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Illustrated Key to the Snakes of the Philippines

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Introduction

In this contribution we present an illustrated key to the snakes of the Philippine archipelago (Fig. 1). Following on our recent systematic review of all credible terrestrial and marine snake records for the country (Leviton et al. 2018), our goal here has been to distinguish comprehensively all species ascribed to the country, organize the taxa in accordance with the up-to-date classification, and assemble a dichotomous key, arranged hierarchically by superfamily, family, genus, and species. Here we also provide illustrations of the salient diagnostic characters, summarized so as to be accessible not only to academic herpetologists, but also biologists of other subdisciplines, Philippine government natural resource officers, local area wildlife managers, ecotourists, the general public, and most importantly, students.

The last systematic review and comprehensive key to the species of Philippine snakes was that of Taylor (1922a), who included the seven families, 41 genera, and 108 species known at the time. Various contributions since that time took the form of a field guide (Alcala 1986), selected reviews of portions of the fauna (i.e., Taylor 1963; Gaulke 2011), and a comprehensive series of papers constituting a systematic revision of the archipelago's fauna by Leviton (1957–1983) and colleagues (Inger and Marx 1965; Malnate and Underwood 1988; Brown et al. 1999, 2001; Wallach et al. 2007; Wynn et al. 2016). Following nearly a decade of focused terrestrial biodiversity inventory work (reviewed by Brown et al. 2013a) that resulted in the collection of many rare snake species from throughout the archipelago's major faunal regions (e.g., Phenix et al. 2011; Brown et al. 2012, 2013; Sanguila et al. 2016; Weinell et al. 2019) as well as amassing considerable genetic resources that are now to be found in biodiversity repositories (CMNH, TNHC, PNM, KU), genetic data from Philippine snake species has become accessible for inclusion in molecular phylogenetic studies. Consequently, our knowledge of the systematic affinities of many of the country's rare and diverse taxa has increased significantly (Vidal et al. 2007, 2010; Pyron et al. 2011; 2013; Pyron and Wallach 2014; Figueroa et al. 2016; Weinell and Brown 2017). Most recently, whole sections of the archipelago's snake fauna have been included in molecular phylogenetic analyses, thus allowing researchers to employ time-calibrated molecular phylogenetic analyses to investigate the timeframes for diversification, biogeographic inference, and species boundaries in the genera *Lycodon, Boiga, Calliophis, Malayopython, Cyclocorus, Hemibungarus, Oxyrhabdium, Myersophis,* and *Hologerrhum* (Castoe et al. 2007; Siler et al. 2013; Murray-Dickson et al. 2017; Weinell and Brown 2017; Weinell et al. *in review*; Brown et al. 2018) and others (Weinell et al. *unpublished data*). For those interested in the evolutionary biology, biogeography, and taxon-specific topics, we refer readers to the comprehensive synopsis of Leviton et al. (2018).

It is our hope that these biodiversity information products will serve as resources that may promote the scientific community's understanding and the lay public's appreciation of the diversity of Philippine snakes. Additionally, given that only a small portion of the country's terrestrial snake fauna, less than 15% of the species, are dangerously venomous, we hope that this key, taken with our earlier checklist with its numerous photo illustrations of the country's living snakes (Leviton et al. 2018), may result in reducing public fear of the archipelago's many harmless species, help prevent snake persecution in the country, promote public education, and advance conservation of the archipelago's diverse and fascinating snake fauna.

Methods

Taxonomic representation.—The species and subspecies included in this key are those included in Leviton et al.'s (2018) checklist of Philippine snakes, with a few exceptions that account for recent taxonomic changes or personal observations. *Malayotyphlops manilae* (Taylor 1919) has been treated as a member of the genus *Gerrhopilus* (Leviton et al. 2018), but the only specimen

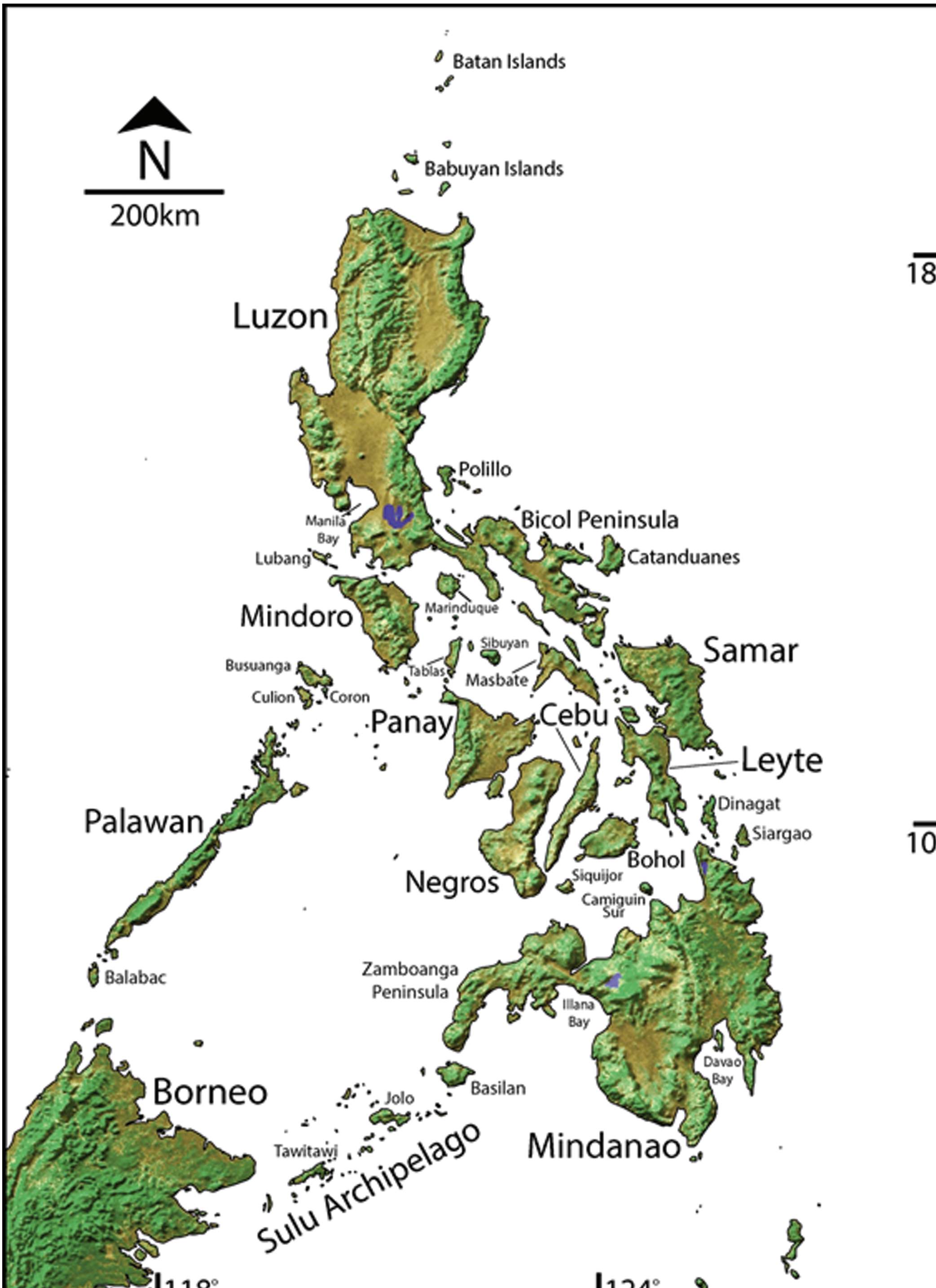

FIGURE 1. The Philippine Archipelago, with major landmasses labeled.

(the holotype, an unnumbered specimen in the Santo Tomas Museum, Philippines; collector and locality unknown) was never illustrated (Leviton et al. 2018; Wynn et al. 2016), and Taylor's (1919) description of the holotype is confusing to interpret. Nevertheless, we treat this species as a member of the genus *Malayotyphlops* rather than *Gerrhopilus*, because this species has a relatively small tail, rounded snout, and 28 longitudinal body scale rows, which are character states common for species of *Malayotyphlops* and are not known to occur in combination in other Philippine blind snake species (see Wynn et al. [2016] for a more detailed discussion of this species). Additionally, *Dryocalamus philippinus* (*sensu* Leviton et al. 2018) is here treated as *Lycodon philippinus*, because Figueroa et al. (2016) merged *Dryocalamus* into *Lycodon*.

We are including an "unnamed genus and species" (Cyclocorinae), which is currently being described as a new genus and species (Weinell et al. *in review*) and was formerly referred to as "unnamed Samar-Leyte lineage" by Weinell and Brown (2017). Additionally, we are also including *Pseudorabdion collaris*, which has not previously been reported from the Philippines, because we examined two specimens (KU 315197–98) from Pasonanca Park, Zamboanga City Province, Mindanao Island, which we tentatively assign to this species.

We have not included the four *Calamaria gervaisii* subspecies (*gervaisii*, *hollandi*, *iridescens*, and *polilloensis*) recognized by earlier authors (Taylor 1922a, 1923; Leviton et al. 2018) because the character state differences previously used to distinguish these subspecies are not geographically or genetically cohesive (i.e., do not correspond to geographically circumscribed or genetically-defined units; Weinell *pers. obs.*). Also, although the type locality of *Gerarda prevostiana* was reported as "Manille" [Luzon], this was almost certainly an error (Wallach et al., 2014; Leviton et al., 2018). Thus, we include this genus and species in the key based on the strength of a single record (voucher specimen UF 69099) from Brooke's Point, Palawan (Auth et al., 1990). In contrast, the presence of *Fordonia leucobalia* in the Philippines (Taylor 1922a) remains highly suspect (Leviton et al. 2018), and we do not include this genus or species in the key and believe it should be excluded from the Philippine faunal list in future works as well.

Sources consulted for character data.—This key builds upon many earlier works that treated subsets of the Philippine snake fauna, primarily in the form of dichotomous keys and taxonomic accounts. To construct the dichotomous key presented herein, we relied heavily upon the works of Taylor (1917, 1918, 1919, 1922a–c, 1923, 1925, 1963), Leviton (1957, 1963, 1964a–d, 1965a–c, 1967, 1968, 1970a–c, 1979, 1983), Inger and Marx (1965), Leviton et al. (2014), and Wynn et al. (2016). We also used character state data from additional publications for Philippine members of the following genera: *Acutotyphlops* (Wallach et al. 2007); *Ahaetulla* (Gaulke 1994); *Boiga* (Peters 1861, 1867; Gaulke 2004a); *Calliophis* and *Hemibungarus* (Brown et al. 2018); *Cerberus* (Murphy et al. 2012; Barrera Jr. et al. 2017); *Coelognathus* (Helfenberger 2001); *Dendrelaphis* (Gaulke 2004b; Rooijen and Vogel 2012; Vogel and van Rooijen 2008); *Gerrhopilus* (Savage 1950); *Gonyosoma* (Dowling 1958); *Hologerrhum* (Brown et al. 2001); *Hydrophis* (Kharin 1984; Rasmussen 1989 2011, 2014; Kharin and Hallerman 2009; Sherratt et al. 2018); *Laticauda* (Kharin 2005); *Lycodon* (Ota and Ross 1994; Lanza 1999; Gaulke 2002; Ota 2000); *Malayotyphlops* (Wynn and Leviton 1993; Hedges et al. 2014); *Naja* (Wüster and Thorpe 1996); *Oligodon* (Gaulke 1981; Green 2010); *Opisthotropis* (Brown and Leviton 1961; Yang et al. 2011); *Pseudorabdion* (Leviton and Brown 1959; Inger and Leviton 1966; Brown et al. 1999; Doria and Petri 2010); *Ptyas* (Ross et al. 1987; Malkmus et al. 2002); *Ramphotyphlops* (Gaulke 1995; Wallach 1993); *Sibynophis* (Gaulke 1993); *Stegonotus* (Boulenger 1893; Sanguila et al. 2016)); *Trimeresurus* (Malhotra and Thorpe 2004; David et al 2011); *Tropidonophis* (Malnate and Underwood 1988); and *Tropidolaemus* (Vogel et al. 2007). In addition to synthesizing data from earlier publications, we examined formalin/alcohol-preserved specimens at the University of Kansas Biodiversity Institute (KU).

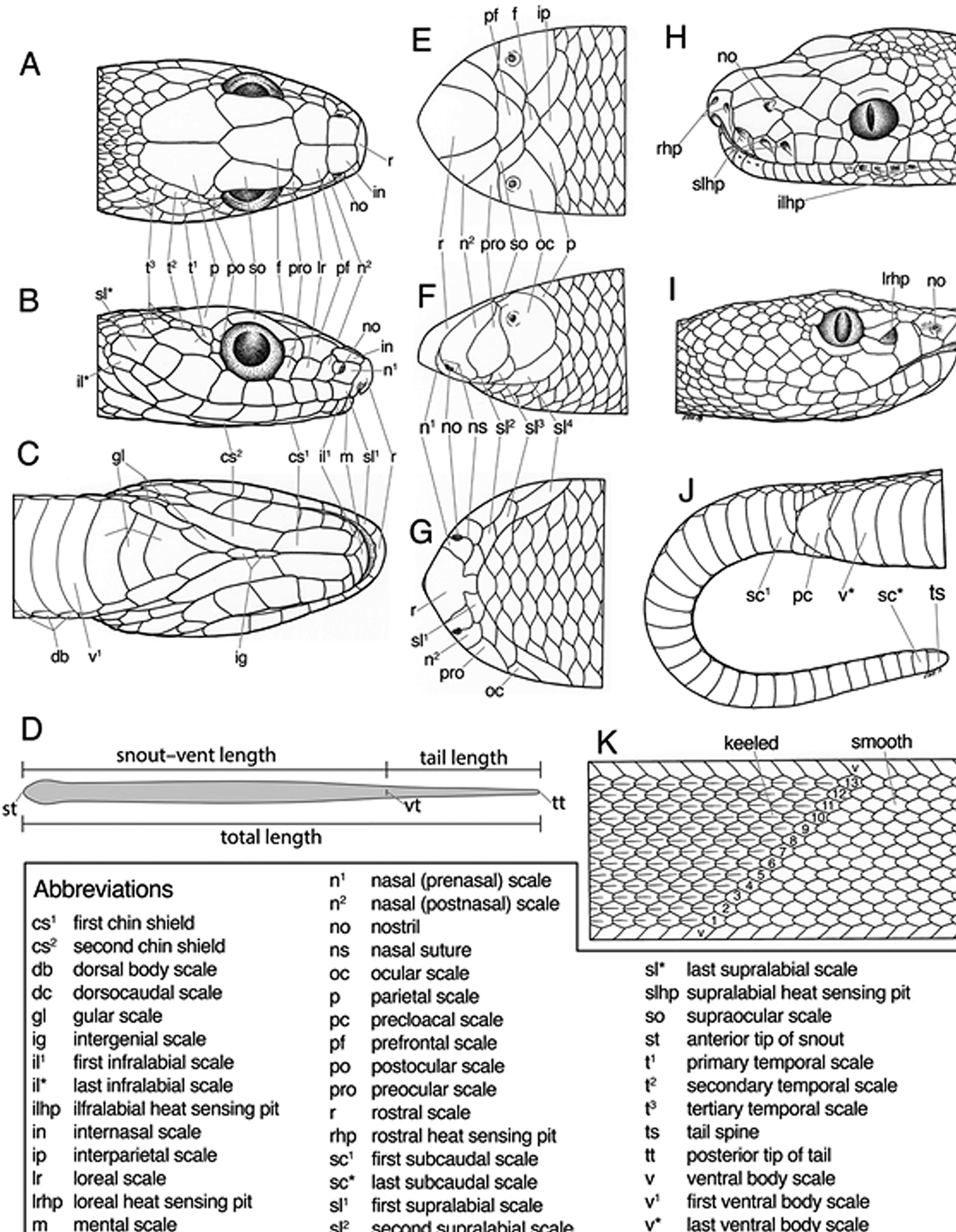

FIGURE 2. Typical characteristics of snakes. (A–C) scales of the head of most snakes (*Tropidonophis dendrophiops*, KU 310368); (D) body and tail length measurements of snakes; (E–G) scales of the head of most blindsnakes (*Ramphotyphlops suluensis*, PBS 2001, redrawn from Taylor 1918); heat sensing pits of (H) pythonids (*Malayopython reticulatus*, KU 330021), and (I) and viperids (*Trimeresurus flavomaculatus*; KU 329422); (J) scales of the ventral surface of the tail and posterior body of most snakes (*Cyclocorus lineatus alcalai*; KU 324539); (K) method for counting the number of dorsal body scale rows.

