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https://dx.doi.org/10.4314/nvj.v44i1.5 **ORIGINAL ARTICLE**

MORPHOLOGICAL IDENTIFICATION OF THE WHIZZLING SAND SNAKE: PSAMMOPHIS SIBILANS IN ZARIA, NORTHWESTERN NIGERIA

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SUMMARY

Background: Despite extensive research on snakes, although subject to some variation and ignored by many authors, scarce information is available on the morphology of *Psammophis Sibilans*.

Objectives: This research aimed to study the morphological characterization of *Psammophis Sibilans* in Zaria, Northwestern Nigeria, as a basis for its morphological identification which may be extrapolated or used as baseline data to show the reliability of scale count in species determination of *Psammophis Sibilans*.

Methods: Active capture methods were used on free-range snakes and scales were counted to distinguish between the families, generic and specific levels.

Results: The result showed that on the head shield, the loreal [1.0±0.00], pre-nasal[2.0±0.00], internasal[2.0±0.00],preocular[4.0±0.00],supraocular[2.0±0.00],frontal[1.0±0.00], parietal[2.0±0.00] were all the same for all the population studied (n = 20). The dorsal scale [18.00±0.00], and anal plate [1.00±0.00] were also the same for all the snakes studied while the ventral scales [173±2.83], and tail scales [191.30±1.76] showed significant differences within the group. For the zoometric parameters, the body length [85.33±0.44], mid-circumference [7.40±0.10], head length [3.50±0.29], and tail length [32.17±0.17] all showed significant differences within and between the population except for the head width [1.00±0.00].

In conclusion: The head shields are more reliable in the identification of *Psamophis sibilans* than the zoometric parameters studied, except for the head width. We also discovered a significant variation in the loreal head shield which was just one for all the population studied as opposed to studies from Egypt and Ethiopia where a range of one to two was reported.

Keywords: head shields, zoometric parameters, scale count, *Psamophis sibilans*

INTRODUCTION

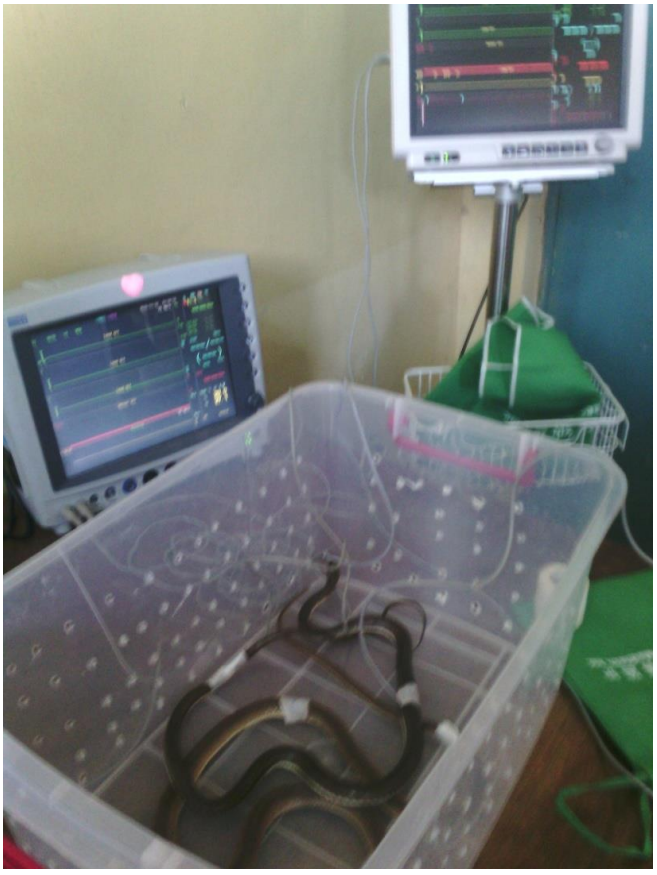
One of the most important factors in toxinological research is the ability to precisely and concisely identify the species of animals without any chances of error [1; 2]. Global standard in herpetology relies in phenotypic and DNA identification of venomous species [3;4]. Every country should be able to develop a database of reptiles within her country to help in conservation and research [2]; such database is not available in Nigeria. As a result of which toxinologists in Nigeria rely mostly on expressed traits and scale count as a means of identification [5]. The snake DNA database has not been developed in Nigeria for the identification of snakes, and hence emphasis is placed on scale count which can prove as effective as finger printing in humans [5]. Snake scales are formed by differentiation of the snake's underlying skin or epidermis[6; 4]. Each scale has an outer surface and an inner surface[7; 8]. The skin from the inner surface hinges back and forms a free area which overlaps the base of the next scale which emerges below this scale[6; 4]. A snake hatches with a fixed number of scales. The scales do not increase in number as the snake matures nor do they reduce in number over time[9; 6]. The scales however grow larger and may change shape with each moult[7]. This makes scale count a very reliable tool in specie identification. Scales do not play an important role in distinguishing between the families but are important at generic and specific level[10;11]. Scale arrangements are important, not only for taxonomic utility, but also for forensic reasons and conservation of snake species[6;12].There is an elaborate scheme of nomenclature of scales. Scales patterns, by way of scale surface or texture, pattern and colouration and the division of the anal plate, in combination with other morphological characteristics, are the principal means of classifying snakes down to species level[6; 13].The scales patterning may also be used for individual identification in field studies[14]. Clipping of specific scales, such as the subcaudals, to mark individual snakes is a popular approach to population estimation by mark and recapture techniques[14]. The whizzing sand snake, *Psamorphis sibilans*, is the most abundant in Northwestern Nigeria, it is often encountered in farmlands, along bush paths, residential areas, playgrounds, and almost everywhere their prey (mice, rats, lizards, smaller snakes, etc) are found [5]. This research aimed to study the morphological dimorphism for the characterization of *Psammophis sibilans* in Zaria, Northwestern Nigeria, as a basis for its morphological identification.

