

# Taxonomic notes on the head squamation of the genus *Liotyphlops* Peters, 1881 (Serpentes, Anomalepididae)

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## Abstract

The only head scales which are consistent for *Liotyphlops* taxonomy are the rostral, prefrontal, and frontal scales. Subdivisions and nomenclature of scales posterior to the prefrontal, frontal, nasal and above supralabials two, three and four should be avoided.

## Key Words

Anomalepididae, blindsnakes, meristic data, scales, Scolecophidia, taxonomy

According to modern taxonomy, *Liotyphlops* consists of 12 species popularly known as “blindsnakes” (Santos and Reis 2018; Boundy 2021; Linares-Vargas et al. 2021; Entiauspe Neto 2023; Marra Santos 2023): *Liotyphlops albirostris* (Peters, 1858); *Liotyphlops anops* (Cope, 1899); *Liotyphlops argaleus* Dixon & Kofron, 1984; *Liotyphlops bondensis* (Griffin, 1916); *Liotyphlops caissara* Centeno, Sawaya & Germano, 2010; *Liotyphlops haadi* Silva-Haad, Franco & Maldonado, 2008; *Liotyphlops palauophis* Marra Santos, 2023; *Liotyphlops schubarti* Vanzolini, 1948; *Liotyphlops taylori* Santos & Reis, 2018; *Liotyphlops ternetzii* (Boulenger, 1896); *Liotyphlops trefauti* Freire, Caramaschi & Argôlo, 2007; and *Liotyphlops wilderi* (Garman, 1883). In recent years, the description of new species of Anomalepididae have been restricted to the genus *Liotyphlops* (Freire et al. 2007; Haad et al. 2008; Centeno et al. 2010; Santos and Reis 2018; Marra Santos 2023).

The rows of cycloid scales posterior to the prefrontal, frontal, nasal and above supralabials two, three and four present enormous variability in quantity and shape, which makes it very difficult to establish a reliable delimitation for the use of these rows of scales as diagnostic characters among *Liotyphlops* species. The aim of this study is to demonstrate that the main cephalic scales for the taxonomy of *Liotyphlops* are the rostral, prefrontal, and frontal

scales, plus supralabials and infralabials, complemented with scales in the first vertical row of dorsals.

Authors of some recent studies on *Liotyphlops* taxonomy have decided to name rows of scales posterior to the prefrontal scales (Linares-Vargas et al. 2021; Entiauspe Neto 2023), however the validity of the subdivision and nomenclature of scales posterior to the prefrontal in *Liotyphlops* species has already been discussed and discouraged by Dixon and Kofron (1984). In this work the authors wrote: “The only scales that appear to be consistently defined in all writings are the rostral, prefrontal and frontal scales” (Dixon and Kofron 1984: 242).

They wrote the following: “Considering the number of errors made by previous authors, we have concluded that only an examination of the type material would reveal the true nature of the genus and its attendant species. In addition, we have decided that all head scales that lie posterior to the rostral, prefrontal, frontal and nasal scales, and above supralabials two, three and four, should not be affixed with names except as they occur in more or less vertical rows. We have done this in order to avoid all earlier authors’ remarks as to specific names that have not been consistent among the authors. This allowed us some degree of freedom in recognizing certain patterns of scale arrangement that have facilitated the identification of species groups” (Dixon and Kofron 1984: 242).

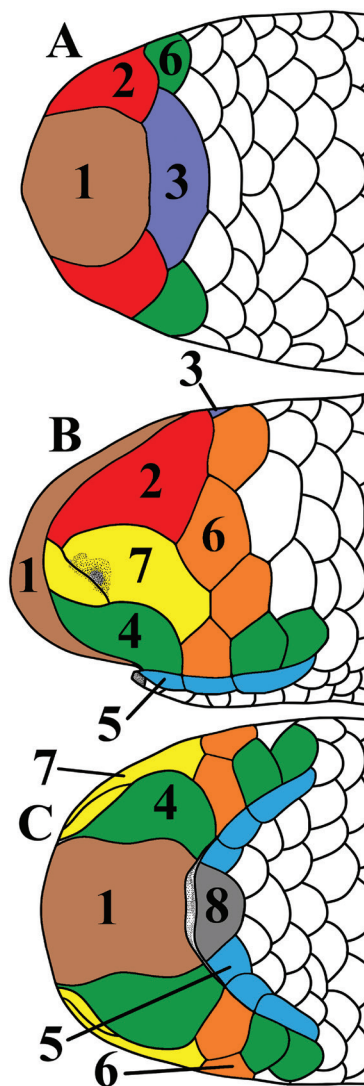
I disadvise the naming of these scales, even if they occur in more or less vertical rows, because the variability in the arrangement of these vertical rows is huge and even within a series of specimens of *Liotyphlops* spp. belonging to the same population this arrangement is very variable. As described earlier, the rows of cycloid scales posterior to the prefrontal, frontal, nasal and above supralabials two, three and four present enormous variability in quantity and shape, which makes it very difficult to establish a reliable delimitation for the use of these rows of scales as diagnostic characters among *Liotyphlops* species.