Types of characters included in dichotomous key.—We have tended to limit the types of characters included in the dichotomous key to those that can be easily observed (scored) by examining live or preserved specimens without dissection. For the most part, such characters include the number, shape, and arrangement of various types of scales, or the relative sizes of different parts of the head, body, and tail. In the absence of scalation and size differences, we do resort to consideration of color pattern differences, or less frequently, internal anatomy differences. Furthermore, when possible, we avoided using characters that can only be used to distinguish species of a particular sex (e.g., hemipenial characters) or age class, except when character states were known for all sex and age classes, or if additional characters were also provided. On the other hand, for some species, we do provide geographical information to supplement character information, if we considered species' range to be particularly useful for the purpose of identification. Occasionally, a species, or set thereof, could be distinguished only by geography, and in such cases it may be difficult or impossible to recognize additional range extensions or identify extralimital geographic records without additional information such as genetic data. Thus, we advocate the use of genetic data, in concert with geographical and phenotypic data whenever possible, but we recognize that, in many cases, morphological diagnostic characters may be the only source of information available to field biologists and students. As such, we have attempted to make use of phenotypic, scalation, and morphometric information wherever possible (the purpose of the present effort) and we expect that this key will be useful for identifying the vast majority of Philippine snakes. Characters and other specialized terminology used in this key are defined in the Glossary (see Appendix, pp. 42–44), and our definitions are consistent with those used by Dowling (1951), Powell et al. (2016), and Lillywhite (2008).

Illustrations.—We (EH) illustrated 69 of 154 species and subspecies and 43 of the 45 genera reported from the Philippines and included in this key (Figs. 3–47; Table 1). Illustrations were initially drawn using pencil on grid paper, and were then transferred to mylar film and redrawn with Rapidograph© pens and ink or felt-tip pens. Novel illustrations were drawn from either preserved specimens viewed under a dissecting microscope with camera lucida, from photographs of one or more specimens, or from one or more photographs of living animals. For species that occur both within and outside of the Philippines, we prioritized illustrations of Philippine specimens (Table 1). Some illustrations (especially the blind snakes) are adapted from earlier works (Brown et al. 2001; Leviton et al. 2014; Rasmussen et al. 2011; Savage 1950; Taylor 1918, 1919, 1922a; Wallach et al. 1993, 2007; Wynn et al. 1993, 2016; see also Acknowledgments section). Drawings were digitally scanned and arranged into figures using Adobe Photoshop CC v20.0.5 and Adobe Illustrator v23.0.04 (Adobe Inc.). See Table 1 for a full list of species and specimens illustrated, and for original sources of adapted illustrations.

Key to the Families of Philippine Snakes

1a. Dorsal body scales spinose (Fig. 3A), and arranged in > 50 longitudinal rows at midbody . . . . Acrochordidae (p. 12)
1b. Dorsal body scales smooth or keeled (Fig. 3B–C), and arranged in < 50 longitudinal rows at midbody 2
2a. Tail laterally flattened, not conical or rounded (Fig. 4A) . . . Elapidae (marine species) (p. 13)
2b. Tail conical or rounded, not laterally flattened (Fig. 4B) 3

3a. Ventral body scales about the same size as dorsal body scales (Fig. 5A); tail short, rounded . 4
3b. Ventral body scales much larger than dorsal body scales (> 1/3 width of body) (Fig. 5B); tail conical 5

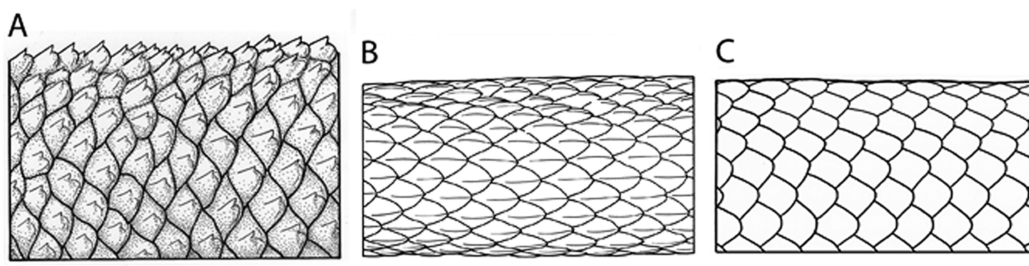

Figure 3. Dorsal body scales: (A) spinose (*Acrochordus granulatus*; KU 302951), (B) keeled (*Opisthotropis typica*; KU 327424), (C) smooth (*Oligodon maculatus*; KU 321699).

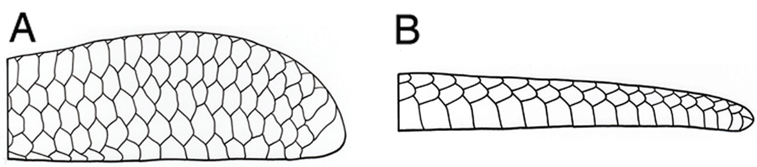

Figure 4. Tail shape of (A) *Laticauda colubrina* (KU 303033): laterally flattened, paddle-like, (B) *Ophiophagus hannah* (KU 321813): conical.

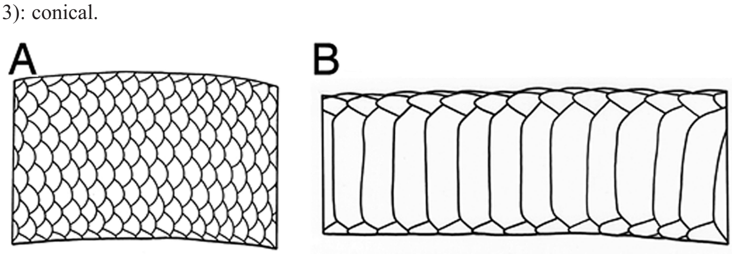

Figure 5. Ventral body scales of (A) *Ramphotyphlops cumingii* (KU 334468): ventral body scales about the same size as dorsal body scales; (B) *Calamaria gervaisii* (KU 307983): ventral body scales larger than dorsal body scales.

4a. Second supralabial scale overlaps preocular scale (Fig. 6A) . . . . Gerrhopilidae (p. 14)
4b. Preocular scale either overlaps second supralabial scale or does not contact it (Fig. 6B–C). . . . . Typhlopidae (p. 15)

5a. Heat sensing pits present on the head (Fig. 7) 6
5b. Heat sensing pits absent from head 7

6a. Single heat sensing pit present between eye and nostril (Fig. 7A). . . . . Viperidae (p. 16)
6b. Multiple heat sensing pits on each side of head, on labial scales and rostral scale (Fig. 7B) . . . . Pythonidae (p. 15)

7a. Head laterally compressed (Fig. 8A); number of loreal scales + preocular scales ≥ 4; supralabial scales do not border eye (Fig. 8B); second infralabial scales in contact medially. . . . . Pareidae (p. 15)

7b. Head not laterally compressed; number of loreal scales + preocular scales < 4; supralabial scales may or may not border eye; second infralabial scales not in contact medially 8

8a. Nostrils positioned more dorsally than laterally; additionally, one of the following combinations of characters is true: (1) supralabial scales do not border eye; frontal scale fragmented into multiple smaller scales; internasal scales paired, positioned posterior to nasal scales; nasal scales paired and in contact with each other medially (Fig. 9A); or (2) one or more supralabial scales usually border eye; frontal scale not fragmented; internasal scale single, not paired, positioned medially between a pair of nasal scales; nasal scales not in contact with each other medially. . . . . Homalopsidae (p. 14)

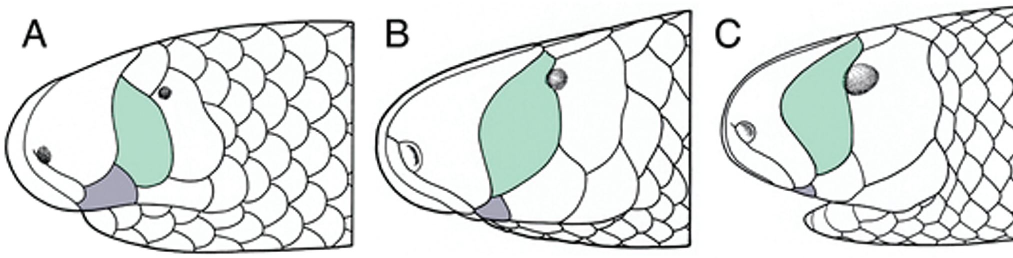

FIGURE 6. Lateral view of head of (A) *Gerrhopilus hedraeus* (CAS-SUR 12346; a redrafting by EH of original image in Savage 1950); (B) *Malayotyphlops luzonensis* (CM 2653; a redrafting by EH of original image in Wynn et al. 2016); (C) *Malayotyphlops denrorum* (PNM 9813; a redrafting by EH of original image in Wynn et al. 2016). Preocular scale (green), second supralabial scale (purplish-gray). Fig. A reproduced and modified with permission of J.M. Savage; Figs.B-C reproduced and modified with permission of A. Wynn and *Journal of Herpetology*.

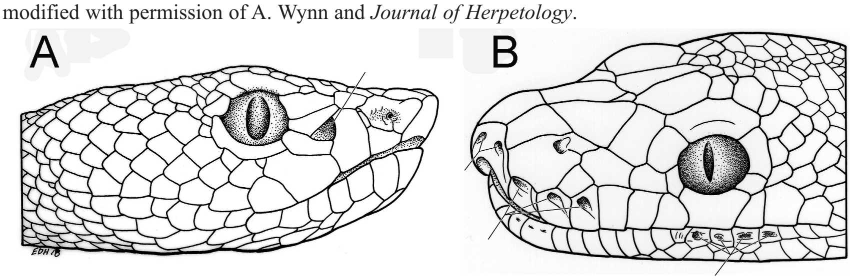

FIGURE 7. Location of heat sensing pits. (A) *Trimeresurus flavomaculatus* (KU 329422): loreal heat sensing pits, (B) *Malayopython reticulatus* (KU 330021): labial and rostral heat sensing pits.

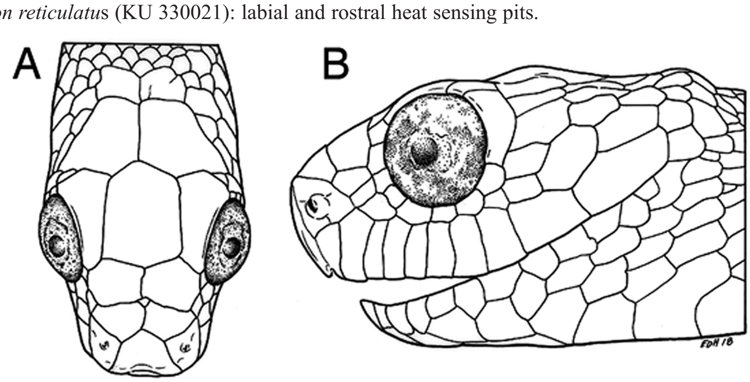

FIGURE 8. Head shape and scalation of *Aplopeltura boa*. (A) Dorsal view (KU 334473), (B) lateral view (KU 334474).

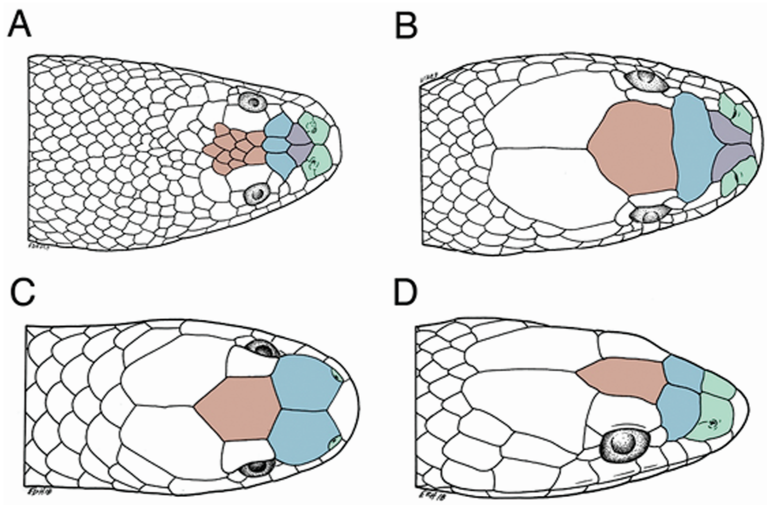

FIGURE 9. Dorsal view of head of (A) *Cerberus schneideri* (KU 305489), (B) *Opisthotropis typica* (KU 327424), (C) *Calamaria gervaisii* (KU 322329), (D) *Liopeltis philippinus* (KU 327731). Frontal scale (reddish brown), prefrontal scales (blue), internasal scales (purplish-gray), nasal scales (green).

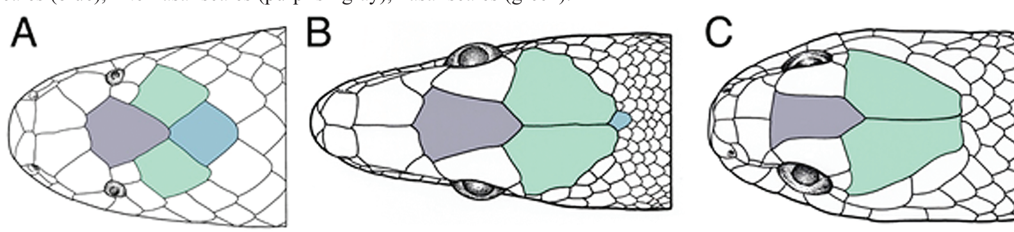

FIGURE 10. Dorsal view of head of (A) *Xenopeltis unicolor* (KU 79152), (B) *Gonyosoma oxycephalum* (KU 315168), (C) *Hologerrhum dermali* (CMNH 5075; drawn from photograph in Brown et al. 2001). Frontal scale (purplish-gray), interparietal scale (blue), and parietal scales (green).

8b. Nostrils positioned more laterally than dorsally; frontal scale not fragmented; supralabial scales may or may not border eye; internasal scales either (1) paired, positioned medially between nasal scales, or, (2) fused to either prefrontal scales or nasal scales (Fig. 9B–D) 9

9a. Frontal scale and interparietal scale similar in size; parietal scales not in contact with each other medially (Fig. 10A) . . . . Xenopeltidae (p. 17)

9b. Frontal scale much larger than interparietal scale (Fig. 10B), or interparietal scale is absent (Fig. 10C); parietal scales in contact with each other medially (Figs. 10B–C) 10

10a. Loreal scales absent; one or more preocular scales present and in contact with posterior nasal scale (Fig. 11A); one enlarged venom fang on each maxilla (although replacement fangs may also be present); venom fang short, permanently erect; maxillary bone elongate, usually with several small teeth behind front fang . . . . Elapidae (terrestrial) (p. 13)

10b. Loreal and preocular scales present or absent (Fig. 11B–C); if preocular scales present and loreal scales absent, preocular scales not in contact with nasal scales (Fig. 11B–C); enlarged fang(s) absent, numerous (> 5) maxillary teeth present 11

11a. Temporal scales present (Fig. 12B), dorsal body scales smooth, and at least one of the following characters or combinations of characters also true: (1) nasal scale divided (Fig. 13B) and subcaudal scales single, not paired (Fig. 14B); (2) nasal scale undivided (Fig. 13A), subcaudals scales paired (Fig. 14A), and dorsal body scales in 17 longitudinal rows at midbody;

(3) nasal scale divided (Fig. 13B), subcaudal scales paired (Fig. 14A), dorsal body scales in 15 longitudinal rows throughout length of body, and prefrontal scale ≥ 3 times size of supraocular scale. . . . . Lamprophiidae (p. 14)

11b. Subcaudal scales paired, and at least one of the following characters or combinations of characters also true: (1) temporal scales absent (Fig. 12A); (2) dorsal body scales keeled; (3) temporal scales present (Fig 12B), nasal scale undivided or incompletely divided (Fig. 13A), and dorsal body scales in 15 longitudinal rows at midbody; (4) temporal scales present, nasal scale divided, dorsal body scales smooth and in 15 longitudinal rows throughout length of body,

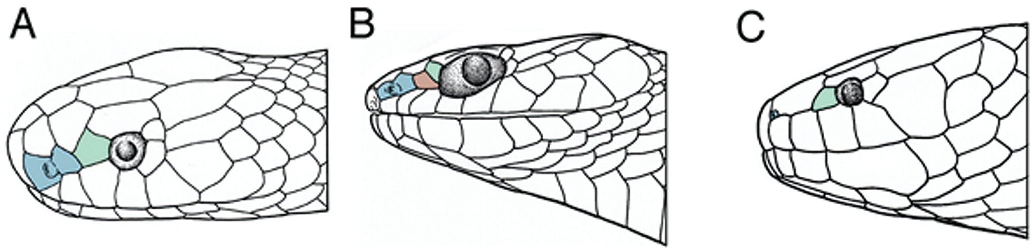

FIGURE 11. Lateral view of head of (A) *Hemibungarus mcclungi* (KU 313898), (B) *Sibynophis bivittatus* (KU 309608), (C) *Calamaria lumbricoidea* (KU 315159). Preocular scales (green), nasal scales (blue), loreal scale (reddish brown).

