

CONTRIBUTIONS TO A REVIEW OF PHILIPPINE
SNAKES, XI

THE SNAKES OF THE GENUS BOIGA

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TWO TEXT FIGURES

The rear-fanged arboreal snakes of the genus *Boiga* are distributed from Australia, on the east, to Afghanistan and western Pakistan, on the west, and following a hiatus of major proportions, central Africa. Though occasionally found in semiarid or arid environments, such as the Dasht-i-Margo of Afghanistan [Leviton (1959) 457], members of the genus favor more tropical conditions.

Five species of *Boiga* are found in the Philippines. One, *B. philippina*, is known from a single specimen taken on northern Luzon and is doubtfully distinct from its congener, *B. anquilata*. The four remaining species are widely distributed, one or more being found on each of the larger islands.

The Philippine species of *Boiga* are clearly related to Indonesian forms, indeed for the most part scarcely more than subspecifically distinct from populations inhabiting Borneo. Inadequate samples prevent a more detailed assessment of the taxonomic status of the several nominal species currently recognized.

TERMINOLOGY

Standard length: Distance from tip of snout to anal opening. Measurements given under "Diagnosis" are for the largest specimen of each sex studied, both standard and tail lengths being given.

Tail length: Distance from anal opening to tip of undamaged tail.

* : [asterisk] following locality listed under "Range" indicates sites from which specimens were examined.

23 (-3 [144-145]) 21: Dorsal scale reduction formula indicates a reduction from 23 to 21 longitudinal rows of scales

by loss of the third row on each side between ventrals 144 and 145 in the series of specimens examined. Caudodorsal scale reductions determined by level of subcaudal shield opposite which reduction takes place.

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Genus **BOIGA** Fitzinger

- Boiga* FITZINGER (1826) 31 (type species *Coluber irregularis* Merrem, by original designation).
- Dipsadomorphus* FITZINGER (1843) 27 (type species *Dipsas trigonata* Schlegel, by original designation).
- Gonyodipsas* FITZINGER (1843) 27 (type species *Dipsas irregularis* Merrem [of Schlegel], by original designation).
- Cephalophis* FITZINGER (1843) 27 (type species *Dipsas dendrophilia* Reinwardt in BOIE (1827) by original designation).
- Eudipsas* FITZINGER (1843) 27 (type species *Dipsas cynodon* Cuvier, by original designation).
- Macrocephalus* FITZINGER (1843) 27 (type species *Dipsas drapiezii* Boie, by original designation).
- Opetiodon* DUMÉRIL (1853) 494 (type species *Dipsas cynodon* Cuvier [of Schlegel], by monotypy).
- Triglyphodon* DUMÉRIL (1853) 507 [type species *Coluber irregularis* Merrem, by subsequent designation by Stejneger, (1907)].
- Toxicodryas* HALLOWELL (1857) 60 (type species *Toxicodryas blandingi* Hallowell, by monotypy).
- Pappophis* MACLEAY (1877) 39 (type species *Pappophis laticeps* Macleay, by monotypy).
- Liophallus* COPE (1895) 427 (type species *Dipsas furca* Gray [of Cope], by monotypy).

Definition.—Maxillary teeth 10 to 16, subequal except for the last two or three which are enlarged and grooved; palatine teeth often strongly enlarged: ectopterygoid more or less distinctly forked anteriorly, both branches articulate with maxilla; head distinct from neck; snout short, blunt; eye large, pupil vertical; body somewhat compressed; scales smooth, with apical pits, in 19 to 23 longitudinal rows, the vertebral series frequently enlarged; ventrals usually obtusely angulate laterally; tail moderate or long; subcaudals paired; hypapophyses present or absent on posterior vertebræ. [After Smith (1943) 344.]

Remarks.—The snakes of this genus are usually found in arboreal situations, in among the branches of bushes and trees. They are characterized by possessing a short, blunt head which is very distinct from the neck, an elongate and compressed body, moderate to long tail, enlarged vertebral scales, and ventrals which angulate laterally. The very large eyes and vertical pupil suggest nocturnal habits. Smith [(1943) 346] states that these snakes lie coiled up on branches of trees, differing thereby from other arboreal snakes, such as *Dendrelaphis* and *Ahaetulla*, which lie extended upon branches.