Regarding the research of Dixon and Kofron (1984), in the part where they dealt with the characters historically used in descriptions of *Liotyphlops*, Marra Santos (2023: 89) wrote the following: “Here it is important to highlight the research of Dixon and Kofron (1984). They observed that most of the characters utilized for described forms are variable within populations, and occasionally the squamation is different on each side of the head in an individual. Also, according to Dixon and Kofron (1984), the nasal scale is divided and is variously called upper and lower nasals, preseminasals and postseminasals, anterior nasals and postnasals, or just nasals; additionally, the lateral and dorsomedian head scales are variously called subocular(s), preocular(s), ocular, supraocular(s), frontal, and postfrontal(s). They explained that much depends upon one’s concept of the position of the scales as to whether there are two suboculars and one preocular, or two preocular and one subocular, or two supraoculars and one preocular, or two preoculars and one supraocular, etc. According to Dixon and Kofron (1984) the presence or absence of the division and/or fusion of scales on one side of the head and not on the other has been largely ignored by most describers of *Liotyphlops* species, which has, therefore, resulted in poor species concepts; the only scales that appear to be consistently defined in all writings are the rostral, prefrontal, and frontal scales”.

Although it has already been widely discussed and demonstrated objectively by Dixon and Kofron (1984) that in *Liotyphlops* species, the only head scales which are consistent for *Liotyphlops* taxonomy are the rostral, prefrontal, and frontal scales, some recent authors (e.g., Linares-Vargas et al. 2021; Entiauspe Neto et al. 2023) have decided to subdivide and name the posterior scales to the prefrontals. Here, it is interesting to note that Entiauspe Neto et al. (2023: 14) decided to name scales posterior to the prefrontal and validated his decision by attributing to Dixon and Kofron (1984) the nomenclature of these scales. Despite this wrong inference, Dixon and Kofron (1984: 243), contrary to what was presented by Entiauspe Neto and his collaborators, have decided not to name individual scales as subocular, preocular, ocular, supraocular, etc., because according to them the eye spot is not always evident below a scale normally called “ocular” and may be entirely absent. Furthermore, according to Dixon and Kofron (1984: 243) concerning the subdivision and nomenclature of posterior scales to the prefrontals, the subocular may or may not be present, dependent upon what one labels as an ocular; ad-

ditionally, the postfrontal immediately follows the frontal and consists of one wide scale of equal width to the frontal, or two scales of one half the width of the frontal, or three scales that are of the same size as the rest of the posterior head scales; the size and number of postfrontals is not consistent in any species (Dixon and Kofron 1984: 243).

Based on what has been presented here on head squamation for taxonomic studies of *Liotyphlops* species, my suggestion (especially to those inexperienced in *Liotyphlops* taxonomy) is to focus their analyses on the following scales: rostral, prefrontal, frontal, supralabials, infralabials, and scales in the first vertical row of dorsals (Fig. 1). It is important to note that the scales in the first vertical row of dorsals are in contact with the prefrontal and nasal and, therefore, the number of scales in contact with the prefrontal and nasal is a diagnostic character for *Liotyphlops* species (for example, *L. albirostris* has 3 scales contacting the posterior edge of the prefrontal and 1 scale contacting the posterior edge of the nasal be-



**Figure 1.** A. Dorsal view, B. Lateral view, and C. Ventral view of the head squamation of *Liotyphlops*. 1 – rostral; 2 – prefrontal; 3 – frontal; 4 – supralabial; 5 – infralabial; 6 – scales in the first vertical row of dorsals; 7 – nasal; 8 – mental.

tween the second supralabial and prefrontal; *L. anops* has 4 scales contacting posterior edge of the prefrontal and 2 scales contacting the posterior edge of the nasal between the second supralabial and prefrontal).

An important observation is that some authors of new species of *Liotyphlops* decided to follow Dixon and Kofron (1984) (Centeno et al. 2010; Santos and Reis 2018; Marra Santos 2023) in the terminology used for the head scalation and the result is that the characters analyzed by these authors, based on head scalation, can be compared in all known *Liotyphlops* species.

In conclusion, the proposal presented here aims to provide a better standardization in obtaining meristic characters obtained from head squamation of species belonging to the genus *Liotyphlops*, so that these characters can be comparable among all species of *Liotyphlops*, which will enable a better understanding of the taxonomy of this incredible group of snakes.

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