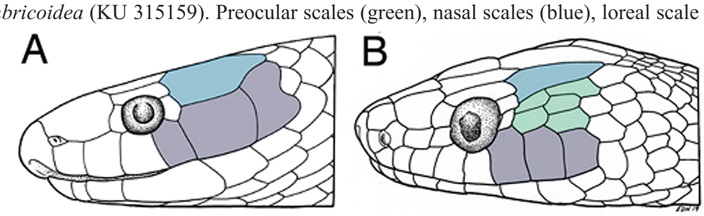

FIGURE 12. Lateral view of head of (A) *Calamaria gervaisii* (KU 322329), (B) *Lycodon muelleri* (KU 327575). Temporal scales (green), supralabial scales (purplish-gray), parietal scale (blue).

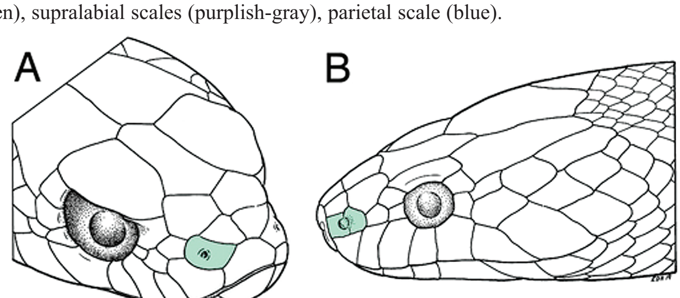

FIGURE 13. Lateral view of head of (A) *Psammodynastes pulverulentus* (KU 329688), (B) *Cyclocorus lineatus alcalai* (KU 324539). Nasal scale (green) undivided (A) or divided (B).

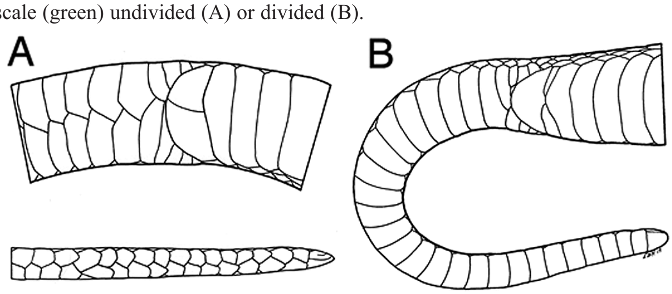

FIGURE 14. Arrangement of subcaudal scales, (A) *Opisthotropis typica* (KU 327424): subcaudal scales paired; (B) *Cyclocorus lineatus alcalai* (KU 324539): subcaudal scales single, not paired.

prefrontal scale less than twice size of supraocular scale; (5) temporal scales present, nasal scale divided, dorsal body scales not in 15 longitudinal rows throughout length of body . . . . Colubridae (p. 12)

Keys to Family Subgroups, arranged alphabetically by Family Groups

Acrochordidae

Represented by a single genus . . . . *Acrochordus* (p. 19)

Colubridae

Key to Philippine subfamilies.

1a. Temporal scales absent; parietal scales in contact with supralabial scales (Fig. 12A) . . . . Calamariinae (p. 18)
1b. Temporal scales present; parietal scales not in contact with supralabial scales (Fig. 12B) . . . 2

2a. Supralabial scales either do not border eye, or supralabial scales 4–6 border eye; if supralabial scales 4–6 border eye, then dorsal body scales reduce from 19→17 or from 17→15 longitudinal rows posteriorly, and lateral body scales (except possibly first row) keeled (Fig. 3B) . . . . Natricinae (p. 19)
2b. One or more supralabial scales border eye; if supralabial scales 4–6 border eye and dorsal body scales reduce from 19→17 or 17→15 longitudinal rows posteriorly, then lateral body scales are smooth (Fig. 3C) 3

3a. Lateral body scales in oblique rows (Fig. 15A); dorsal body scales reduce from 17→13, 15→13, 15→11, or 13→11 longitudinal scale rows posteriorly; third supralabial scale does not border eye. . . . . Ahaetulliinae (p. 17)
3b. One of the following combinations of characters true: (1) lateral body scales in horizontal, not oblique rows (Fig. 13B), and dorsal body scales in 13 longitudinal rows at midbody; (2) lateral body scales in oblique rows (Fig. 15A) and dorsal body scales in 15–17 longitudinal rows at midbody, not reducing to fewer than 15 rows before vent; (3) lateral body scales in oblique or horizontal rows (compare Fig. 15A, B), and dorsal body scales in 19–23 longitudinal rows at midbody 4

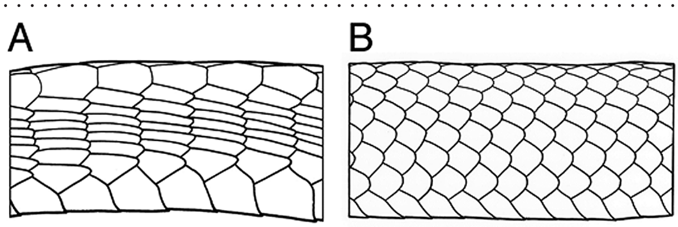

Figure 15. Lateral body scales of (A) *Dendrelaphis marenae* (KU 314131): oblique rows, (B) *Oligodon maculatus* (KU 321699): horizontal rows.

4a. Dorsal body scales in 17 smooth longitudinal rows throughout length of body; number of ventral body scales 144–185; subcaudal scales arranged in 89–145 pairs; numerous small teeth, 30–50, on each of maxillary and dentary bones . . . . Sibynophiinae (p. 19)
4b. Dorsal body scales in 15–23 smooth or keeled longitudinal rows at midbody; if dorsal body scales in 17 smooth longitudinal rows throughout length of body, then subcaudal scales arranged in < 80 or > 190 pairs; fewer than 30 teeth on each of maxillary and dentary bones . . . . Colubrinae (p. 18)

Elapidae (marine species)

Key to Philippine genera.

1a. Nasal scales separated by internasal scales; width of ventral body scales > 1/3 body width. . . . . *Laticauda* (p. 27)

1b. Internasal scales absent, nasal scales in contact with each other medially; width of ventral body scales variable 2

2a. Width of ventral body scales > 1/3 body width. . . . . *Aipysurus* (p. 20)

2b. Width of ventral body scales < 1/4 body width and often narrower than adjacent lateral body scales 3

3a. Three supralabial scales, second very elongate (Fig. 16). . . . . *Emydocephalus* (p. 24)

3b. More than three supralabial scales . . . . *Hydrophis* (p. 24)

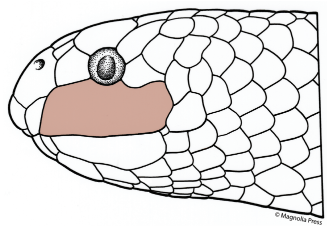

FIGURE 16. Lateral view of head of *Emydocephalus annulatus* (specimen number unknown; a redrafting by EH of original image in Rasmussen et al. 2011). Second supralabial scale (reddish brown). Fig. 16, modified original line drawing reproduced with permission of A. Rasmussen and *Zootaxa* and Magnolia Press.

Elapidae (terrestrial species)

Key to Philippine genera.

1a. Three postocular scales (Fig. 17A–B); lateral body scales in oblique or horizontal rows (Fig. 15). 2

1b. Two postocular scales (Fig. 17C–D); lateral body scales in horizontal rows (Fig. 15B); number of longitudinal rows of dorsal body scales not reducing posteriorly 3

2a. Dorsal body scales in 17–25 longitudinal rows at midbody; postnasal scale vertically elongate, separated from or only narrowly in contact with prefrontal scale (Fig. 17A) . . . . . *Naja* (p. 30)

2b. Dorsal body scales in 15 longitudinal rows throughout length of body; postnasal scale triangular, about as long as tall, and broadly in contact with prefrontal scale (Fig. 17B). . . . . *Ophiophagus* (p. 31)

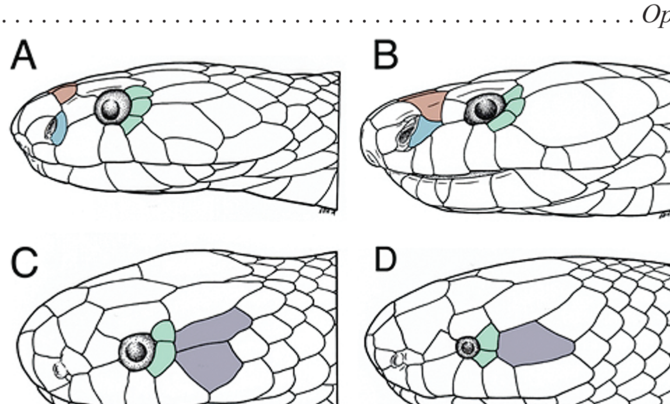

FIGURE 17. Lateral view of head of (A) *Naja samarensis* (KU 326653), (B) *Ophiophagus hannah* (KU 321813), (C) *Hemibungarus mcclungi* (KU 313898), (D) *Calliophis philippina* (KU 327218). Postocular scales (green), anterior temporal scales (purplish-gray), postnasal scales (blue), prefrontal scales (reddish brown).

3a. Two anterior temporal scales (Fig. 17C); dorsal body scales in 15 longitudinal rows throughout length of body . . . . *Hemibungarus* (p. 24)
3b. One anterior temporal scale (Fig. 17D); dorsal body scales in 13 longitudinal rows throughout length of body . . . . *Calliophis* (p. 21)

Gerrhopilidae

Represented by a single genus . . . . *Gerrhopilus* (p. 24)

Homalopsidae

Key to Philippine genera.

1a. Supralabial scales do not border eye; frontal scale fragmented into multiple smaller scales; internasal scales paired, positioned posterior to a pair of nasal scales; nasal scales in contact with each other medially (Fig. 9A). . . . . *Cerberus* (p. 21)
1b. One or more supralabial scales usually border eye; frontal scale not fragmented; internasal scale single, not paired, and is positioned medially between a pair of nasal scales; nasal scales not in contact with each other medially . . . . *Gerarda* (p. 24)

Lamprophiidae

Key to Philippine genera.

1a. Nasal scale large, round and undivided (Fig. 13A) . . . . *Psammodynastes* (p. 31)
1b. Nasal scale divided (Fig. 13B) 2
2a. Snout broad (Fig. 18B); anterior chin shields smaller than or similar in size to posterior chin shields; subcaudal scales unpaired (Fig. 14B) 3
2b. Snout narrow (Fig. 18A); anterior chin shields much larger than posterior chin shields; subcaudal scales paired or unpaired (Fig. 14). 4

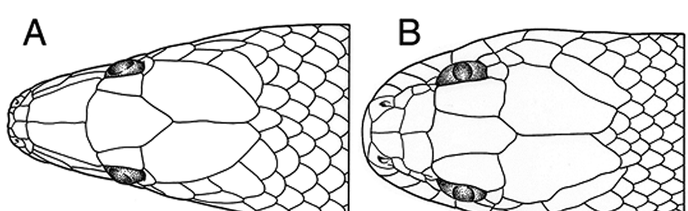

FIGURE 18. Dorsal head shape and scalation of (A) *Oxyrhabdium modestum* (KU 311301): narrow snout, (B) *Hologerrhum philippinum* (KU 330056): broad snout.

3a. Maxilla not strongly angled; no maxillary diastema, although anterior and posterior maxillary teeth are much larger than intervening teeth; posterior maxillary tooth grooved; five infralabial scales in contact with chin shields, and fourth infralabial scale broadly in contact with the anterior and posterior chin shields for about an equal length (Fig. 19A) . . . . . *Hologerrhum* (p. 24)
3b. Maxilla strongly angled; large diastema between anterior and posterior maxillary teeth; posterior maxillary teeth not grooved; one of the following is also true: (1) five infralabial scales in contact with chin shields, and fourth infralabial scale either not in contact with or barely in contact with posterior chin shield (Fig. 19B), or (2) four infralabial scales in contact with chin shields, and third infralabial scale either not in contact with or barely in contact with posterior chin shield (Fig. 19C) . . . . *Cyclocorus* (p. 22)

4a. Five supralabial scales; subcaudal scales unpaired . . . . Unnamed genus (p. 35)
4b. Six or more supralabial scales; subcaudal scales paired 5

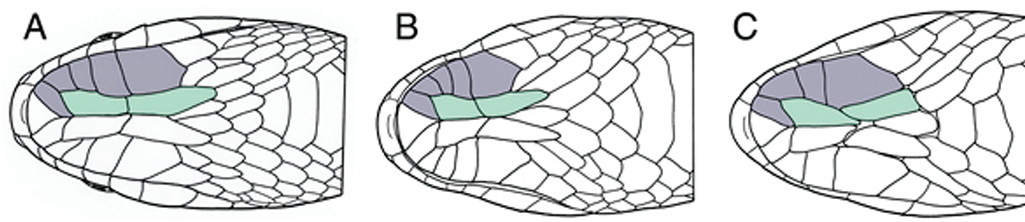

FIGURE 19. Ventral view of head of (A) *Hologerrhum philippinum* (KU 330065): five infralabial scales in contact with chin shields; anterior chin shields broadly contact infralabial scales 1–4; posterior chin shields broadly in contact with fourth and fifth infralabial scales; (B) *Cyclocorus lineatus lineatus* (KU 346571): five infralabial scales in contact with chin shields; anterior chin shields broadly in contact with infralabial scales 1–4; posterior chin shields broadly in contact with fifth infralabial scale; (C) *Cyclocorus nuchalis nuchalis* (KU 327765): four infralabial scales in contact with chin shields, anterior chin shields broadly in contact with infralabial scales 1–3; posterior chin shields broadly in contact with fourth infralabial scale.

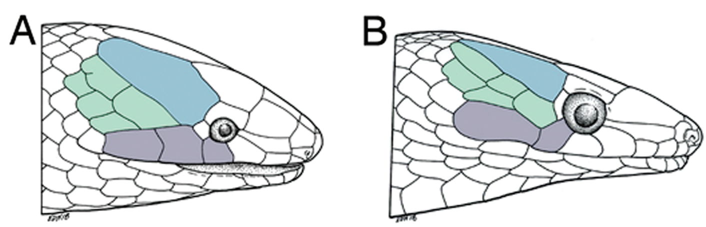

FIGURE 20. Lateral view of head of (A) *Myersophis alpestris* (KU 308684), (B) *Oxyrhabdium modestum* (KU 311301). Parietal scale (blue), temporal scales (green), posterior supralabial scales (purplish-gray).

5a. Parietal scales in contact with supralabial scales (Fig. 20A) . . . . *Myersophis* (p. 30)
5b. Parietal scales not in contact with supralabial scales (Fig. 20B) . . . . *Oxyrhabdium* (p. 31)

Pareidae

Represented by a single genus . . . . *Aplopeltura* (p. 20)

Pythonidae

Represented by a single genus . . . . *Malayopython* (p. 29)

Typhlopidae

Key to Philippine genera.

1a. Posterior origin of nasal suture is preocular scale (Fig. 21A) . . . . *Indotyphlops* (p. 27)
1b. Posterior origin of nasal suture is the second supralabial scale (Fig. 21B) 2

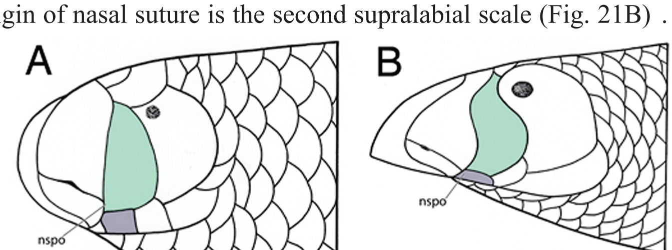

FIGURE 21. Lateral view of head of (A) *Indotyphlops braminus* (specimen number unknown; redrawn from Taylor 1922a), (B) *Ramphotyphlops cumingii* (EHT R-99; a redrafting by EH of original image in Taylor 1919). Second supralabial scale (purplish-gray); preocular scale (green); nspo = nasal suture posterior origin scale.