In defining the genus *Boiga* Smith [(1943) 244] stated that "Hypapophyses [are] present on the posterior dorsal vertebræ in all the Asiatic species." Brongersma [(1938) 241-242] examined specimens of *Boiga cynodon*, *B. jaspidea*, *B. multi-maculata* and *B. irregularis*. He failed to find hypapophyses present in the first three species. In *B. irregularis* their presence was variable; five of seven specimens possessed hypapophyses; one specimen had only a low keel; and one specimen lacked hypapophyses altogether. I am able to confirm Brongersma's observations to the extent that the presence or absence of well defined hypapophyses on the posterior dorsal vertebræ is variable. I have examined specimens of *B. cynodon*, *B. dendrophila*, *B. irregularis*, *B. karelini*, and *B. angulata* and find that a ridge is usually present along the base of the centrum, and that in some individuals the posterior portion of this ridge projects downward slightly, forming a small hooklike projection. In only one specimen of *B. cynodon* was the ridge completely lacking.

Four nominal species, one polytypic with two nominal subspecies, were recognized by Taylor in 1922. A year later

Taylor added a fifth nominal species of *Boiga* to the Philippine fauna. Of these five, *B. philippina*, known from the type only, cannot reasonably be differentiated from *B. angulata*, a species widely distributed throughout the Philippines; though it probably should be referred to the synonymy of *B. angulata*, it is retained here since I have not seen Peters' type. Both *B. angulata* and *B. schultzei*, the latter described by Taylor in 1923 from Palawan, are close to *B. drapiezi*, a widely distributed and evidently variable snake known from Borneo and elsewhere in western Indonesia. It is my guess that two species currently parade under the name *B. drapiezi* and that one of these is more closely allied to *B. angulata*; lack of adequate samples to evaluate pattern variation leads me to take a conservative approach and retain the arrangement of earlier authors. *Boiga dendrophila*, the brilliantly colored mangrove snake of the Indo-Malayan region, is represented in the Philippines by three distinct populations. Brongersma (1934) reviewed this species complex; I have accepted his arrangement because our data are in complete agreement. Lastly, *Boiga cynodon*, another species widely distributed throughout the Indo-Malayan region, is treated as a monotypic species in the Philippines. Taylor [(1923) 554] has pointed out that there is extensive variation in color and markings, and it is difficult to find two specimens marked alike. Further, neither differences in color pattern nor other known variations can be associated with geographic distribution.

Key to the Philippine species and subspecies of Boiga

- 1a. Body color very dark brown or black with a series of yellow or white crossbars; scales in 21 longitudinal rows at midbody.
 - 2a. Yellow or white crossbars less than two scale rows wide, not expanded laterally.
 - 3a. Interspaces between narrow light crossbars black (Palawan Archipelago) *B. dendrophila multicolorata*
 - 3b. Interspaces between narrow light crossbars, which are edged with black, bluish gray to bluish brown (Luzon and Polillo).
B. dendrophila divergens
 - 2b. Yellow or white crossbars two or more scale rows wide, which become wider on sides (Mindanao and Samar).
B. dendrophila latifasciata
- 1b. Body color light brown, with or without darker brown crossbars; **scale rows variable.**

- 4a. Scales in 23 longitudinal rows at midbody; 9 upper labials; 3 anterior temporals *B. cynodon*
- 4b. Scales in 19 longitudinal rows at midbody; 8 upper labials; 2 anterior temporals.
- 5a. One preocular; ventrals more than 250.
- 6a. Posterior chin shields smaller than anterior shields; loreal present; 39 to 42 brown crossbars on body which widen laterally *B. angulata*
- 6b. Posterior chin shields as large as anterior shields; loreal present or absent; about 70 very narrow dark brown crossbars on body which do not widen laterally *B. schultzei*
- 5b. Two preoculars; ventrals less than 250 *B. philippina*

BOIGA ANGULATA (Peters).

Dipsas (Dipsadomorphus) angulata PETERS (1861) 688 (type loc.: Leyte; type in Berlin Museum; original description); BOETTGER, (1886) 113 (listed), (1892b) xlix (Catanduanes; listed).

Dipsadomorphus angulatus, BOULENGER (1896) 75 (description after Peters; BOETTGER (1898) 93 (Catanduanes; listed).

Boiga angulata, GRIFFIN (1910) 213 (Polillo; food), (1911) 263 (distribution compiled; listed in key); TAYLOR (1917) 366 (Negros [Mt. Marapara]; listed), (1922a) 204, pl. 26, figs. 1-3, pl. 27 (Catanduanes, Leyte, Negros, Luzon [Los Baños], Polillo, synonymy, description, counts and measurements of material examined), (1922c) 139 (Luzon [Mt. Makiling]; listed), (1923) 553 (comparison with *B. schultzei*); LEVITON (1963) 383, 389, 390, 398, 402 (listed from Catanduanes, Leyte, Luzon, Mindanao, Negros, and Polillo).