MATERIALS AND METHOD

Snakes

Thirty snakes (*Psammophis sibilans*) were caught from different localities of Zaria and environ, Kaduna State, Nigeria, and were identified at the Department of Veterinary

Pharmacology and Toxicology, Ahmadu Bello University Zaria. The active capture method described by Dorcas and Wilson [14], was adopted. Free-range snakes, snakes on shrubs, and snakes hiding under rocks, logs, and shallow burrows were sourced and captured. The presence/absence of hemipenes was used to determine the sexes. Blood samples (2 ml) were collected from each snake through the caudal vein for full blood count and differential leucocyte counts, they were screened for blood and gastrointestinal parasites, and their temperature, respiratory rate, and pulse rate were also determined. Twenty of the healthiest snakes were selected for the study. All the captured snakes were released back into the wild after the study which lasted for only 72 hours.



Determination of pulse rate, respiratory rate, and temperature of *Psamophis sibilans* in Zaria.

Head shields

The snakes were properly restrained, and the following scales were counted on the head:

I. **Rostral scales –** Found on the snout of the snake.

II. **Loreal scale –** Found between the preocular and the postnasal scales.

III. **Prenasal scale –** Found at the outer nasal (near the snout).

IV. **Internasal scale –** Found along the top of the snout connecting the nasals on both sides of the head.

V. **Preocular scales -** The circumorbital scales towards the snout or the front are called preocular scales, and those towards the rear are called postocular scales.

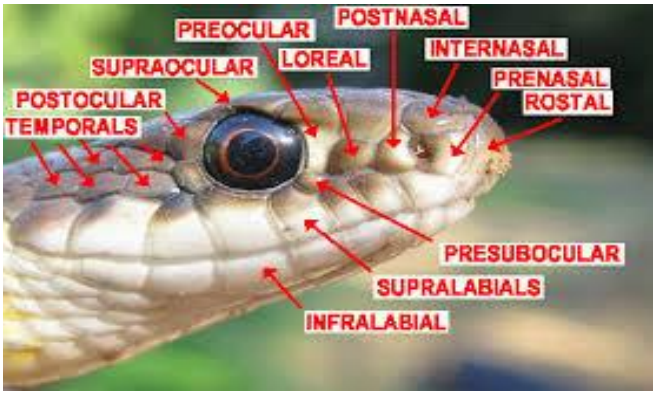
VI. **Supraoccular scales -** and those towards the upper or dorsal side are called supraocular scales. Circumorbital scales towards the ventral or lower side, if any, are called subocular scales.