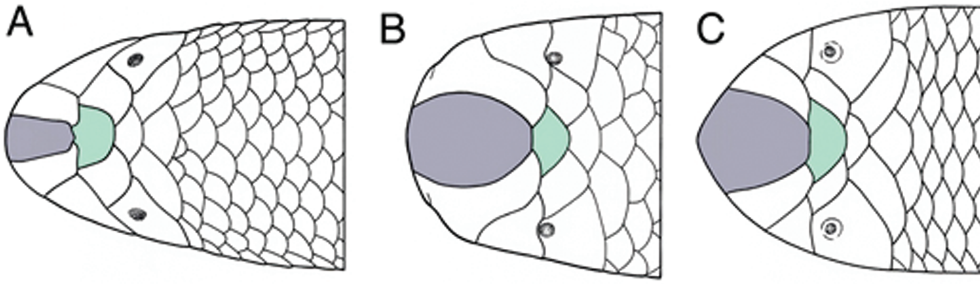

FIGURE 22. Dorsal view of head of (A) *Acutotyphlops banaorum* (FMNH 262249; a redrafting by EH of original image in Wallach et al. 2007), (B) *Malayotyphlops ruber* (SMF 16616; a redrafting by EH of original image in Wynn et al. 2016), (C) *Ramphotyphlops suluensis* (PBS 2001; a redrafting by EH of original image in Taylor 1918). Prefrontal scale (green), rostral scale (purplish-gray). Fig. A reproduced and modified with permission of V. Wallach and *Journal of Herpetology*. Fig. B reproduced and modified with permission of A. Wynn and *Journal of Herpetology*.

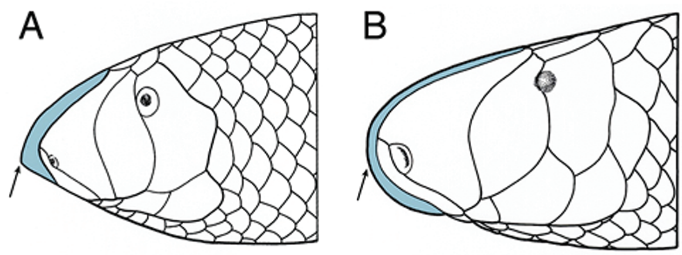

FIGURE 23. Lateral view of head of (A) *Ramphotyphlops marxi* (FMNH 96520; a redrafting by EH of original image in Wallach 1993), (B) *Malayotyphlops luzonensis* (CM 2653; a redrafting by EH of original image in Wynn et al. 2016). Rostral scale (blue); arrow indicates either (A) beaked shape of rostral scale, or (B) rounded shape of rostral scale. Fig. A reproduced and modified with permission of V. Wallach and *Journal of Herpetology*. Fig. B reproduced and modified with permission of A. Wynn and *Journal of Herpetology.*

2a. Prefrontal scale much wider than rostral scale (Fig. 22A) . . . . *Acutotyphlops* (p. 19)
2b. Prefrontal scale narrower than rostral scale (Fig. 22B–C) 3

3a. Rostral scale beaked (Fig. 23A) . . . . *Ramphotyphlops* (p. 33)
3b. Rostral scale rounded (Fig. 23B) . . . . *Malayotyphlops* (p. 29)

Viperidae

Key to Philippine genera.

1a. Some scales on head strongly keeled (Fig. 24a); second supralabial scale not in contact with scale forming anterior border of heat sensing pit . . . . *Tropidolaemus* (p. 34)
1b. Scales on head smooth (Fig. 24b); second supralabial scale in contact with scale forming anterior border of heat sensing pit . . . . *Trimeresurus* (p. 34)

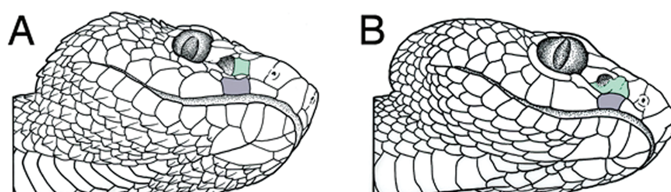

FIGURE 24. Ventral-lateral view of head of (A) *Tropidolaemus subannulatus* (KU 327425), (B) *Trimeresurus flavomaculatus* (KU 330050). Second supralabial scale (purplish-gray), scale anterior to heat sensing pit (green).

Xenopeltidae

Represented by a single genus . . . . *Xenopeltis* (p. 35)

Keys to the genera within subfamily groups of the family Colubridae

Ahaetulliinae

Key to Philippine genera.

1a. Pupil horizontally elongated and rectangular (Fig. 25A); ventral body scales laterally hinged, and their posterior edges unnotched (Fig. 26A) . . . . *Ahaetulla* (p. 19)
1b. Pupils may be circular or slightly horizontally elongate (Fig. 25B); ventral body scales laterally hinged, and their posterior edges notched Fig. 26B) 2

FIGURE 25. Lateral view of head of (A) *Ahaetulla prasina preocularis* (KU 347854), (B) *Dryophiops rubescens* (KU 328516). Note horizontally elongate pupil in *Ahaetulla* versus rounded pupil in *Dryophiops.*

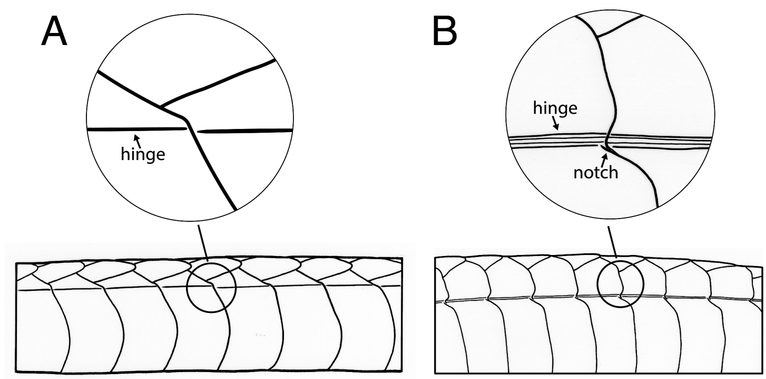

FIGURE 26. Ventral body scales of (A) *Ahaetulla prasina preocularis* (KU 349849): ventral body scales hinged, with posterior edge unnotched, (B) *Chrysopelea paradisi variabilis* (KU 337271): ventral body scales hinged, and posterior edge notched.

2a. Dorsal body scales in 17 longitudinal rows at midbody; last ventral body scale (i.e., the scale immediately before the precloacal scale) divided. . . . . *Chrysopelea* (p. 22)
2b. Dorsal body scales in 13–15 longitudinal rows at midbody; last ventral body scale undivided 3

3a. Dorsal body scales in 15 longitudinal rows at midbody; vertebral scales similar in size to other dorsal body scales; black postoocular stripe absent. *Dryophiops* (p. 23)
3b. One of the following combinations of characters true: (1) dorsal body scales in 13 longitudinal rows at midbody, vertebral scales similar in size to other dorsal body scales; (2) dorsal body scales in 15 longitudinal rows at midbody, vertebral scales much larger than other dorsal body scales, and a black postocular stripe present . . . . *Dendrelaphis* (p. 23)

Calamariinae

Key to Philippine genera.

1a. Internasal scales absent (fused to prefrontal scales) (Fig. 27A); dorsal body scales in 13 longitudinal rows at midbody. . . . . *Calamaria* (p. 20)
1b. Internasal scales present (distinct from prefrontal scales) (Fig. 27B); dorsal body scales in 15 longitudinal rows at midbody . . . . *Pseudorabdion* (p. 32)

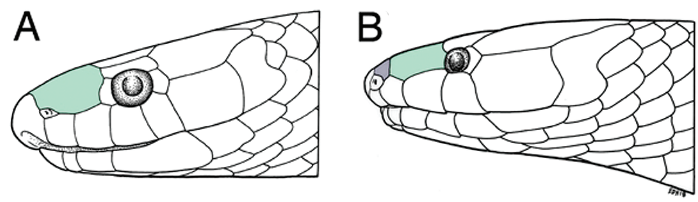

FIGURE 27. Lateral view of head of (A) *Calamaria gervaisii* (KU 322329), (B) *Pseudorabdion collaris* (KU 315197). Prefrontal scales (green), internasal scales (purplish-gray).

Colubrinae

Key to Philippine genera.

1a. Dorsal body scales in 19–27 longitudinal rows at midbody 2
1b. Dorsal body scales in 14–18 longitudinal rows at midbody 4

2a. Pupil strongly vertically elliptical (Fig. 28A) . . . . *Boiga* (p. 20)
2b. Pupil circular or slightly vertically elliptical (Fig. 28B). 3

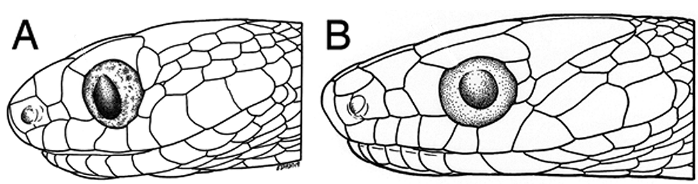

FIGURE 28. Lateral view of head of (A) *Boiga angulata* (KU 343853), (B) *Coelognathus erythrurus manillensis* (KU 335195). Note vertically elliptical (A) versus rounded pupil (B).

3a. Dorsal body scales in 23–27 longitudinal rows at midbody; body emerald green in life, blue after preservation in alcohol. . . . . *Gonyosoma* (p. 24)
3b. Dorsal body scales in 21 longitudinal rows at midbody; body not emerald green in life, not blue after preservation in alcohol . . . . *Coelognathus* (p. 22)

4a. Dorsal body scales in 15–17 longitudinal rows that do not reduce posteriorly; subcaudal scales 27–54 pairs . . . . *Oligodon* (p. 30)
4b. Dorsal body scales may or may not reduce posteriorly; if dorsal body scales do not reduce posteriorly, then subcaudal scales in > 100 pairs 5

5a. Lateral edge of supraocular scale robust, protruding over eye rather than curving around eye (Fig. 29A); dorsal body scales usually in 14, 16, or 18 longitudinal rows at midbody . . . . *Ptyas* (p. 33)
5b. Lateral edge of supraocular scale not robust, and curves with contour of eye (Fig. 29B); dorsal body scales usually in 15 or 17 longitudinal rows at midbody 6

6a. Loreal scale absent; dorsal body scales in 15 longitudinal rows at midbody . . *Liopeltis* (p. 27)
6b. Loreal scale present; dorsal body scales in 15–17 longitudinal scale rows at midbody 7

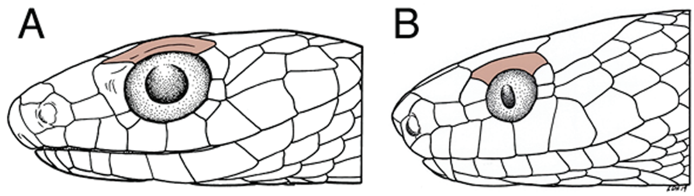

FIGURE 29. Lateral view of head of (A) *Ptyas luzonensis* (KU 306605), (B) *Stegonotus muelleri* (KU 344097). Supraocular scale (reddish brown) of *Ptyas* robust, protruding over eye.

7a. One or more of the following combinations of characters true: (1) dorsal body scales in 17 longitudinal rows at midbody, and 184–216 smooth ventral body scales; (2) dorsal body scales in 15 longitudinal rows at midbody and ventral body scales keeled . . . . *Lycodon* (p. 28)
7b. Dorsal body scales in 17 longitudinal rows at midbody, 220–232 smooth ventral body scales . . . . *Stegonotus* (p. 34)

Natricinae

Key to Philippine genera.

1a. Fewer than 10 supralabial scales 2
1b. More than 10 supralabial scales. . . . . *Opisthotropis* (p. 31)

2a. One of the following combinations of characters true: (1) dorsal body scales in 15–17 longitudinal rows at midbody and background color of ventral body scales black; (2) dorsal body scales in 19 longitudinal rows at midbody and background color of ventral body scales pale (but not pinkish) in life . . . . *Rhabdophis* (p. 33)
2b. One of the following combinations of characters true: (1) dorsal body scales in 17 longitudinal rows at midbody and background color of ventral body scales pale; (2) dorsal body scales in 19 longitudinal rows at midbody and background color of ventral body scales pinkish in life . . . . *Tropidonophis* (p. 35)

Sibynophiinae

Represented in the Philippines by a single genus . . . . *Sibynophis* (p. 34)

KEYS TO THE SPECIES OF PHILIPPINE SNAKES, ARRANGED ALPHABETICALLY BY GENUS

Acrochordus

Represented in the Philippines by a single species . . . . *Acrochordus granulatus*

Acutotyphlops

Represented in the Philippines by a single species. . . . . *Acutotyphlops banaorum*

Ahaetulla

Key to Philippine species and subspecies.

1a. Precloacal scale not divided; ≥ 2 preocular scales . . . . *Ahaetulla prasina preocularis*
1b. Precloacal scale divided; one preocular scale 2

2a. Usually two loreal scales; endemic to Sulu Archipelago . . . . *Ahaetulla prasina suluensis*
2b. Usually one loreal scale; endemic to Palawan . . . . *Ahaetulla prasina prasina*

Aipysurus

Represented in the Philippines by a single species . . . . *Aipysurus eydouxii*

Aplopeltura

Represented in the Philippines by a single species. . . . . *Aplopeltura boa*

Boiga

Key to Philippine species and subspecies.

1a. Dorsal body scales in 19 or 23 longitudinal rows at midbody 2
1b. Dorsal body scales in 21 longitudinal rows at midbody. 5

2a. Dorsal body scales in 23 longitudinal rows at midbody; three anterior temporal scales; eighth infralabial scale anterior to center of eye (Fig. 30A) . . . . *Boiga cynodon*
2b. Dorsal body scales in 19 longitudinal rows at midbody; two anterior temporal scales; eighth infralabial scale posterior to center of eye (Fig. 30B) 3

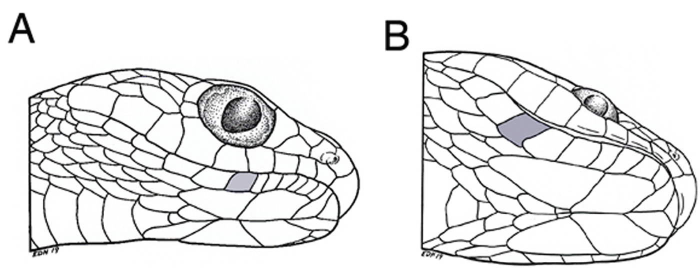

FIGURE 30. Ventral-lateral view of head of (A) *Boiga cynodon* (KU 328496), (B) *Boiga philippina* (KU 304855). Eighth infralabial scale (purplish-gray).

3a. Number of preocular scales two; number of ventral body scales < 250 . . . . . *Boiga philippina*
3b. Number of preocular scales one; number of ventral body scales > 250. 4

4a. Number of dark dorsal body crossbands ~40, each widening laterally . . . . *Boiga angulata*
4b. Number of dark dorsal body crossbands ~70, not widening laterally . . . . *Boiga schultzei*

5a. Dorsal color black, with most scales possessing a yellow or white speckle; yellow or white not arranged into distinct crossbands . . . . *Boiga dendrophila levitoni*
5b. Dorsal color black, with yellow or white crossbands on body and tail 6

6a. Yellow or white crossbands ≥ 2 scale rows wide, becoming wider laterally . . . . *Boiga dendrophila latifasciata*
6b. Yellow or white crossbands < 2 scale rows wide that do not widen laterally 7

7a. Interspaces between narrow light crossbands black. . . . . *Boiga dendrophila multicincta*
7b. Interspaces between narrow light crossbands, which are edged with black, bluish gray to bluish brown . . . . *Boiga dendrophila divergens*

Calamaria

Key to Philippine species.

1a. Mental scale not in contact with anterior chin shields (Fig. 31A) 2
1b. Mental scale in contact with anterior chin shields (Fig. 31B) 4

2a. Number of pair of subcaudal scales < 30 (males), < 25 (females) 3

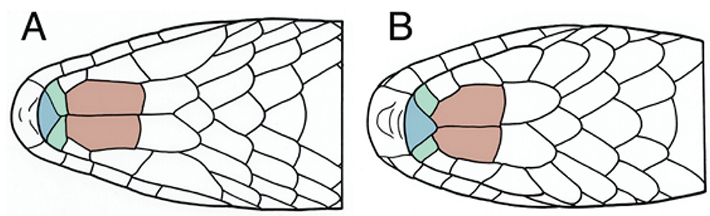

FIGURE 31. Ventral view of head of (A) *Calamaria palavanensis* (KU 309445), (B) *Calamaria gervaisii* (KU 307983). Mental scale (blue), anterior chin shields (reddish brown), first infralabial scales (green).