Dipsas (Eudipsas) quiraonis STEINDACHNER (1867) 75, pl. 3, figs. 9-10 (type loc: Philippine Islands; types in Vienna Museum; original description); MÜLLER (1883) 289 (Mindanao; listed); FISCHER (1885) 81 (Mindanao; listed); BOETTGER (1886) 113 (distribution compiled; listed).

Range.—CATANDUANES: (without exact locality *). LEYTE: (without exact locality). LUZON: Laguna Province (Los Baños *; Mt. Makiling *). MINDANAO: Bukidnon Province (Del Monte Plantation *); Cotabato Province (Tatayan * [= ? Talayan]); Davao Province (Caburan *); Lanao Province (Lake Lanao *). NEGROS: (Pagyabunan *; Mt. Marapara [cannot be located; may be Mt. Malapanta). POLILLO: (without exact locality *).

Material examined (9).—CATANDUANES: without exact locality (CAS 15315). LUZON: Laguna Province: Los Baños (MCZ 25792); Mt. Makiling (CAS 61305). MINDANAO: Bukidnon Province: Del Monte Plantation (SU 12360); Cota-

Taxonomic notes.—This species is close to *Boiga drapiezi* from which it appears to differ in possessing a somewhat larger loreal shield and, though this is by no means constant and a complete series of intermediates is known, in the proportionally smaller size of the posterior chin shields compared to the anterior pair. These are not very significant differences and it seems likely that examination of adequate samples of both forms will lead to the union of the two taxa. There appears to be two color pattern varieties of *B. drapiezi*, one of which is almost identical to that of *B. angulata*; the pattern is formed of a series of light brown saddle-shaped blotches bordered by darker bars; the other variety of *B. drapiezi* has light and dark cross bands which do not expand middorsally and a distinct middorsal light stripe extending onto the tail.

I have examined 13 specimens of *Boiga drapiezi* from Sarawak, Borneo. These 13 specimens may be divided into two groups, one having a series of saddle-shaped light brown blotches separated by dark brown crossbars which widen on the sides on the dorsum, the other a series of dark and light crossbars of uniform width and a solid middorsal stripe. Though the samples are too small for adequate statistical analysis of the meristic data, a comparison of ventral counts between the males, which are in the majority, is instructive. Six males having crossbars and a middorsal white stripe average $278.3 \pm \text{SE } 3.31$ ventrals, while four males having saddle-shaped blotches and lacking the white stripe average $263.3 \pm \text{SE } 5.23$ ventrals. The difference in average ventral counts is not immediately striking until a comparison is made with counts obtained from a series of Philippine *Boiga*, nominally referred to *B. angulata*, which have saddle-shaped blotches, lack a white middorsal stripe, and otherwise look like their Sarawak counterparts. Five males from scattered localities in the Philippines average 262.6 ventrals, a remarkable coincidence if we are to believe that in Sarawak both color patterns are to be referred to *B. drapiezi*. A further observation is also instructive. Sexual dimorphism in ventral counts is only weakly developed, so it is possible to combine data for males and females. The cross-barred Sarawak sample of males and females includes eight individuals; there is an average of $276.4 \pm \text{SE } 3.75$ ventrals (range 256 to 287). The blotched Sarawak sample (males and females) of five

specimens average $265.8 \pm \text{SE } 4.76$ ventrals. The Philippine sample (males and females) of *B. angulata* consists of nine specimens. These average $263.8 \pm \text{SE } 1.14$ ventrals, again a remarkable concurrence with the blotched Bornean sample. I suspect that in fact two species have for a long time paraded under the name of *B. drapiezi*, and that one of them is more widely distributed than the other, being found throughout eastern and northern Philippines as well as on Borneo.

Boiga drapiezi was described by F. Boie in 1827, evidently based on a series of specimens said to have come from Java. His description is not adequate to determine which of the two forms he had before him, nor are the data published later by Boulenger (1896) or de Rooj (1917) especially helpful. At the moment I must deal with what I know and therefore take the conservative position retaining the taxa in their present dubious states. Though both Boulenger [(1896) 74] and de Rooj (1917) point out that two distinct color patterns are recognizable in *B. drapiezi*, they make no attempt to correlate these patterns with other characters, nor do they present any data enabling others to do so. Consequently, examination of a more substantial series of these animals from western Indonesia must be made.

Boiga philippina (Peters) appears to be very similar to *B. angulata*. According to Peters the anterior palatine teeth are very greatly enlarged, there are two preoculars, and there are 240 ventrals. Inasmuch as the species is known from the type specimen alone, it has not been possible to compare it with *B. angulata*. I suspect that the two nominal species will be found to be quite similar, however.