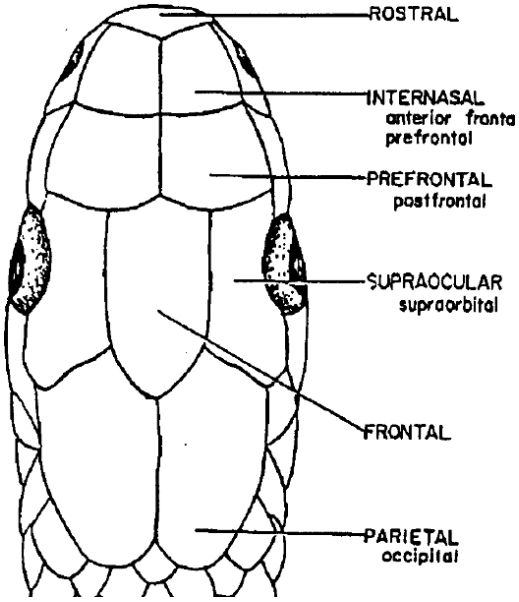
VII. Frontal scale – Found on top of the head, between the eyes, adjacent to the supraoculars.

VIII. **Parietal scales –** Found on the back of the top of the head has scales connected to the frontal.

IX. **Upper labial –** Found on the lower lips from the right to the left commeasures.

X. **Lower labial –** Found on the upper lips from the right to the left commeasures.





Head shield of Psammophis sibilant [6]

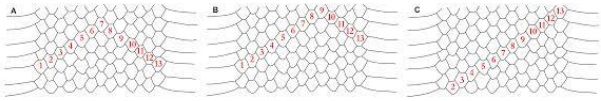
Body scales

III. **Dorsal scales -** The scales on the dorsum of the snake are called the dorsal or costal scales.

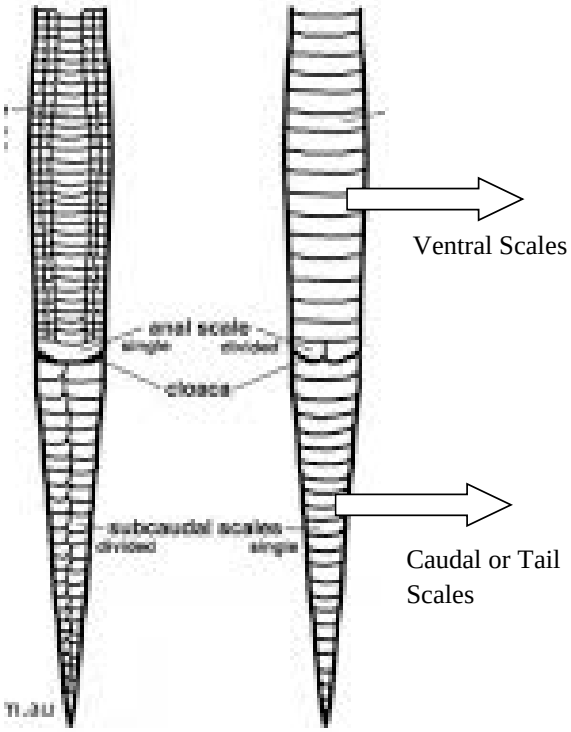
IV. **Ventral scales -** The enlarged scales on the belly of the snake are called ventral scales or gastrosteges.

I. **Anal plate -** At the end of the ventral scales of the snake is an anal plate that protects the opening to the cloaca.

II. **Tail scales -** The part of the body beyond the anal scale is considered to be the tail.



Dorsal scale count of *Psamophis sibilans* [6]



Ventral and tail scales count of *Psamophis sibilans* [6]

Zoometric parameters

I. **Body length** – It is the distance between the first ventral scales to the anal plate.

II. **Mid-circumference** – It is mid circular diameter around the body midpoint of the body length.

III. **Head width** – It is the distance from the base of the left eye to the base of the right eye.

IV. **Head length** – It is the distance from the rostral shield to the base of the parietal shield.

V. **Tail length** – It is the distance from the anal plate to the tip of the tail.

DATA ANALYSIS

All data recorded were expressed as Mean ±Standard Error of the Mean (SEM) and analyzedby one-way Analysis of variance (ANOVA), In all the analyses,Graphpad Prism version 5.0 for Windows fromGraphpad Software, San Diego, California wasused; *P* values less than 0.05 were considered significant.