2b. Number of pair of subcaudal scales >40 (males), > 30 (females) . . . . *Calamaria* sp. Mindoro (Weinell et al., in review)

3a. Number of pairs of subcaudal scales ≤ 21 (males), ≤ 14 (females). . . . . . *Calamaria virgulata*
3b. Number of pairs of subcaudal scales 23–25 (males), 16–20 (females) *Calamaria palavanensis*

4a. Ventral surface of body with dark bands . . . . *Calamaria lumbricoidea*
4b. Ventral surface of body without dark bands 5
5a. Dorsal surface behind head has 2–6 dark, black-edged crossbands . . . . . *Calamaria bitorques*

5b. Dorsal surface behind head lacks dark, black-edged crossbands 6

6a. Diameter of eye less than eye-mouth distance . . . . *Calamaria joloensis*
6b. Diameter of eye equal to or greater than eye-mouth distance 7

7a. Each dorsal body scale with a light network; a continuous light stripe on first row of dorsal body scales present. . . . . *Calamaria suluensis*
7b. Each dorsal body scale above first row yellowish with a dark network; a dark-edged, interrupted, light stripe on first row of dorsal body scales usually present. . . . . *Calamaria gervaisii*

Calliophis

Key to Philippine species.

1a. Dorsal body surface with black and white crossbands, rather than longitudinal stripes; head black dorsally; tail red dorsally . . . . *Calliophis salitan*
1b. Dorsal body surface with pale longitudinal stripes, rather than crossbands. 2

2a. Black bands on ventral body surface not in contact with black of lateral body surface; distinct white longitudinal stripe present on lateral body surface, occupying entire first, or parts of first and second, dorsal body scale rows . . . . *Calliophis bilineata*
2b. Black bands on ventral body surface in contact with black of lateral body surface; distinct white stripe absent from first or second dorsal body scale rows 3

3a. Cream-colored bands on ventral body surface do not extend onto side of body above first dorsal body scale row. . . . . *Calliophis suluensis*
3b. Cream-colored bands on ventral body surface extend onto side of body, often to fourth dorsal body scale row. . . . . *Calliophis philippina*

Cerberus

Key to Philippine species.

1a. Dorsal body scales in 27–31 longitudinal rows at midbody; supralabial scales and other scales of head have a strongly papillate texture . . . . *Cerberus microlepis*
1b. Dorsal body scales in < 28 longitudinal rows at midbody; supralabial scales and other scales on head smooth . . . . *Cerberus schneideri*

Chrysopelea

Key to Philippine subspecies.

1a. Lateral body scales speckled (black with a bright central fleck); distinct transverse bands only in young animals; in the Philippines, only known from Sibutu Island (Sulu Archipelago). . . . . *Chrysopelea paradisi paradisi*

1b. Lateral body scales mostly light; color pattern of dorsal body surface variable, but transverse bands almost always present; occurs throughout the Philippines, but not known from Sabtang Island (Batanes Island group, off northern Luzon) . . . . *Chrysopelea paradisi variabilis*

Coelognathus

Key to Philippine species and subspecies.

1a. Number of subcaudal scales 87–107; number of ventral body scales + subcaudal scales < 330; adults lack distinctive black-edged white bars on side of body; juveniles usually with whitish crossbands present 2

1b. Number of subcaudal scales 102–114; number of ventral body scales + subcaudal scales > 325; adults and juveniles with a series of short black-edged white bars on side of body . . . . *Coelognathus philippinus*

2a. Adults with tail much lighter than posterior portion of body . . . . *Coelognathus erythrurus erythrurus*

2b. Adults without a distinct change in dorsal color between posterior portion of body and tail; posterior portion of body may or may not be darker than anterior portion of body 3

3a. Adults uniform light brown to reddish brown throughout the length of body and tail; no darkening posteriorly . . . . *Coelognathus erythrurus manillensis*

3b. Adults become darker posteriorly along length of body and tail . . . . *Coelognathus erythrurus psephenourus*

Cyclocorus

Key to Philippine species and subspecies.

1a. Ventral body scales > 137; hemipenes narrow, elongate with minute spines ornamenting walls; usually eight supralabial scales, three bordering eye; usually two anterior temporal scales (Fig. 32A); prominent white spots present along lateral edge of ventral body scales; many dark, usually triangularly-shaped, blotches on ventral body scales 2

1b. Ventral body scales < 136; hemipenes robust, inner walls uniformly spinose, spines of moderate size; supralabial scales 7–8, two or three bordering eye; anterior temporal scale usually one (Fig. 32B); white spots along lateral edge of ventral body scales, if present, obscure; few or no dark triangular blotches on ventral body scales 3

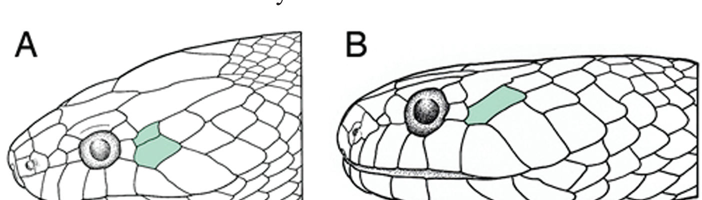

FIGURE 32. Lateral view of head of (A) *Cyclocorus lineatus alcalai* (KU 324539), (B) *Cyclocorus nuchalis taylori* (KU 344152). Anterior temporal scales (green).

2a. Tail length/total length 0.295–0.371 (males), 0.196–0.262 (females); subcaudals 52–59 (males), 42–48 (females); white spots along lateral edge of ventral body scales prominent. . . . . *Cyclocorus lineatus lineatus*

2b. Tail length/total length 0.235–0.296 (males), 0.152–0.223 (females); subcaudal scales 42–53 (males), 33–44 (females); white spots along lateral edge of ventral body scales very small . . . . *Cyclocorus lineatus alcalai*

3a. Usually seven supralabial scales, two bordering eye. . . . . *Cyclocorus nuchalis nuchalis*

3b. Usually eight supralabial scales, three bordering eye . . . . *Cyclocorus nuchalis taylori*

Dendrelaphis

Key to Philippine species.

1a. Dorsal body scales in 15 longitudinal rows at midbody; vertebral scales enlarged relative to other dorsal body scales . . . . *Dendrelaphis marenae*

1b. Dorsal body scales in 13 longitudinal rows at midbody; vertebral scales not enlarged relative to other dorsal body scales 2

2a. Pale ventrolateral body stripe absent; black longitudinal dorsal body stripes absent. 3

2b. Pale ventrolateral body stripe present; 2–8 black longitudinal dorsal stripes present (minimally) on posterior part of body 4

3a. Yellow stripe present on neck (in life); endemic to Sulu Archipelago . . . . *Dendrelaphis flavescens*

3b. Yellow stripe absent from neck (in life); not known from Sulu Archipelago. . . . . *Dendrelaphis fuliginosus*

4a. Number of black longitudinal stripes at midbody eight; known from Palawan, Balabac, and Busuanga Islands . . . . *Dendrelaphis levitoni*

4b. Fewer than eight black longitudinal stripes at midbody; not from Palawan, Balabac, and Busuanga Islands. 5

5a. Thin black stripe usually present along border of ventral scales and first row of dorsal body scales; second narrow black stripe may or may not be present on anterior one-fifth of body along border of second and third dorsal body scale rows; additional dark body stripes absent . . . . *Dendrelaphis philippinensis*

5b. Distinct black stripe present along border of ventral scales and first longitudinal row of dorsal body scales, and along border of second and third dorsal body scale rows; additional distinct dark stripes present on posterior third of body, along border of fourth and fifth, and fifth and sixth dorsal body scale rows . . . . *Dendrelaphis luzonensis*

Dryophiops

Key to Philippine species.

1a. Loreal scale absent (Fig. 33A); number of ventral body scales I77–188 . . . . *Dryophiops philippina*

1b. Loreal scale present (Fig. 33B); number of ventral body scales 188–199 . . . . *Dryophiops rubescens*

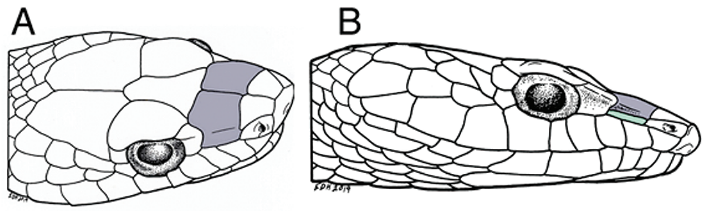

FIGURE 33. Lateral view of head of (A) *Dryophiops philippina* (UPLB MNH-Z-NS 4907), (B) *Dryophiops rubescens* (KU 328516). Loreal scale (green), prefrontal scales (purplish-gray).

Emydocephalus

Represented in the Philippines by a single species . . . . *Emydocephalus annulatus*

Gerarda

Represented in the Philippines by a single species . . . . *Gerarda prevostiana*

Gerrhopilus

Represented in the Philippines by a single species . . . . *Gerrhopilus hedraeus*

Gonyosoma

Represented in the Philippines by a single species . . . . *Gonyosoma oxycephalum*

Hemibungarus

Key to Philippine species.

1a. Temporal region of head heavily pigmented with melanin; number of white dorsal body bands usually < 60 2
1b. Temporal region of head not heavily pigmented with melanin; number of white dorsal body bands usually > 60 . . . . *Hemibungarus gemianulis*

2a. Number of ventral body scales 223–233 (males), 252–259 (females); black ventral body bands not divided by thin white bands . . . . *Hemibungarus calligaster*
2b. Number of ventral body scales < 223 (males; unknown for females); black ventral body bands divided by thin white band . . . . *Hemibungarus mcclungi*

Hologerrhum

Key to Philippine species.

1a. Posterior border of parietal scales unnotched (Fig. 34A); dark midventral stripe present; dark midlabial stripe present . . . . *Hologerrhum dermali*
1b. Posterior border of parietal scales notched (Fig. 34B); dark midventral stripe absent; dark midlabial stripe absent . . . . *Hologerrhum philippinum*

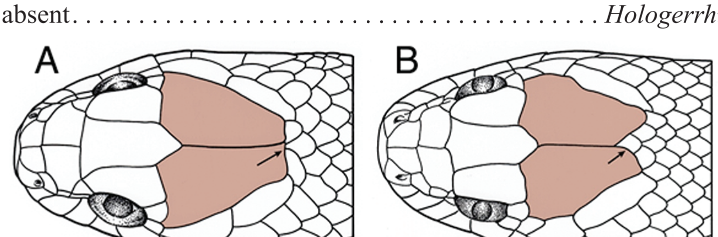

FIGURE 34. Dorsal view of head of (A) *Hologerrhum dermali* (CMNH 5075), (B) *Hologerrhum philippinum* (KU 330056). Parietal scales (reddish brown); black arrows point to posterior margin of parietal scale, showing unnotched parietal pattern (A), or notched parietal pattern (B).

Hydrophis

Key to species reported from or likely to occur in marine waters in the Philippines.

1a. Longitudinal scale rows around thickest part of body > 72 .... *Hydrophis annandalei*
1b. Longitudinal scale rows around thickest part of body 25–70 2

2a. Rostral scale fragmented into four or five smaller scales (Fig. 35); dorsal head scales with thickened edges .... *Hydrophis anomalus*
2b. Rostral scale not fragmented into four or five smaller scales 3

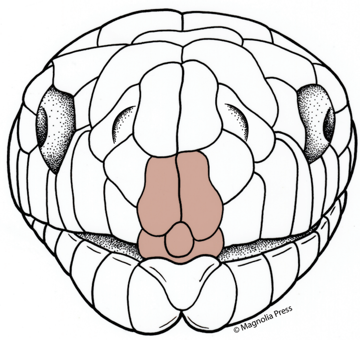

FIGURE 35. Rostral scale fragmented into four or five scales in *Hydrophis anomalus* (specimen number unknown; a redrafting by EH of original image in Rasmussen et al. 2011). Rostral scale (reddish brown). Fig. 35, modified original line drawing reproduced with permission of A. Rasmussen and *Zootaxa* and Magnolia Press.

3a. Ventral body scales large (> 1/4 body width) on anterior part of body and small on posterior part of body. .... *Hydrophis viperinus*
3b. Ventral body scales small on both anterior and posterior parts of body 4

4a. Ventral surface of body uniform yellow or white; dorsal part of body uniform dark brown or black .... *Hydrophis platurus*
4b. Ventral surface of body not uniform yellow or white; dorsal part of body not uniform dark brown or black. 5

5a. Mental scale elongate, not triangular (Fig. 36A) .... *Hydrophis schistosus*
5b. Mental scale triangular, not elongate (Fig. 36B). 6

6a. Enlarged chin shields absent 7
6b. Enlarged chin shields present, one or two pairs 8

7a. Midbody scales in > 45 longitudinal rows around body .... *Hydrophis stokesii*

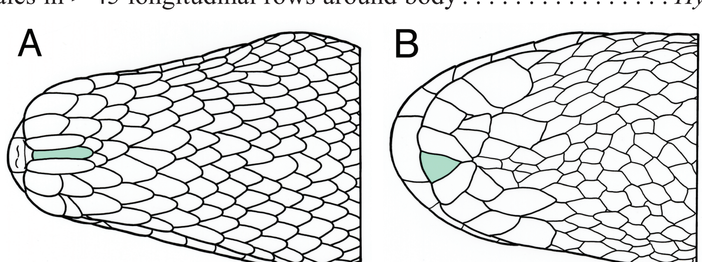

FIGURE 36. Ventral view of head of (A) *Hydrophis schistosus* (specimen number unknown; a redrafting by EH of original image in Rasmussen et al. 2011), (B) *Hydrophis curtus* (KU 40063). Mental scale (green), and either elongate (A) or triangular (B). Fig. 36A modified original line drawing reproduced with permission of A. Rasmussen and *Zootaxa* and Magnolia Press.

7b. Midbody scales in < 45 longitudinal rows around body . . . . *Hydrophis curtus*

8a. Longitudinal scale rows around thickest part of body ≤ 2. . . . . *Hydrophis jerdoni*
8b. Longitudinal scale rows around thickest part of body ≥ 25 9

9a. Frontal scale and parietal scales more or less fragmented (Fig. 37A). . . . . . *Hydrophis peronii*
9b. Frontal scale and parietal scales unfragmented (Fig. 37B). 10

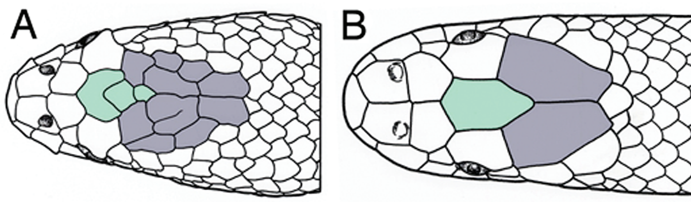

FIGURE 37. Dorsal view of head of (A) *Hydrophis peronii* (CAS 136104; a redrafting by EH of original image in Leviton et al. 2014), (B) *Hydrophis melanocephalus* (KU 94556). Frontal scales (green), parietal scales (purplish-gray). Fig. A reproduced and modified with permission of A. Leviton and the California Academy of Sciences.