Diagnosis.—Scales in 19 longitudinal rows at midbody; loreal present; preocular reaches upper surface of head; posterior chin shields tend to be smaller than anterior pair; dark brown crossbars on dorsum expand on sides and extend onto ventrals, lighter blotches saddle-shaped; a series of discrete spots present along lateral edge of ventrals, usually not forming a continuous line. Standard length: ♂ 1055; ♀ 916; tail length: ♂ 367, ♀ 312.

Descriptive notes.—Maxillary teeth 14; anterior palatine teeth only moderately enlarged; 1 preocular which reaches upper surface of head; well developed loreal present; 2 postoculars; temporals 2 + 2 or 2 + 3; 8 upper labials, third, fourth and

fifth bordering orbit; 10 lower labials, the first five in contact with anterior chin shields; posterior chin shields shorter and narrower than anterior pair; ventrals 254 to 267; subcaudals 126 to 153; anal plate single.

Hemipenes extend to end of eighth subcaudal plate, unforked; sulcus spermaticus unforked; spinose throughout with large spines present in proximal half followed by an abrupt reduction with smaller spines in the distal half; a few shallow calyces present at distal end.

Color (in alcohol) above light brown saddle-shaped blotches with a series of 39 to 42 dim, darker brown crossbars and with numerous minute dark brown spots; dark stripe present or absent along lateral edges of ventrals.

Sexual dimorphism.—Other than a difference in the number of subcaudals, which are more numerous in males than in females, the sexes do not seem to differ. The absence of interisland variation permits grouping of data for all of the island samples. These are summarized in Table 1.

TABLE 1.—Summary of variation between sexes in *Boiga angulata*.

Character	Male			Female		
	N	Mean	Range	N	Mean	Range
Ventrals	5	262.6	259-267	4	265.3	261-270
Subcaudals	5	146.0	138-153	4	141.75	134-150
Body blotches	4	40.0	39-42	2	42.0	42
Tail length/standard length	6	0.348	0.331-0.380	2	0.347	0.341-0.352

Ecological notes.—Of the three Field Museum specimens examined, two were collected in the forest at Caburan, at an altitude of 36 meters, and one on the forest floor at Tatayan [= ? Talayan] [altitude 2,500 meters].

BOIGA CYNODON (H. Boie).

Dipsas cynodon H. BOIE (1826) 238 (*nomen nudum*); in F. BOIE (1827) column 549 (type loc.: Sumatra; type in Leiden Museum; original description); GÜNTHER (1864) 308 (description; listed as occurring in the Philippines); JAN (1871) Livr. 38, pl. 6, figs. 1-2; GÜNTHER (1879) 78 (Mindanao; listed); BOETTGER (1895) 4, 5 (Calamianes Ids.; also stated to occur in Mindanao and Luzon; scutellation, counts).

Dipsadomorphus cynodon, BOULENGER (1896) 78 (synonymy, description, counts of material examined); BOETTGER (1898) 94 (Culion, Luzon [Manila]; listed).

Boiga cynodon, GRIFFIN (1909) 599 (Mindanao, Palawan [Iwahig]; listed), (1910) 213 (Polillo; listed), (1911) 264 (distribution compiled; listed in key); TAYLOR (1922a) 206 (Culion, Luzon [Los Baños], Mindanao [Bunawan], Polillo, Palawan [Iwahig], Leyte; synonymy, description, counts and measurements of material examined), (1922c) 139 (Luzon [Mt. Makiling]; ecological note), (1923) 553 (Basilan [Abung-Abung], Luzon [Mt. Makiling], "? Palawan (or Balabac)," Polillo; scutellation, measurements and counts); LEVITON (1963) 379-385, 389, 390, 393, 400, 403 (listed from Basilan, Culion, Leyte, Luzon, Mindanao, Palawan, and Polillo).

Range.—(Philippine localities only.) BASILAN: Abung-Abung*. CULION: without exact locality. LEYTE: without exact locality. LUZON: Laguna Province (Los Baños*; Mt. Makiling); Rizal Province (Manila). MINDANAO: Agusan Province (Bunawan*); Cotabato Province (Saub*; Tatayan* [= ? Talayan]). PALAWAN: * Iwahig*, Puerto Princesa*. POLILLO: without exact locality.

