their larger body size and enhanced locomotor abilities, are capable of capturing a wider variety of prey, including larger and more energetically profitable food items.

The differences observed between males and females suggest partial trophic segregation. Males consumed a higher proportion of molluscs (IRI = 39.38%), whereas females more frequently exploited annelids, crustaceans, and arachnids. In anurans, such dietary differences may be associated with sex-specific energetic requirements related to reproduction as well as differential use of microhabitats [2]. Females, particularly during vitellogenesis, require greater energetic inputs and may therefore select prey that are richer in proteins and lipids. Nevertheless, the predominance of insects in the diets of both sexes indicates substantial trophic overlap and further supports the generalist feeding strategy of *Ptychadena mascareniensis*.

The dietary variations observed among habitats highlight the strong influence of local resource availability on the feeding ecology of *Ptychadena mascareniensis*. In the cultivated habitat (S-CUL), insects accounted for more than 90% of the total IRI, with Hemiptera and Coleoptera being the dominant prey groups. Agroecosystems are generally characterised by a high abundance of phytophagous and detritivorous insects, promoted by plant diversity and the continuous input of organic matter [23]. The high consumption of these insects suggests that *P. mascareniensis* may contribute to the biological control of certain crop pests, thereby playing an important functional role within these agricultural ecosystems.

In the mangrove habitat (S-PAL), the predominance of molluscs is likely related to the high humidity, muddy substrates, and accumulation of organic litter that characterize mangrove environments. In contrast, the greater diversity of prey categories recorded at the lowland site (S-BAS) may reflect higher microhabitat heterogeneity and a greater availability of soil-dwelling invertebrates. These findings are consistent with recent studies conducted in West Africa, which have shown that habitat characteristics and agricultural practices strongly influence both amphibian community structure and the availability of trophic resources [9], [8]. Agroecosystems and other human-modified habitats generally favour certain groups of invertebrates, particularly insects. In contrast, natural wetland habitats such as mangroves provide suitable conditions for molluscs and other organisms associated with moist substrates.

Overall, the observed habitat-related variation in diet composition demonstrates the high trophic plasticity of *P. mascareniensis*. This flexibility likely enhances the species' ability to exploit locally available resources and may contribute to its successful persistence across a wide range of environmental conditions within the Ehotile Islands.

The results of the Principal Component Analysis (PCA) further support these findings. The first two principal axes explained nearly half of the total variability in the dataset (49.03%), indicating that diet composition was structured according to habitat characteristics. The association of the cultivated habitat (S-CUL) with insects, the mangrove habitat (S-PAL) with annelids and myriapods, and the lowland habitat (S-BAS) with molluscs and arachnids suggests that *P. mascareniensis* adjusts its feeding strategy to the most readily available resources within each habitat. Such dietary flexibility is characteristic of opportunistic anurans inhabiting tropical ecosystems [6], [2].

Overall, this study demonstrates that *P. mascareniensis* is a predominantly insectivorous species that exhibits considerable trophic plasticity and an opportunistic feeding strategy, enabling it to exploit a wide variety of food resources across developmental stages, sexes, and habitat characteristics. This dietary flexibility is likely a key factor underlying the species' adaptation to the insular ecosystems of the Ehotile Islands and may explain its ability to successfully occupy both natural and human-modified habitats.

5 CONCLUSION

Ptychadena mascareniensis is a predominantly insectivorous species that exhibits marked trophic plasticity and an opportunistic feeding strategy. The species is capable of adjusting its diet according to developmental stage, sex, and habitat characteristics, thereby exploiting a wide range of available food resources. Insects, particularly Coleoptera and Hemiptera, constituted the dominant prey category, although substantial variations in prey composition were observed among habitats and age classes. This dietary flexibility likely contributes to the ecological success of *P. mascareniensis* in the insular ecosystems of the Ehotilé Islands. Furthermore, the high consumption of phytophagous insects in cultivated areas suggests that the species may play an important ecological role in the natural regulation of agricultural pests. These findings improve our understanding of the feeding ecology of amphibians in Côte d'Ivoire and highlight the ecological importance of *P. mascareniensis* in both natural and human-modified environments.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Authors' contributions

All authors made significant contributions to this study, from the sampling phase through the drafting, critical review, and approval of the final version of the manuscript. They have all read and approved the final version of the article.