10a. Maxillary teeth behind fangs ≥ 9 11
10b. Maxillary teeth behind fangs ≤ 8. 13

11a. Neck width divided by width at widest part of body 0.45–0.56; maxillary teeth behind fangs 14–18. . . . . *Hydrophis caerulescens*
11b. Neck width divided by width at widest part of body ≥ 0.57; maxillary teeth behind fangs 9–13 12

12a. Interspaces between black transverse dorsal bands thin, less than two scale rows wide . . . . *Hydrophis ornatus* or *H. inornatus*
12b. Interspaces between black transverse dorsal bands broad, more than two scale rows wide . . . . *Hydrophis lamberti*

13a. Width of neck > 1/2 width of widest part of body; anterior temporal scale one 14
13b. One or both of the following true: (1) width of neck < 1/2 width of widest part of body; (2) anterior temporal scales two 15

14a. Longitudinal scale rows around midbody 8–18 more than around neck . . *Hydrophis belcheri*
14b. Longitudinal scale rows around midbody 4–8 more than around neck . . . *Hydrophis spiralis*

15a. Head very small, width of neck ≤ 1/3 width of widest part of body; longitudinal scale rows around neck 17–23; ventral body scales of anterior part of body wider than adjacent scale rows; ventral body scales of posterior part of body are divided by a long longitudinal furrow . . . . *Hydrophis gracilis*
15b. One or more of the following combinations of characters true: (1) head small or moderate in size, width of neck > 1/3 width of widest part of body; (2) longitudinal scale rows around neck ≥ 23; (3) ventral body scales of posterior part of body not divided by a long longitudinal furrow 16

16a. Longitudinal scale rows around midbody 29–35; ventral body scales 278–325; dorsal surface of head uniformly dark brown to black . . . . *Hydrophis coggeri*

16b. One or more of the following combinations of characters true: (1) longitudinal scale rows around midbody > 35; (2) ventral body scales > 325; (3) dorsal surface of head has yellow spot behind nostrils and yellow streak behind eye 17

17a. Anterior temporal scales one 18
17b. Anterior temporal scales two 20

18a. Ventral body scales < 360; maxillary teeth behind fangs 6–8. . . . *Hydrophis melanocephalus*

18b. One or both of the following true: (1) ventral body scales ≥ 360; (2) maxillary teeth behind fangs < 6 19

19a. Longitudinal scale rows around midbody 37–45; dorsal body scales on thickest part of body hexagonal or quadrangular. . . . . *Hydrophis brookii*
19b. Longitudinal scale rows around midbody 31–39; dorsal body scales on thickest part of body with rounded or bluntly pointed tips . . . . *Hydrophis klossi*

20a. Width of neck ≤ 1/2 width of widest part of body; longitudinal scale rows around midbody 12–20 more than around neck; anterior surface of body dark with pale oval spots laterally that sometimes connect as crossbands. . . . . *Hydrophis atriceps*
20b. One or both of the following true: (1) width of neck > 1/2 width of widest part of body; (2) longitudinal scale rows around midbody < 12 more than around neck; (3) anterior and posterior surface of body dark with distinct white annuli 21

21a. Head yellowish or olive (adults) or black (juveniles); ventral body scales with a black longitudinal stripe that may fade with age; ventral body scales 290–390 . . . *Hydrophis cyanocinctus*
21b. Head black; ventral body scales usually black; ventral body scales 314–356; [non-marine] endemic to Lake Taal (Luzon) . . . . *Hydrophis semperi*

Indotyphlops

Represented in the Philippines by a single species . . . . *Indotyphlops braminus*

Laticauda

Key to the Philippine species.

1a. Scales in 19 longitudinal rows at midbody; two prefrontal scales (Fig. 38A) . . . . *Laticauda laticaudata*
1b. Scales in 21–25 longitudinal rows at midbody; three prefrontal scales (Fig. 38B) 2

2a. Rostral scale not divided horizontally; upper lip yellow; ventral body scales 213–245 . . . . *Laticauda colubrina*
2b. Rostral scale divided horizontally; upper lip brown; ventral body scales 195–205 . . . . *Laticauda semifasciata*

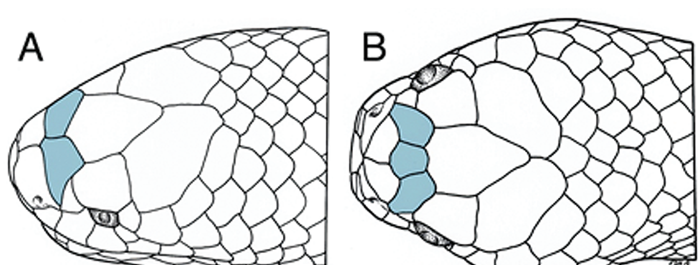

FIGURE 38. Dorsal view of head of the (A) *Laticauda laticaudata* (KU 94559), and (B) *Laticauda colubrina* (KU 303031). Prefrontal scales (blue).

Liopeltis

Key to Philippine species.

1a. Nasal scales fused to internasal scales anterior to rostral (Fig. 39); dorsal surface of body with four brown longitudinal stripes . . . . *Liopeltis philippinus*

1b. Nasal scales not fused to internasal scales; dorsal surface of body uniformly colored above, without longitudinal stripes . . . . *Liopeltis tricolor*

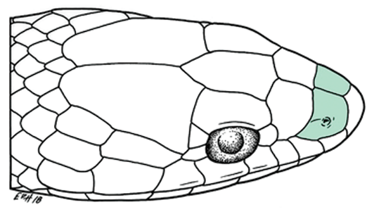

FIGURE 39. Dorsolateral view of head of *Liopeltis philippinus* (KU 327731). Nasal scales (green).

Lycodon

Key to Philippine species.

1a. Ventral body scales and subcaudal scales strongly keeled; dorsal body scales in 15 longitudinal rows at midbody . . . . *Lycodon philippinus*
1b. Ventral body scales and subcaudal scales smooth; dorsal body scales in 17 longitudinal rows at midbody 2

2a. Subcaudal scales in > 130 pairs . . . . *Lycodon fausti*
2b. Subcaudal scales in < 130 pairs. 3

3a. Some dorsal body scale rows keeled along the entire length of the body (keels may be faint or absent from scales that have lost their outermost layer). *Lycodon sealei*
3b. Dorsal body scales either all smooth, or, keeled on posterior part of body 4

4a. Subcaudal scales in > 100 pairs. 5
4b. Subcaudal scales in < 100 pairs . . . . *Lycodon capucinus*

5a. Dorsal part of body without light crossbands; ventral surface of body does not have dark markings, except for a large spot in lateral corner of each ventral body scale. 6
5b. Dorsal surface of body with light crossbands (at least the anterior part of body); ventral surface of body or tail has dark dots, spots, and/or transverse bands 7

6a. Ventral body scales > 200; vertebral scales > 205. . . . . *Lycodon alcalai*
6b. Ventral body scales < 200; vertebral scales < 205. . . . . *Lycodon chrysopteros*

7a. Crossbands absent from tail and posterior part od body; ventral bands absent; number of infralabial scales in contact with anterior and posterior chin shields five. . . . . *Lycodon solivagus*
7b. Dorsal crossbands present throughout length of body and tail; additionally, at least one of the following combinations of characters true: (1) number of infralabial scales in contact with anterior and posterior chin shields six; (2) ventral bands present 8

8a. Dorsal light crossbands > 50 on body, > 27 on tail; tail length 36–45% (usually > 38%) of snout-vent length . . . . *Lycodon muelleri*
8b. Dorsal light crossbands < 30 on body, < 25 on tail; tail length 33–39% (usually < 38%) of snout-vent length 9

9a. Dorsal light crossbands > 20 on body, > 15 on tail . . . . *Lycodon bibonius*
9b. Dorsal light crossbands < 20 on body, < 15 on tail 10

10a. Body and tail with dark rings completely encircling the body; number of supralabial scales usually ten (fourth through sixth border eye); dorsal body scales reducing to 15 longitudinal rows at approximately ventral 119 . . . . *Lycodon ferroni*
10b. Dorsal part of body and tail with dark crossbands often extending onto lateral edges of ventral body scales, but not completely encircling the body; number of supralabial scales 8–9 (fourth and fifth border eye); dorsal body scales reduce to 15 longitudinal rows between ventral body scales 131–145 . . . . *Lycodon dumerili*

Malayopython

Represented in the Philippines by a single species . . . . *Malayopython reticulatus*

Malayotyphlops

Key to Philippine species.

1a. Small subocular scale present, in contact with second and third supralabial scales, preocular scale, and ocular scale . . . . *Malayotyphlops manilae*
1b. Small subocular scale absent 2

2a. Dorsal body scales in < 29 longitudinal rows at midbody 3
2b. Dorsal body scales in ≥ 29 (usually 30) longitudinal rows at midbody; a dark dorsal stripe present with sharply defined lateral edges. 9

3a. Third supralabial scale does not extend dorsally to levels of nostrils (Fig. 40A). . . . . *Malayotyphlops denrorum*
3b. Third supralabial scale extends dorsally to levels of nostrils (Fig. 40B) 4

4a. Preocular scale overlaps second supralabial scale, and postnasal scale does not overlap third supralabial scale (Fig. 40B). 5
4b. Preocular scale does not overlap second supralabial scale and postnasal scale overlaps third supralabial scale (Fig. 40C). 6

5a. Dorsal body scales in 26 longitudinal rows behind head; dorsal stripe ≥ 17 scale rows wide on anterior of body . . . . *Malayotyphlops hypogius*
5b. Dorsal body scales in 28 longitudinal rows behind head; dorsal stripe 15 scale rows wide on anterior of body, narrowing posteriorly. . . . . *Malayotyphlops luzonensis*

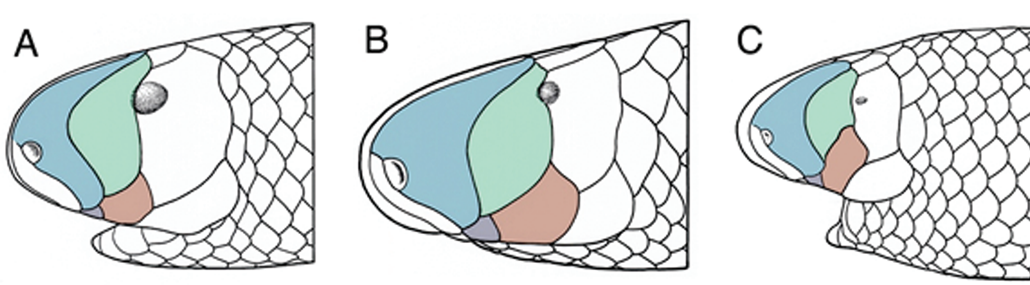

FIGURE 40. Lateral view of head of (A) *Malayotyphlops denrorum* (PNM 9813; a redrafting by EH of original image in Wynn et al. 2016), (B) *Malayotyphlops luzonensis* (CM 2653; a redrafting by EH of original image in Wynn et al. 2016), (C) *Malayotyphlops castanotus* (CAS SUR-27940; a redrafting by EH of original image in Wynn et al. 1993). Postnasal scale (blue; or posterior part of nasal scale, if nasal scale incompletely sdivided), preocular scale (green), second supralabial scale (purplish-gray), third supralabial scale (reddish brown). Figs. A–C reproduced and modified with permission of A. Wynn and *Journal of Herpetology.*

6a. Well-delineated, dark dorsal stripe 9–11 scale rows wide, not narrowing posteriorly . . . . *Malayotyphlops castanotus*
6b. Lateral scale rows of dorsal stripe lighter than (or not as completely pigmented as) medial rows; dorsal stripe narrows posteriorly 7

7a. Pale (unpigmented) collar present behind head; dorsal body scales in > 400 transverse rows between head and tail . . . . *Malayotyphlops collaris*
7b. No pale collar behind head; dorsal body scales in < 400 transverse rows between head and tail 8

8a. Dark dorsal body stripe 15 scale rows wide on anterior of body . . . . . . *Malayotyphlops ruber*
8b. Dark dorsal body stripe 13 scale rows wide on anterior of body . . . . . . *Malayotyphlops andyi*

9a. Dorsal body scales in > 350 transverse rows between head and tail . . . . *Malayotyphlops canlaonensis*
9b. Dorsal body scales in < 350 transverse rows between head and tail . . . . *Malayotyphlops ruficaudus*

Myersophis

Represented by a single species . . . . *Myersophis alpestris*

Naja

Key to Philippine species.

1a. Dorsal body scales in 21–23 longitudinal rows at midbody; dorsal color uniformly light brown or olive . . . . *Naja philippinensis*
1b. Dorsal body scales in 17–19 longitudinal rows at midbody; dorsal color black or dark brown 2

2a. A few anterior ventral body scales light yellow, followed by band of black that gradually fades posteriorly; 162–178 ventral body scales . . . . *Naja samarensis*
2b. Ventral body surface dark or light but without a distinctive black band on anterior portion; 178–189 ventral body scales . . . . *Naja sumatrana*

Oligodon

Key to Philippine species.

1a. Dorsal body scales in 15 longitudinal rows at midbody 2
1b. Dorsal body scales in 17 longitudinal rows at midbody 3

2a. Light vertebral stripe present; no prominent dorsal body blotches; quadrangular black spots present on ventral body scales . . . . *Oligodon modestus*
2b. Light vertebral stripe absent; light dorsal body spots or blotches usually present; distinctive markings absent from ventral body scales . . . . *Oligodon notospilus*

3a. Number of supralabial scales usually six; number of anterior temporal scales two; no transverse markings on dorsal surface of body . . . . *Oligodon meyerinki*
3b. Number of supralabial scales usually seven; number of anterior temporal scales one or two; transverse markings present on dorsal surface of body 4

4a. Dorsal body blotches > 30, irregularly shaped, forming poorly defined dark crossbands; number of ventral body scales > 180; number of ventral body scales + subcaudal scales > 230 (females; unknown for males) . . . . *Oligodon perkinsi*

4b. Dorsal body blotches well-defined, numbering < 30; number of ventral body scales < 180; number of ventral body scales + subcaudal scales < 220 5

5a. Dark dorsal body blotches extend laterally to ventral body scales; two preocular scales (Fig. 41A); number of ventral body scales + subcaudal scales 211–216 . . . . *Oligodon maculatus*

5b. Dark dorsal body blotches saddle-shaped, not extending to ventral body scales; usually one preocular scale (Fig. 41B); number of ventral body scales + subcaudal scales 183–207 . . . . *Oligodon ancorus*

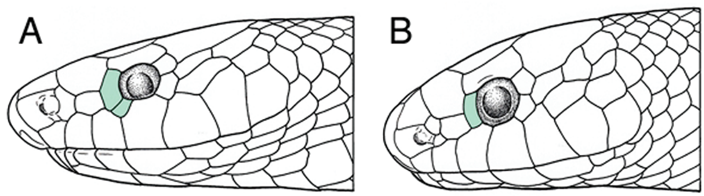

FIGURE 41. Lateral view of head of (A) *Oligodon maculatus* (KU 321699), (B) *Oligodon ancorus* (KU 346379). Preocular scales (green).

Ophiophagus

Represented by a single species . . . . *Ophiophagus hannah*

Opisthotropis

Key to Philippine species.

1a. Dorsal body scales in 19 longitudinal rows at 25th ventral body scale . . . *Opisthotropis typica*

1b. Dorsal body scales in 21 longitudinal rows at 25th ventral body scale. . . *Opisthotropis alcalai*

Oxyrhabdium

Key to Philippine species.

1a. Loreal scale separated from or in contact with second supralabial scale; if loreal scale in contact with second supralabial scale, their length of contact is less than half the length of the contact between loreal and postnasal scales (Fig. 42A); usually eight supralabial scales (rarely seven), with fifth and six (rarely fourth and fifth) supralabial scales bordering eye (Fig. 42A); dorsal surfaces of head, body, and tail brown or reddish-brown in color; juveniles have distinct white nuchal collar, but lack light crossbands on other parts of the body . . . . *Oxyrhabdium modestum*

1b. Length of contact between loreal scale and second supralabial scale similar to length of contact between loreal scale and postnasal scale (Fig. 42B); seven supralabial scales, with fourth and fifth supralabial scales bordering eye (Fig. 42B); dorsal surfaces of head, body, and tail dark gray or olive in color; juveniles have distinct white nuchal collar plus light crossbands on other parts of body and tail; pale crossbands may be faintly visible in adults 2

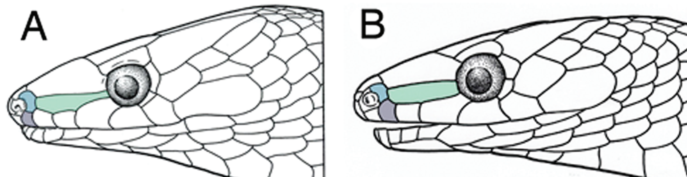

FIGURE 42. Lateral view of head of (A) *Oxyrhabdium modestum* (KU 311301), (B) *Oxyrhabdium leporinum leporinum* (KU 322335). Loreal scale (green), postnasal scale (blue), second supralabial scale (purplish-gray).

2a. Adult dorsal color pattern uniform (lacking pale crossbands); number of ventral body scales + subcaudal scales 192–230 . . . . *Oxyrhabdium leporinum leporinum*
2b. Adults and juveniles with narrow white dorsal body crossbands and white nuchal collar; number of ventral body scales + subcaudal scales 221–235 . . . *Oxyrhabdium leporinum visayanum*

Psammodynastes

Represented in the Philippines by a single species. . . . . *Psammodynastes pulverulentus*

Pseudorabdion

Key to Philippine species.