Material examined (13).—BASILAN: Abung-Abung (CAS 603348); without exact locality (USNM 37432). LUZON: Laguna Province: Los Baños (MCZ 25796); Mt. Makiling (CAS 61301-61303). MINDANAO: Agusan Province: Bunawan (CM 2144); Cotabato Province: Saub (MCZ 25794); Tatayan [= ? Talayan] (MCZ 25795); without exact locality: (CAS 44140). PALAWAN: Puerto Princesa (CAS 15811); without exact locality (MCZ 25795). POLILLO: without exact locality (CAS 62422).

Taxonomic notes.—This distinctive species is widely distributed throughout southeastern Asia where it is said to inhabit the plains and hill country at low altitudes [Smith (1943) 358]. There has been no attempt to distinguish geographical populations, except by Boulenger [(1896)79], and based upon the present study no division is called for. There is a remarkable homogeneity among samples of this species, and except for slight intra-population variation in color pattern, the species throughout its entire range is monomorphic.

Diagnosis.—Scales in 23 longitudinal rows at midbody; vertebral scales enlarged; subcaudals 122 to 157. Standard length: ♂ 1,250, ♀ 1,300; tail length: ♂ 397, ♀ 383.

Descriptive notes.—Maxillary teeth 11 to 14; anterior palatine teeth greatly enlarged; 1 preocular, frequently in contact

with frontal; 2 postoculars; temporals 2 + 3 or 3 + 3; 9 upper labials, rarely 8 or 10, fourth, fifth and sixth shields bordering orbit, rarely third through fifth or fourth through seventh; posterior chin shields longer than anterior pair; dorsal scales reduce 23 (-3[144-145]) 21 (vertebral + paravertebral [146-148]) 19 (vertebral + paravertebral [156]) 17 (vertebral + paravertebral [176]) 15; caudodorsal scales reduce 6 (2 + 3 [49-50]) 4; ventrals 250-282; subcaudals 120-157; anal plate single.

Hemipenes extending between eleventh and seventeenth subcaudal plates, unforked; sulcus spermaticus unforked; spines absent; proximal half to two-thirds with a series of smooth longitudinal folds; distal third to half with a few transverse plicæ and large, shallow calyces.

Color (in alcohol) light brown above, the dorsum usually crossed by a series of from 33 to 49 darker brown, black-edged crossbars of three to five scale rows in width, which narrow slightly on sides; tail crossed by 23 to 37 crossbars which are separated by very narrow lighter interspaces; below light brown thickly powdered with darker punctuations except under tail where dark color predominates and there are small light spots; a brown stripe extends from eye to angle of jaw; nape frequently with two narrow parallel brown stripes, or with a single dark brown spot between parietals; in some individuals all markings are absent from body.

Sexual dimorphism.—Because of the small size of the available sample it has not been possible to demonstrate whether the sexes differ in any character. There is a suggestion (Table 2) that males may have more ventral shields than females, but more adequate sampling is needed before a decision can be reached.

TABLE 2.—Summary of variation between sexes in material examined of *Boiga cynodon*.

Character	Male			Female		
	N	Mean	Range	N	Mean	Range
Ventrals.....	3	279.0	276-281	7	271.4	259-279
Subcaudals.....	3	139.3	136-150	8	140.3	132-157
Tail length/standard length.....	2	0.302	0.276-0.317	7	0.327	0.295-0.382
Crossbars on body.....	1	34	-----	5	38.8	33-49
Crossbars on tail.....	1	23	-----	5	27.8	21-37

Inter-island variation.—There is no clear evidence to indicate that known variations can be associated with geographic distribution. The absence of distinctive differences between sexes permits grouping the data for all of the island samples as has been done in Table 2.

Ecological notes.—According to Smith [(1934) 358] this snake inhabits the plains and hill country at low altitudes. All the specimens I have seen were taken at low altitudes. It is evident from body form that the snake is arboreal, but nowhere can I find a statement about the habitat in which specimens have been collected. The principal food items, which consist of birds and eggs, would indicate an arboreal habitat. The breeding habitats are unknown, but it is presumed that the snake is oviparous as are other members of the genus.

BOIGA DENDROPHILA (F. BOIE).

Dipsas dendrophila F. BOIE (1827) column 549.

Taxonomic notes.—Three subspecies of *Boiga dendrophila* have been recognized in the Philippines [Taylor (1922a) 196–203; BRONGERSMA (1934) 201, 261–219]. I have seen a total of 25 specimens representing these three forms and find they are readily distinguishable. The earlier results of Taylor and Brongersma are, therefore, accepted and have been followed here.

Diagnosis.—Scales in 21 (rarely 23) longitudinal rows at midbody; usually eight upper labials; preocular reaches dorsum of head; body color black or dark slate, crossed by yellow or white bars which may be narrow or broad but not as broad as black interspaces.