RESULTS AND DISCUSSION

The head shields of *Psamophis sibilans* found in Zaria Northwestern Nigeria were constant for the entire population (Table 1).

Table 1: Head shields of *Psamophis sibilans* in Zaria Northwestern Nigeria (n = 20)

Shield	Male (Mean± SEM)	Female (Mean±SEM)	Range	Mean average
Rostral	1 ± 0.00	1 ± 0.00	1 – 1	1
Prenasal	2 ± 0.00	2 ± 0.00	2 – 2	2
Internasal	2 ± 0.00	2 ± 0.00	2 – 2	2
Preoccular	4 ± 0.00	4 ± 0.00	4 – 4	4
Supraoccular	2 ± 0.00	2 ± 0.00	2 – 2	2
Frontal	1 ± 0.00	1 ± 0.00	1 – 1	1
Parietal	2 ± 0.00	2 ± 0.00	2 – 2	2
Loreal	1 ± 0.00	1 ± 0.00	1 – 1	1

There was no significant difference at $p \geq 0.05$ within groups. This is very important for the identification of this snake in Zaria. A constant reoccurrence of a similar pattern within a population of snakes is an important pointer to a common ancestry [15; 16; 2; 11]. The phylogenic tree can thus be constructed to include these measurable factors which seem constant within a population of the snake specie. Although DNA remains the significant tool for identification [9; 18; 10], head shields can also be of help where the DNA cannot be easily accessed.

There was a wide variation in the ventral scales (151 - 183), and the caudal or tail scales (87 - 110) of the population studied (table 2),

Table 2: Body scales of *Psamophis sibilans* in Zaria Northwestern Nigeria (n = 20)

scale	Male (Mean±SEM)	Female (Mean±SEM)	Range	Mean average
Dorsal	18 ± 0.00	17.8 ± 0.12	17 – 18	17.92 ± 0.04
Ventral	179 ± 0.41	173 ± 0.08	151 – 183	176.5 ± 0.26
Anal plate	2 ± 0.00	2 ± 0.00	2 – 2	2 ± 0.00
Tail	97 ± 1.16	92 ± 0.62	87 – 110	96.3 ± 1.76

this increases the chances of error in identification since different other species can also fall into this category [6; 8]. But a constant anal plate (2 ± 0.00) was constant for the entire population which also suggests a common ancestry [15; 16;2;17. The dorsal scales were also reliable, though to a lesser extent (17 - 18). Although the condition of the anal plates has been considered a diagnostic feature between *phillipsi* (1 anal plate) and (2 anal plates)*sibilans*or *rukwae*,[19]. Some authors named all specimens (including those with 2 anal plates) 'phillipsi' [4; 19; 20].

The morphometric features were significantly different within the specie except for the head width and mid-circumference (table 3).

Table 3: Morphological dimorphism of *Psamophis sibilans* in Zaria Northeastern Nigeria (n = 20)

Parameter (cm)	Male (Mean±SEM)	Female (Mean±SEM)	Range	Mean average
Body length	87.23 ± 0.44	83.44 ± 1.82	82 - 112	85.33 ± 1.14
Mid-circumference	7.83 ± 0.10	6.97 ± 0.06	6.5 – 8.2	7.40 ± 0.12
Head length	3.6 ± 0.87	3.2 ± 1.22	2.26 – 4.74	3.50 ± 0.29
Head width	1.00 ± 0.00	1.00 ± 0.00	1 – 1	1.00 ± 0.00
Tail length	32.5 ± 0.02	32.1 ± 0.07	31.45 – 32.88	32.17 ± 0.17

CONCLUSION

Based on the finding of this research study, the following conclusions were drawn:

I. The head shields of *Psamophis sibilans* were constant and hence very valuable for morphometric identification (rostral 1, prenasal 2, internasal 2, preocular 4, supraoccular 2, frontal 1, parietal 2, loreal 1).

II. The body scales dimorphisms were significantly different and thus not reliable in specie identification for *Psamophis sibilans* except for the anal plates which are constant for the entire population studied.

III. All the zoometric parameters measured were significantly different and thus not suitable for specie identification, however, the head width was constant for the entire population studied. The head with con thus is of the head.

IV. *Psamophis sibilans* can be identified morphologically using the head shields (rostral, prenasal, internasal, preoccular, supraoccular, frontal, parietal, and loreal shields), anal plates, and the head width.

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