1a. Loreal scale absent, prefrontal scale in contact with supralabial scales (Fig. 43B–D). 2
1b. Loreal scale present, prefrontal scale not in contact with supralabial scales (Fig. 43A) 4

2b. Frontal scale does not border eye; supraocular and postocular scales present, fused to each other (Fig. 43C–D) 3
2a. Frontal scale borders eye; supraocular scale absent (Fig. 43B) 6

3a. Parietal scale in contact with fourth and fifth supralabial scales (Fig. 43C); each scale of first dorsal body scale row has dark center and light edges; each ventral body scale dark brown, lighter along posterior edge; supraocular and postocular scales usually fused to eye; ventral body scales 132–144 (males), 144–157 (females); subcaudal scales 22–24 (males), 16–17 (females) . . . . *Pseudorabdion oxycephalum*
3b. Parietal scale in contact with fifth, but not fourth, supralabial scale (Fig. 43D); each scale of first dorsal body scale row has light center and dark edges; each ventral body scale whitish, with dark brown pigment confined to a broad transverse band; supraocular and postocular scales not fused to eye; ventral body scales 146–148 (males), 154–161 (females); subcaudal scales 28 (males), 21–24 (females) . . . . *Pseudorabdion montanum*

4a. Light nuchal collar usually present; subcaudal scales 26–29 (males), 17–23 (females) . . . . *Pseudorabdion mcnamarae*
4b. Light nuchal collar absent; subcaudal scales > 30 (males and females). 5

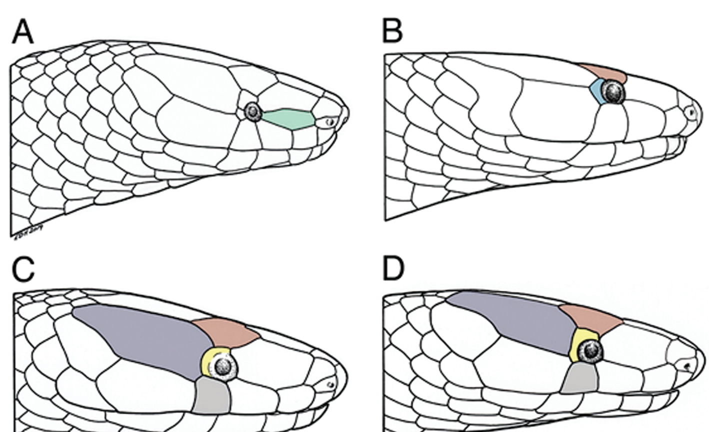

FIGURE 43. Lateral view of head of (A) *Pseudorabdion mcnamarae* (KU 327199), (B) *Pseudorabdion* cf. *collaris* (KU 315197), (C) *Pseudorabdion oxycephalum* (KU 324641), (D) *Pseudorabdion montanum* (KU 305063). Loreal scale (green; A), parietal scale (purplish-gray; C–D), fourth supralabial scale (light gray; C–D), postocular scale (blue; B), frontal scale (reddish brown; B–D), scale formed from fusion of supraocular and postocular scales (yellow; C–D).

5a. Dorsal body scales uniform pale brown, each thinly edged with pigmentless border; distal portion of hemipenes calyculate, subcaudal scales 33–35 (females), 40 (males) . . . . *Pseudorabdion taylori*

5b. Dorsal body scales pale, centers and posterior tips nearly without pigment; anterior edge of each dorsal body scale with brown mottling; large areas of lateral portion of ventral body scales without pigment; distal portion of hemipenes minutely spinose; subcaudal scales 36–39 (males; unknown for females) . . . . *Pseudorabdion talonuran*

6a. Postocular scale absent (fused to ocular scale); maxillary teeth 10–12 . . . *Pseudorabdion ater*

6b. Postocular scale present, not fused to ocular scale (Fig. 43B); maxillary teeth 22–25 . . . . *Pseudorabdion* cf. *collaris*

Ptyas

Key to Philippine species.

1a. Dorsal body scales in 16 or 18 longitudinal rows on anterior third of body; mid-dorsal body scales keeled. . . . . *Ptyas carinata*

1b. Dorsal body scales in 14 longitudinal rows on anterior third of body; mid-dorsal body scales smooth. . . . . *Ptyas luzonensis*

Ramphotyphlops

Key to Philippine species.

1a. Ocular scale overlaps third supralabial scale (Fig. 44A) . . . . *Ramphotyphlops marxi*

1b. Third supralabial scale overlaps ocular scale (Fig. 44B) . . . .

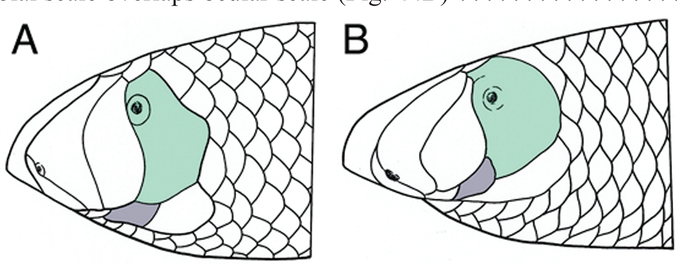

FIGURE 44. Lateral view of head of (A) *Ramphotyphlops marxi* (FMNH 96520; a redrafting by EH of original image in Wallach et al. 1993), (B) *Ramphotyphlops suluensis* (PBS 2001; a redrafting by EH of original image in Taylor 1918). Ocular scale (green), third supralabial scale (purplish-gray). Fig. A reproduced and modified with permission of V. Wallach and *Journal of Herpetology.*

2a. Longitudinal scale rows around midbody 24–28 . . . . *Ramphotyphlops cumingii*

2b. Longitudinal scale rows around midbody 20–22 3

3a. Width of preocular scale about equal to width of ocular scale; width of rostral scale ~0.75 head width; nasal scale nearly, but not completely, divided. . . . . *Ramphotyphylops olivaceus*

3b. Preocular scale much narrower than ocular scale; width of rostral scale about half the width of head; nasal scale completely divided . . . . *Ramphotyphlops suluensis*

Rhabdophis

Key to Philippine species.

1a. Dorsal body scales in 15–17 longitudinal rows at midbody; background color of ventral body scales black 2

1b. Dorsal body scales in 17–19 longitudinal rows at midbody; background color of ventral body scales pale 3

2a. Light lateral body stripe not continuous across angle of jaw, separated from white patch behind eye . . . . *Rhabdophis auriculatus auriculatus*
2b. Light lateral body stripe continuous across angle of jaw to postocular region . . . . *Rhabdophis auriculatus myersi*
3a. Dorsal body scales in 17 longitudinal rows at midbody 4
3b. Dorsal body scales in 19 longitudinal rows at midbody 5
4a. Pale dorsolateral body stripes present; pale nuchal spot present (except for hypermelanistic individuals from Lubang Island) . . . . *Rhabdophis spilogaster*
4b. Pale dorsolateral body stripes absent; pale nuchal spot absent . . . . *Rhabdophis barbouri*
5a. Distinct white stripe extends across supralabial scales; one anterior temporal scale, in contact with the sixth supralabial scale; usually two preocular scales (Fig. 45A). . *Rhabdophis lineatus*
5b. No distinct white stripe on supralabial scales; two anterior temporal scales, neither in contact with the sixth supralabial scale; one preocular scale (Fig. 45B) . . . . . . *Rhabdophis chrysargos*

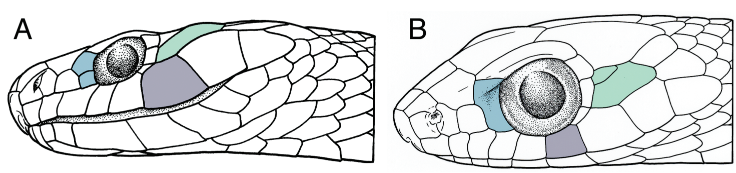

FIGURE 45. Lateral view of head of (A) *Rhabdophis lineatus* (KU 326696), (B) *Rhabdophis chrysargos* (composite drawing from photographs of multiple individuals). Anterior temporal scales (green), sixth supralabial scale (purplish-gray), preocular scales (blue).

Sibynophis

Key to Philippine species and subspecies.

1a. Pale interocular bar present; usually eight (rarely nine) supralabial scales . . . . *Sibynophis bivittatus*
1b. Pale interocular bar absent; usually nine (rarely eight) supralabial scales . . . . *Sibynophis geminatus geminatus*

Stegonotus

Represented in the Philippines by a single species . . . . *Stegonotus muelleri*

Trimeresurus

Key to Philippine species.

1a. Tail color distinctly different from body color (in life: tail color red, body color green); hemipenes spinose. . . . . *Trimeresurus schultzei*
1b. Tail color not distinctly different from body color (in life: tail and body may be green, red, orange, yellow, gray, or white); hemipenes lack spines 2
2a. Body and tail color green (adults and some juveniles in life) or red (some juveniles in life) . . . . *Trimeresurus flavomaculatus*
2b. Body and tail color yellow, gray, or white (in life) . . . . *Trimeresurus mcgregori*

Tropidolaemus

Key to Philippine species.

1a. Longitudinal rows of dorsal body scales at midbody 21–23 (males), 21–29 (females); dorsal scales on head 9–16 along a line passing between the supraocular scales (Fig. 46A); third supralabial scale usually separated from subocular scale by one or two scales; color variable, shades of green, blue or green, and blue in females, and green in males, but blue in some Negros Island populations; crossbands on body blue and white, red and white, or blue, red and white; color of postocular stripe variable (females), white or red (males), or red (juveniles). . . . . *Tropidolaemus subannulatus*

1b. Longitudinal rows of dorsal body scales at midbody 18–19 (males and females); dorsal scales on head 6–8 along a line between the supraocular scales (Fig. 46B); third supralabial scale usually in contact with subocular scale (rarely separated by one scale); in life: background body color turquoise-green (males) or green (females); postocular stripe usually black (rarely white) . . . . *Tropidolaemus philippensis*

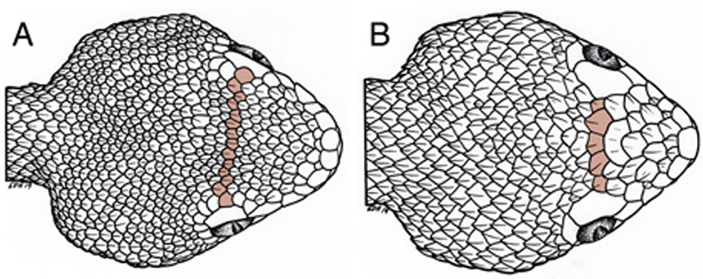

FIGURE 46. Dorsal view of head of (A) *Tropidolaemus subannulatus* (KU 324585), (B) *Tropidolaemus philippensis* (KU 334672). Dorsal scales of head along line between supraocular scales (reddish brown).

Tropidonophis

Key to Philippine species.

1a. Dorsal body scales in 17 longitudinal rows at ventral 25 . . . . *Tropidonophis dendrophiops*
1b. Dorsal body scales in 19 longitudinal rows at ventral 25 . . . . *Tropidonophis negrosensis*

Unnamed genus

Represented by a single species. . . . . unnamed genus and species (Fig. 47)

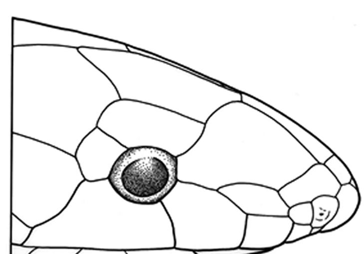

FIGURE 47. Lateral view of anterior part of head of a recently discovered (Weinell and Brown 2018) unnamed lineage (KU 337269).

Xenopeltis

Represented in the Philippines by a single species . . . . *Xenopeltis unicolor*

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Appendix

Glossary

Annulus. (*pl.* –**i**) Transverse ring of color encircling the body.

Anterior. At or near the front (head) end of the body. *Anterior to* means relatively nearer to the anterior end of the body compared to another structure.

Band. A broad, transverse area of contrasting color that may or may not completely encircle the body.

Blotch. An area of color differing from the ground color, usually somewhat round or square in shape, and may have a contrasting border.

Calyculate. Covered by cup-shaped structures.

Chin shield. Any of paired, elongated scales on the lower jaw of snakes and situated behind one or more pairs of infralabial scales that are in contact medially.

Cloaca. The common chamber where the urinary, digestive, and reproductive ducts release their contents; opens to the exterior through the vent.

Collar. A transverse band of color on the dorsal surface of the neck.

Crossband. A transverse area of color that extends towards (but usually not onto) the ventral body surface; a band that does not encircle the body and is usually restricted to the dorsal surfaces of the body.

Dorsal. At or near the upper (back) surfaces of the head, body, or tail; *dorsal to* means relatively nearer to the upper surfaces of the head, body, or tail compared to another structure of interest.

Dorsal body scale. Any of the scales on the upper surface of the body.

Dorsocaudal scale. Any of the scales on the upper surface of the tail.

Eye–mouth distance. The vertical distance from the ventral margin of the eye to the edge of the mouth.

Frontal scale(s). The scale(s) on mid-top of the head between the supraocular scales; if supraocular scales are absent, the frontal scale is between the ocular scales.

Ground color. The background or base color on which more prominent aspects of color pattern (e.g., stripes, blotches, crossbands) may appear. If no specific types of markings are present, the coloration may be called uniform.

Gular scale. A scale on the lower jaw of snakes, situated between the infralabial scales, chin shields, and ventral body scales; sometimes lateral gular scales and medial gular scales are distinguished.

Hemipenis. (*pl.* **–es**) Either of paired copulatory organs (of males) lying in a cavity at the base of the tail in squamate reptiles.

Heat sensing pit. Specialized infrared receptors located either within the rostral scale and labial scales, or as single structures between the eye and nostril on either side of the head.

Hypermelanistic. Having excessive pigmentation or blackening of the skin or other tissues.

Infralabial scale. Any of the scales along the lower lip of the mouth behind the mental scale.

Intergenial scale. Any scale situated between a pair of chin shields.

Internasal scale. Any of enlarged scales on the dorsal surface of the head, situated between the nasal scales, behind the rostral scale, and before the prefrontal scales.

Interocular bar. A transverse band of color located on the dorsal surface of the head between the eyes.

Interparietal scale. A scale on the dorsal midline of the head, situated behind the parietal scales.

Keel. Longitudinal ridge on a scale.

Labial scale. Any of the scales on the side of the head bordering the mouth opening; supralabial scale refers to a labial scale along the upper lip of the mouth; infralabial scale refers to a labial scale along the lower lip of the mouth.

Lateral. At or near the left or right side surfaces of the head, body, or tail; the opposite of medial. *Lateral to* means relatively nearer to the side surfaces of the head, body, or tail compared to some other structure.

Lateral gular scale. Any of the relatively elongate gular scales positioned laterally, rather than medially, on the throat, and arranged in an oblique row.

Lateral body scale. Any of the dorsal body scales not located on the middorsal line of the body.

Longitudinal. Running along, or parallel to, the long axis of the body.

Loreal scale. Either a scale between a nasal scale and a preocular scale (more common condition), or an elongate scale situated between a nasal scale and the eye (less common condition). The latter condition is mostly found in the genera *Oxyrhabdium*, *Myersophis*, and some *Pseudorabdion* species, and the scale is sometimes called a lori-ocular scale (Leviton et al. 2018).

Medial. Situated toward or at the midline of a body or structure.

Medial gular scale. A gular scale along the ventral midline of the throat.

Mental scale. Single median scale situated on the front of the lower jaw, bordered on both sides by the first infralabial scales.

Nasal scale. A scale that borders or contains a nostril. This scale may be entire or partially or completely divided by a suture. If divided, the scale anterior to the suture is called the prenasal scale and the scale posterior to the suture is called the postnasal scale.

Nasal suture. A deep furrow or cleft running from the posterior-ventral end of the nasal scale through the nostril to the prefrontal scale, dividing or nearly dividing the nasal scale into prenasal and postnasal scales.

Nostril. The nasal opening.

Nuchal. Pertaining to neck; the dorsal surface immediately behind the head.

Ocular scale. Either: (1) a scale bordering the eye, including preocular scales, postocular scales, supraocular scales, and subocular scales, or (2) a scale covering a rudimentary eye of blind snakes.

Papillate. Having or bearing papillae, or nipple-shaped protuberances.

Parietal scale. Either of a pair of large scales on the head, immediately behind the frontal scale and forming the last pair of scales usually distinguishable from the dorsal body scales.

Posterior. At or near the tail end of the body. *Posterior to* means relatively nearer to the posterior (tail) end of the body compared to another structure.

Postocular region. Of or pertaining to the region immediately behind the eye.

Postocular scale. A scale bordering the posterior margin of the eye.

Precloacal scale. A scale on the ventral surface of the body that covers the vent, and is situated behind the ventral body scales and before the subcaudal scales; may be single or divided.