Description.—(Composite description of Philippine populations only.) Head very wide across temporal-parietal region, tapering anteriorly; snout short, blunt, 1.1 to 1.6 times longer than horizontal diameter of eye; rostral about as broad as deep, barely visible from above; internasals not as deep as prefrontals; frontal slightly longer than broad, 1.1 to 1.6 times as wide as supraocular, shorter than parietals; nasal large, divided with large nostril; small loreal present, occasionally entering eye beneath preocular; 1 preocular, reaching dorsum of head; two postoculars; temporals usually 2 + 3; 8 upper labials, rarely 9, third, fourth and fifth bordering orbit; 10 to 11 lower labials, first pair in contact behind mental; first four shields in contact with anterior chin shields; posterior chin

shields as long as anterior pair, but somewhat narrower; scales in 21 longitudinal rows at midbody; ventrals 209 to 233; subcaudals 90 to 117; anal plate single.

Inter-island variations.—The principal variation among island populations is in color pattern. This includes both size of light crossbars and their number.

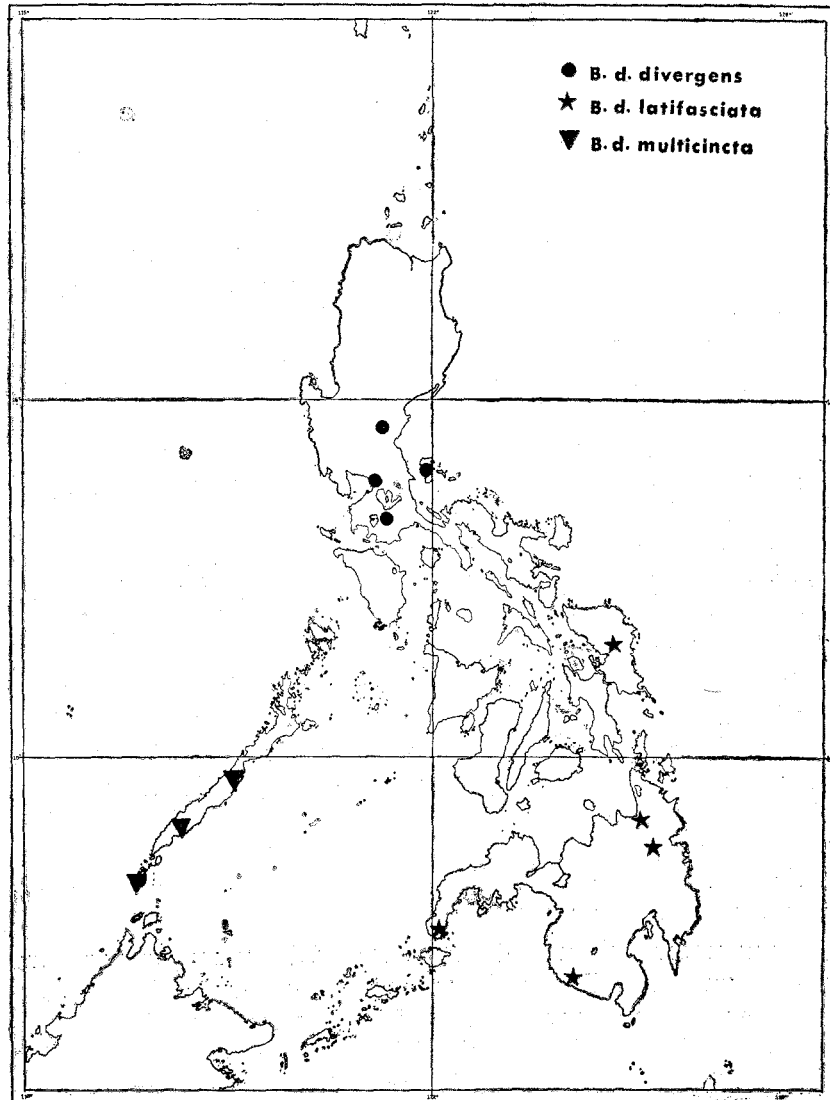


FIG. 2. Distribution of subspecies of *Boiga dendrophila* in the Philippines.

Specimens from Palawan and Balabac islands closely resemble the Bornean populations of *B. d. annectens*. The body is black; it is crossed by a series of narrow yellowish bars, each one scale row wide; these frequently fuse with adjacent bars on the sides, or if not, then the bars extend on to the lateral edge of the ventral shields. In specimens from Palawan and Balabac there are 58 to 80 [*vide* Brongersma (1934) 216] bars on the body (61 and 84 in specimens examined by me) and 21 to 29 bars on the tail (23 to 27 in specimens examined. Taking the total of bars on the body and tail, Brongersma notes that they vary from 85 to 111 (average 101.9 [97.6 in the specimens examined here]) or more bars than the average for Bornean populations.