REFERENCES

[1] Duellman WE, Trueb L. 1994. Biology of Amphibians. Johns Hopkins University Press, Baltimore, Maryland, USA, 670 p

[2] Wells KD. 2007. The Ecology and Behavior of Amphibians. The University of Chicago Press, Chicago and London, 1148 p. https://doi.org/10.7208/chicago/9780226893334.001.0001

[3] Wickramasingha B, West J, Bellanthudawa BKA, Graziano MP, Surasinghe TD. 2026. The multifaceted importance of amphibians: ecological, biomedical, and socio-economic perspectives. Biology, 15(1): 98. https://doi.org/10.3390/biology15010098

[4] Werner EE, Gilliam JF. 1984. The ontogenetic niche and species interactions in size-structured populations. Annual Review of Ecology and Systematics, 15: 393–425. https://doi.org/10.1146/annurev.es.15.110184.002141.

[5] Toft CA. 1985. Resource partitioning in amphibians and reptiles. Copeia, 1985(1): 1–21. https://doi.org/10.2307/1444785

[6] Rödel MO. 2000. Herpetofauna of West Africa. Volume I: Amphibians of the West African Savanna. Edition Chimaira, Frankfurt am Main, Germany, 335 p.

[7] Channing A, Rödel MO. 2019. Field Guide to the Frogs & Other Amphibians of Africa. Struik Nature, Penguin Random House South Africa, Cape Town, South Africa, 408 p.

[8] Aisien MSO, Edo-Taiwo O, Imasuen AA. 2021. Ecological Scenarios and Parasite Diversity in Anurans of West Africa: A Review. Diversity, 13(6): 223. https://doi.org/10.3390/d13060223

[9] Oussou KH, Assemian NE, Kouadio AL, Tiédoué MR, Rödel MO. 2022. The anuran fauna in a protected West African rainforest and surrounding agricultural systems. Amphibian & Reptile Conservation, 16(1): 1–13 (e298).

[10] ESCO. 2006. Parc national des îles Éhôtilé (Côte d'Ivoire). Centre du patrimoine mondial de l'UNESCO, Paris, France. Available at: https://whc.unesco.org/fr/listesindicatives/2099/ accessed on 18/06/2026.

[11] Crump, M L., & Scott, N J., Jr. (1994). Visual encounter surveys. In W. R. Heyer, M. A. Donnelly, R. W. McDiarmid, L. C. Hayek, & M. S. Foster (Eds.), Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians (pp. 84–92).

[12] Roth, H., 1979. *Introduction to the Morphology, Systematics and Biology of Insects*. ORSTOM, Paris, 333 p.

[13] Tachet, H., Richoux, P., Bournaud, M. & Usseglio-Polatera, P., 2010. *Freshwater Invertebrates: Systematics, Biology and Ecology*. CNRS Éditions, Paris, France, 607 p

[14] Sorbe, J.C., 1980. Diet of *Micromesistius poutassou* (Risso, 1826) in the southern Bay of Biscay. *Revue des Travaux de l'Institut des Pêches Maritimes*, 44(3): 245–255.

[15] Hureau, J.C., 1970. Comparative biology of some Antarctic fishes (Nototheniidae). *Bulletin de l'Institut Océanographique de Monaco*, 68(1391): 1–244.

[16] Young JW, Le Duyet TD, Bradford RW, Whitelaw AW. 1997. Feeding ecology and interannual variations in diet of southern bluefin tuna, Thunnus maccoyii, in relation to coastal and oceanic waters off eastern Tasmania, Australia. Environmental Biology of Fishes, 50(3): 275–291. https://doi.org/10.1023/A:1007326120380.

[17] Wootton RJ. 1990. Ecology of Teleost Fishes. Fish and Fisheries Series, Vol. 1. Chapman & Hall, London, UK, 404 p. https://doi.org/10.1007/978-94-009-0829-1.

[18] Pinkas L, Oliphant MS, Iverson ILK. 1971. Food habits of albacore, bluefin tuna and bonito in California waters. Fish Bulletin, 152: 1–105.

[19] Rosecchi, E. & Nouaze, Y., 1987. Comparison of five indices used in the analysis of stomach contents. *Revue des Travaux de l'Institut des Pêches Maritimes*, 49: 111–123.

[20] StatSoft Inc. 2005. STATISTICA (Data Analysis Software System), Version 7.1. StatSoft Inc., Tulsa, OK, USA.

[21] Hyslop EJ. 1980. Stomach contents analysis: a review of methods and their application. Journal of Fish Biology, 17(4): 411–429. https://doi.org/10.1111/j.1095-8649.1980.tb02775.x

[22] Ofori-Boateng C, Oduro W, Hillers A, Norris K, Oppong SK, Adum GB, Rödel MO. 2013. Differences in the effects of selective logging on amphibian assemblages in three West African forest types. Biotropica, 45(1):94–101. https://doi.org/10.1111/j.1744-7429.2012.00887.x

[23] Altieri MA. 1999. The ecological role of biodiversity in agroecosystems. Agriculture, Ecosystems & Environment, 74(1–3): 19–31. https://doi.org/10.1016/S0167-8809(99)00028-6