Prefrontal scale. Any of the scales on the dorsal surface of the head situated immediately anterior to the frontal scale.

Preocular scale. A scale bordering the anterior margin of the eye.

Rostral scale. A scale at the tip of the snout, bordering the mouth and separating the two rows of supralabial scales.

Snout. The anterior part of the head, which includes the nostrils.

Snout–vent length (SVL). A measure of body length representing the distance from the tip of the snout to the vent along the midline of the body.

Subcaudal scale. Any scale on the ventral surface of the tail, either in a single or divided (two) longitudinal series.

Subocular scale. Any scales situated between the lower margin of the eye and one or more supralabial scales.

Supralabial scale. Any of the scales along the upper lip of the mouth behind the rostral scale.

Supraocular scale. A scale on the dorsal surface of the head, bordering the upper margin of the eye.

Tail spine. The terminal scale on the tail tip of snakes.

Temporal scale. Any scale behind the postocular scales, below the parietal scale, and above the supralabial scales. Anterior temporal scales are those belonging to the first vertical row immediately behind the postocular scales.

Transverse. Placed or running at right angles to the long axis of the body; across.

Vent. The external opening of the cloaca.

Ventral. At or near the lower surfaces of the head, body, or tail. *Ventral to* means relatively nearer to the lower surfaces of the head, body, or tail compared to some other structure.

Ventral body scale. Following the definition used by Dowling (1951): any of the scales on the ventral surface of the body anterior to the precloacal scale and in contact with both of the first longitudinal rows of dorsal body scales.

Vertebral body scale. Any of the dorsal body scales located on the middorsal line of the body.

Vertebral stripe. A longitudinal stripe of color located on the middorsal line of the body.

Table 1: Data for illustrated species and specimens.

TABLE 1. Illustrated specimens. California Academy of Sciences (CAS); Carnegie Museum (CM); Edward H. Taylor collection (EHT); Field Museum of Natural History (FMNH); University of Kansas Natural History Museum and Biodiversity Institute (KU); Philippine Bureau of Science (PBS); National Museum of the Philippines (PNM); Senckenberg Forschungsinstitut und Naturmuseum (SMF); Camila G. Meneses field tag (UPLB-MNS). (*) Illustration was reflected along a vertical axis; (**) one side of illustration is a mirror of the other; (***) composite illustration, drawn from multiple source specimens, illustrations, or photos.

Species	Catalog #	Locality	Figures	Sources
Acutotyphlops banaorum	FMNH 262249	Barangay Balbalasang, Municipality of Balbalan, Kalinga Province, Luzon Island, Philippines	22A [dorsal head]	Redrawn from Wallach et al. 2007 Fig. 2
Acrochordus granulatus	KU 302951	Barangay Old Poblacion, Municipality of Buena Vista, Guimaras Island, Guimaras Province, Philippines	3A [lateral body]	original
Ahaetulla prasina preocularis	KU 347854	Barangay Cawayan, Municipality of Irosin, Sorsogon Province, Luzon Island, Philippines	25A* [head lateral]	original
	KU 349849	Barangay Lidong, Municipality of Presentacion, Camarines Sur Province, Luzon Island, Philippines	26A* [ventral scales]	original
Aplopeltura boa	KU 334473	Eye Falls (crossing of Dayhopan and Agay rivers, Mt. Hilong-Hilong), Municipality of Remedios T. Romualdez, Agusan del Norte Province, Mindanao Island, Philippines	8A	original
	KU 334474	May Impit, Mt. Hilong-Hilong, Aguson del Norte Province, Mindanao Island, Philippines	8B	original
Boiga angulata	KU 343853	Barangay Dinaayan, Municipality of Burauen, Leyte Province, Leyte Island, Philippines	28A [head lateral]	original
Boiga cynodon	KU 328496	Khao Luang National Park, Karome, Nakhon Si Thammarat Province, Thailand	30A [head ventral]	original
Boiga philippina	KU 304855	Barangay Babuyan Claro, Babuyan Island, Municipality of Calayan, Cagayan Province, Philippines	30B [head ventral]	original
Calamaria gervaisii	KU 322329	Barangay Villa Aurora, Aurora Memorial National Park, Municipality of Maria Aurora, Aurora Province, Luzon Island, Philippines	9C [head dorsal]	original
			12A*/27A* [head lateral]	original
	KU 307983	Camiguin Norte Island, Municipality of Calayan, Cagayan Province, Philippines	5B [body ventral];	original
			31B [head ventral]	original
Calamaria lumbricoidea	KU 315159	Barangay Baluno, Pasonanca Natural Park, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	11C* [head lateral]	original
Calamaria palavanensis	KU 309445	Barangay Irawan, Municipality of Puerto Princessa, Palawan Island, Palawan Province, Philippines	31A [head ventral]	original
Calliophis philippina	KU 327218	Barangay Pandan, Municipality of Mambajao, Camiguin Province, Camiguin Sur Island, Philippines	17D* [head lateral]	original
Cerberus schneideri	KU 305489	Barangay Dalipay, Municipality of Sorsogon, Sorsogon Province, Luzon Island, Philippines	9A	original
Chrysopelea paradisi variabilis	KU 337271	San Rafael Barangay, Municipality of Taft, Eastern Samar Province, Samar Island, Philippines	26B [ventral scales]	original

Species	Catalog #	Locality	Figures	Sources
Coelognathus erythrurus manillensis	KU 335195	Angat Watershed, Municipality of Norzagaray, Bulacan Province, Luzon Island, Philippines	28B* [head lateral]	original
Cyclocorus lineatus alcalai	KU 324539	Barangay Patag, Municipality of Silay, Negros Occidental Province, Negros Island, Philippines	13B/32A [head lateral]	original
			2J/14B [tail ventral]	original
Cyclocorus lineatus lineatus	KU 346571	Barangay Cogon, Municipality of Irosin, Sorsogon Province, Luzon Island, Philippines	19B* [head ventral]	original
Cyclocorus nuchalis nuchalis	KU 327765	Barangay Kimlawis, Municipality of Kiblawan, Davao del Sur Province, Mindanao Island, Philippines	19C* [head ventral]	original
Cyclocorus nuchalis taylori	KU 344162	Barangay Guinmaayohan, Municipality of Balangiga, Eastern Samar Province, Samar Island, Philippines	32B [head lateral]	original
Dendrelaphis marenae	KU 314131	Barangay San Marcos, Municipality of Bunawan, Agusan del Sur Province, Mindanao Island, Philippines	15A [body lateral]	original
Dryophiops philippina	UPLB MNH-Z-NS 4907	Barangay Tampayan, Sibuyan Island, Municipality of Magdiwang, Philippines	33A [head lateral]	original
Dryophiops rubescens	KU 328516	Khao Luang National Park, Nakhon Si Thammarat Province, Thailand	25B*/33B [head lateral]	original
Emydocephalus annulatus	specimen number not reported	—	16 [head lateral]	Redrawn from Rasmussen et al. 2011 Fig. 3
Gerrhopilus hedraeus	CAS-SUR 12346	fide Savage (1950): "1500 ft. above Luzuriaga, ca. 6 miles southwest of Dumaguete, Oriental Negros, Philippines."	6A [head lateral]	Redrawn from Savage, 1950 Fig. 1
Gonyosoma oxycephalum	KU 315168	Pasonanca Natural Park, Barangay Pasonanca, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	10B** [head dorsal]	original
Hemibungarus mcclungi	KU 313898	Barangay Tulay Na Lupa, Mt. Labo, Municipality of Labo, Camarines Norte Province, Luzon Island, Philippines	11A*/17C* [head lateral]	original
Hologerrhum dermali	CMNH 5075	Mt. Madja-as, Barangay Alojipan, Municipality of Culasi, Antique Province, Panay Island, Philippines	10C/34A [head dorsal]	Brown et al. 2001 Fig. 4A
Hologerrhum philippinum	KU 330056	Barangay Magrafil, Mt. Cagua, Municipality of Gonzaga, Cagayan Province, Luzon Island, Philippines	18B/34B [head dorsal]	original
			19A* [head ventral; some artistic license reflecting scales on left side of head]	original
Hydrophis anomalus	specimen number not reported	—	35 [rostral view]	Redrawn from Rasmussen et al. 2011 Fig. 2
Hydrophis curtus	KU 40063	Phet Buri Province, Thailand	36B [head ventral]	original
Hydrophis melanocephalus	KU 94556	Chiling Harbor, Taiwan	37B [head dorsal]	original
Hydrophis peronii	CAS 136104	Ashmore Reef, West Island, Timor Sea, Australia	37A [head dorsal]	Redrawn from Leviton et al. 2014 Fig. 42.

Species	Catalog #	Locality	Figures	Sources
Hydrophis schistosus	specimen number not reported	—	36A [head ventral]	Redrawn from Rasmussen et al. 2011 Fig. 5
Indotyphlops braminus	specimen number not reported	"East Indies"	21A* [head lateral]	Redrawn from Taylor 1922a Fig. 2b.
Laticauda colubrina	KU 303031	Barangay San Vicente, Municipality of Concepcion, Maestro de Campo Island, Romblon Province, Philippines	38B [head dorsal]	original
	KU 303033	Barangay San Vicente, Municipality of Concepcion, Maestro de Campo Island, Romblon Province, Philippines	4A* [tail lateral]	original
Laticauda laticaudata	KU 94559	Buckner Bay, Okinawa Prefecture, Japan	38A [head dorsal]	original
Liopeltis philippinus	KU 327731	Barangay Samarinana, Municipality of Brooke's Point, Palawan Island, Palawan Province, Philippines	9D/39 [head dorsal-lateral]	original
Lycodon muelleri	KU 327575	Barangay Biak na Bato, Biak na Bato National Park, Municipality of San Miguel, Bulacan Province, Luzon Island, Philippines	12B [head lateral]	original
Malayopython reticulatus	KU 330021	Barangay Magrafil, Mt. Cagua, Municipality of Gonzaga, Cagayan Province, Luzon Island, Philippines	2H/7B [head lateral]	original
Malayotyphlops castanotus	CAS SUR-27940	Inampulugan Island, Municipality of Sibunag, Guimaras Province, Philippines	40C [head lateral]	Redrawn from Wynn et al, 1993 Fig. 1
Malayotyphlops denrorum	PNM 9813	Barangay Dibuluan, Municipality of San Mariano, Isabela Province, Luzon Island, Philippines	6C/40A [head lateral]	Redrawn from Wynn et al. 2016 Fig. 4
Malayotyphlops luzonensis	CM 2653	Mt. Makiling, Laguna Province, Luzon Island, Philippines	6B/23B/ 40B [head lateral]	Redrawn from Wynn et al. 2016 Fig. 3
Malayotyphlops ruber	SMF 16616	Samar Island, Philippines	22B [head dorsal]	Redrawn from Wynn et al. 2016 Fig. 2
Myersophis alpestris	KU 308684	Barangay Maddiangat, Mt. Palali, Municipality of Quezon, Nueva Vizcaya Province, Luzon Island, Philippines	20A [head lateral]	original
Naja samarensis	KU 326653	Barangay Kimlawis, Municipality of Kiblawan, Davao del Sur Province, Mindanao Island, Philippines	17A [head lateral]	original
Oligodon ancorus	KU 346379	Barangay Salvacion, Municipality of Bulusan, Sorsogon Province, Luzon Island, Philippines	41B* [head lateral]	original
Oligodon maculatus	KU 321699	Pasonanca Natural Park, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	3C*/15B* [body lateral]	original
			41A* [head lateral]	original
Ophiophagus hannah	KU 321813	Pasonanca Natural Park, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	4B [tail lateral]	original
			17B [head lateral]	original
Opisthotropis typica	KU 327424	Barangay Mainit, Municipality of Brooke's Point, Palawan Island, Palawan Province, Philippines	3B [body lateral]	original
			9B [head dorsal-lateral]	original
			14A [tail ventral] Note:artistic licence taken to omit protruding hemipenes	original

Species	Catalog #	Locality	Figures	Sources
Oxyrhabdium modestum	KU 311301	Barangay Kilim, Municipality of Baybay, Leyte Province, Leyte Island, Philippines	18A [head dorsal]	original
			20B/42A* [head lateral]	original
Oxyrhabdium leporinum leporinum	KU 322335	Barangay Villa Aurora, Aurora Memorial National Park, Municipality of Maria Aurora, Aurora Province, Luzon Island, Philippines	42B* [head lateral]	original
Psammodynastes pulverulentus	KU 329688	Barangay Adams, Mt. Pao, Municipality of Adams, Ilocos Norte Province, Luzon Island, Philippines	13A [head dorsal-lateral]	original
Pseudorabdion collaris	KU 315197	Barangay Baluno, Pasonanca Natural Park, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	27B/43B* [head lateral]	original
Pseudorabdion mcnamarae	KU 327199	Municipality of San Mariano, Isabela Province, Luzon Island, Philippines	43A [head lateral]	original
Pseudorabdion montanum	KU 305063	Mt. Lihidan, Barangay Duyong, Municipality of Pandan, Antique Province, Panay Island, Philippines	43D [head lateral]	original
Pseudorabdion oxycephalum	KU 324641	Municipality of Masbate City, Masbate Province, Masbate Island, Philippines	43C [head lateral]	original
Ptyas luzonensis	KU 306605	Barangay Valencia, Municipality of Dumaguete, Negros Oriental Province, Negros Island, Philippines	29A* [head lateral]	original
Ramphotyphlops cumingii	EHT R-99	Municipality of Bunawan, Agusan del Sur Province, Mindanano Island, Philippines	21B [head lateral]	Redrawn from Taylor 1919 Fig. 1a.
	KU 334468	Municipality of Remedios T. Romualdez, Agusan del Norte Province, Mindanao Island, Philippines	5A [body ventral]	original
Ramphotyphlops marxi	FMNH 96520	Barangay Tarabucan, Municipality of Matuguinao, Western Samar Province, Samar Island, Philippines	23A/44A [lateral head]	Redrawn from Wallach et al. 1993 Fig. 1a.
Ramphotyphlops suluensis	PBS 2001	Bubuan Island, Basilan Province, Philippines	2E/22C [head dorsal];	Redrawn from Taylor 1918 Fig. 11a.
			2F; 44B [head lateral]	Redrawn from Taylor 1918 Fig. 11b.
			2G [head ventral]	Redrawn from Taylor 1918 Fig. 11c.
Rhabdophis chrysargos	—	—	45B* [head lateral]	original; composite illustration from photos
Rhabdophis lineatus	KU 326696	Visayas State University Campus, Municipality of Baybay, Leyte Province, Leyte Island, Philippines	45A [head lateral]	original
Sibynophis bivattatus	KU 309608	Boundary of Barangay Samarinana and Barangay Saulog, Municipality of Brooke's Point, Palawan Island, Palawa Province, Philippines	11B [head lateral]; Note: mouth closed digitally for aesthetics	original
Stegonotus muelleri	KU 344097	Barangay Dinaayan, Municipality of Burauen, Leyte Province, Leyte Island, Philippines	29B [head lateral]	original

Species	Catalog #	Locality	Figures	Sources
Trimeresurus flavomaculatus	KU 329422	Barangay Kabayunan, Municipality of Dona Remedios Trinidad, Bulacan Province, Luzon Island, Philippines	2I/7A [head lateral]	original
	KU 330050	Barangay Magrafil, Mt. Cagua, Municipality of Gonzaga, Cagayan Province, Luzon Island, Philippines	24B [head ventral-lateral]	original
Tropidolaemus philippensis	KU 334672	Pasonanca Natural Park, Municipality of Pasonanca, Zamboanga del Sur Province, Mindanao Island, Philippines	46B** [head dorsal]	original
Tropidolaemus subannulatus	KU 327425	Barangay Samarinana, Municipality of Brooke's Point, Palawan Island, Palawan Province, Philippines	24A [head ventral-lateral]	original
	KU 324585	Barangay Patag, Municipality of Silay, Negros Occidental Province, Negros Island, Philippines	46A [head dorsal]	original
Tropidonophis dendrophiops	KU 310368	Barangay Pandan, Municipality of Mambajao, Camiguin Province, Camiguin Sur Island, Philippines.	2A [head: dorsal]	original
			2B [head lateral]	original
			2C [head ventral]	original
Unnamed genus and species	KU 337269	San Rafael Barangay, Municipality of Taft, Eastern Samar Province, Samar Island, Philippines	47 [head anterior-lateral]	original
Xenopeltis unicolor	KU 79152	Municipality of Puerto Princessa, Palawan Island, Palawan Province, Philippines	10A [head dorsal]	original