The Mindanao-Samar sample differs from the above in having rather broad crossbars which at midbody are two to three scale rows wide [three or four ventrals wide according to Brongersma (1934) 218]. These crossbars are separated by black interspaces of at least equal width, although they are usually one or two scale rows wider, at least middorsally. The number of crossbars varies from 34 to 49 [Brongersma (1934) 218] on the body and 12 to 19 on the tail (36 to 46 and 12 to 18 respectively in the specimens examined by me).

Specimens from Luzon and Polillo islands more closely resemble the Bornean population than those from Mindanao and Samar islands. The ground color tends to be bluish-gray or slate; the crossbars are narrow, varying from one-half to one and one-half scale rows in width, are bordered by black, do not expand on the sides, and are separated by broad interspaces. There are from 55 to 79 yellowish crossbars on the body [76 to 79 according to Brongersma (1934) 217, 63 according to Taylor (1922a) 202] and 16 to 25 crossbars on the tail [25 to 27 according to Brongersma (1934) 218, 16 according to Taylor (1922a) 202] in specimens examined by me.

Comparison of ventral and subcaudal counts among samples from Luzon-Polillo, Mindanao-Samar, and Palawan-Balabac islands give evidence of inter-island variation in these counts which can be correlated with distribution and is not clinical in character. The Luzon-Polillo and Palawan-Balabac samples average about 10 ventrals more than the Mindanao-Samar sample. On the other hand, the Mindanao-Samar sample averages

about 100 subcaudals compared to 93 for the Luzon-Polillo sample and 110 for the sample from Palawan-Balabac.

It is evident from the above that recognition of three sub-specifically distinct populations in the Philippines is fully justified.

BOIGA DENDROPHILA DIVERGENS Taylor.

Triglyphodon gemmicinctum DUMÉRIL, BIBRON, and DUMÉRIL (1854) 1091 (in part; locality given as Java but Brongersma believes description is that of Luzon population).

Dipsadomorphus dendrophilus multicinctus, BOULENGER (1896) 71 (in part; Philippines; counts of material examined); Boettger (1898) 93 (in part; Luzon [Dingalan; Nueva Ecija Prov.]; listed).

Boiga dendrophila, GRIFFIN (1909) 599 (in part; Luzon; listed), (1910) 214 (Polillo; listed), (1911) 263 (in part; Luzon [Rizal Prov.], Polillo; listed in key).

Boiga dendrophila divergens TAYLOR (1922a) 201 (type loc.: Mt. Makiling, Laguna Province, Luzon Island; type in Carnegie Museum; original description, color in life, counts and measurements of material examined), (1922b) 299 (Luzon [Mt. Makiling], Polillo; doubts Samar Island record given in earlier paper); (1922c) 139 (Luzon [Mt. Makiling]; specimens taken in branches of trees). Brongersma (1934) 317, pl. 1, figs. 5, 11, pl. 2, fig. 4 (distribution compiled; description of color pattern; summarizes counts); LEVITON (1963) 390, 403 (listed from Luzon and Polillo).

Range.—LUZON: Laguna Province (Mt. Makiling*); Nueva Ecija Province (Dingalan); Rizal Province (without exact locality*).

Material examined (3).—LUZON: Laguna Province: Mt. Makiling (CM 2143 [holotype], CAS 61304). POLILLO: without exact locality (CAS 62420).

Taxonomic notes.—In the original description Taylor noted a specimen in the collection of the Santo Tomas Museum which was said to have come from Samar Island. A specimen of *B.d. latifasciatus*, obtained by Dr. Moellendorf, was also said to come from that island. Although the sympatric occurrence of two subspecies of a single species is not without precedence, the present instance seems highly dubious. Zoogeographic considerations would suggest that *B. d. latifasciata* occur on Samar, and probably on Leyte Island too, but that the Luzon subspecies would not occur there. I believe it is reasonable to assume that there was some error in locality data accompanying the specimen in the Santo Tomas Museum.

Diagnosis.—Ground color slate or bluish-gray, with from 55 to 79 narrow, black-edged yellowish crossbars on the body; ventrals 219 to 228. Standard length: ♂ 624, ♀ 1095; tail length: ♂ 175, ♀ 250.

Descriptive notes.—Maxillary teeth 12; 1 preocular which reaches dorsum of head; 2 postoculars; temporals 2 + 2 or 2 + 3; 8 upper labials, third, fourth, and fifth bordering orbit; anterior chin shields as long as posterior pair; ventrals 219 to 228; subcaudals 80 to 95; anal plate single; scales in 21 longitudinal rows at midbody.

Color (in alcohol) brown to purplish brown above, the dorsum crossed by from 55 to 79 white, black-edged crossbars one-half to one and a half scale rows wide and separated by interspaces of four scale rows in width; several white spots on head scales including a line which originates on the supraocular and passes over the parietal, then to the angle of the jaw.

Sexual dimorphism.—As indicated by the data summarized in Table 3, there is marked dimorphism in the length of the tail, the number of subcaudals and the total number of ventral and subcaudal shields (*i.e.*, the total number of vertebræ). It is obvious that males have longer tails than females.

TABLE 3.—Summary of variation between sexes of *Boiga dendrophila divergens*.*

Character	Male			Female		
	N	Mean	Range	N	Mean	Range
Ventrals.....	7	222.3	219-225	1**	223	-----
Subcaudals.....	4	93.0	90-95	1	80	-----
Ventrals plus subcaudals.....	4	316.0	312-319	1	303	-----
Tail length/standard length.....	2	0.280	0.280-0.281	1	0.280	-----

* Includes data from Taylor [(1922a) band c] for specimens not otherwise examined in this study.

** Holotype.

A difference in the number of ventral shields is not very prominent; nevertheless the count for the single female is higher than the maximum number found among male specimens.

Inter-island variation.—Specimens of this subspecies have been taken on only two islands, Luzon and Polillo. Specimens from each island are very similar except for the number of

light crossbars on the body. The known number of crossbars on the dorsum for Luzon males ranges from 71 to 79 (mean 75.1). The single Polillo male specimen which I examined had only 55 crossbars. This represents a considerable reduction in the number of light bars on the body and indicates that the dark interspaces are considerably wider than among specimens from Luzon.

BOIGA DENDROPHILA LATIFASCIATA (Boulenger).

Triglyphodon dendrophilum var. B, DUMÉRIL, BIBRON, and DUMÉRIL (1854) 1090 (said to have come from Java; color description).

Dipsas dendrophila, GÜNTHER (1879) 78 (Mindanao [Butuan]; listed); FISCHER (1885) 81 (Mindanao; listed).

Boiga dendrophila, GRIFFIN (1909) 599 (in part; Mindanao; listed), (1911) 263 (in part; distribution compiled; listed in Key).

Dipsas (Triglyphodon) gemmicincta (nec DUMÉRIL, BIBRON, and DUMÉRIL) PETERS (1861) 688 (Mindanao; listed).

Dipsadomorphus dendrophilus latifasciatus BOULENGER (1896) 71 (type loc.: Mindanao; types in British Museum; specimens from Butuan, Agusan Province and Zamboanga Province, Mindanao; original description); BOETTGER (1898) 93 (Mindanao and Samar; listed).

Boiga dendrophila latifasciata, TAYLOR (1922a) 198 (Mindanao [Bunawan]; description, color in life, variation, counts and measurements of material examined); BRONGERSMA (1934) 218, pl. 1, figs. 6, 8, 10, pl. 2, figs. 10, 12 (Mindanao [Cotabato coast; Kapitan; Butuan; Zamboanga], Samar; description of color pattern scutellation; counts of material examined); LEVITON (1963) 393, 404 (listed from Mindanao and Samar).

Range.—MINDANAO: Agusan Province (Bunawan*; Butuan); Cotabato Province (Saub*); Zamboanga Province (Pantalan; Zamboanga City*). SAMAR: (without exact locality). PHILIPPINES: (without exact locality*).

Material examined (15).—MINDANAO: Agusan Province: Bunawan (CM 2138-2142); Cotabato Province: Saub (MCZ 25782-25789); Zamboanga Province: Pantalan (SU 12361); Zamboanga City (SU 8678). PHILIPPINES: without exact locality data (CAS 15313).

Diagnosis.—Ground color black with from 34 to 49 broad yellowish crossbars on body; ventrals 207 to 233. Standard length: ♂ 917, ♀ 926; tail length: ♂ 243, ♀ 266.

Descriptive notes.—Maxillary teeth 12 to 13; 1 preocular; 2 postoculars; temporals 2 + 2 or 2 + 3; 8 upper labials, rarely 7, third, fourth and fifth, rarely second, third and fourth shields bordering orbit; anterior and posterior chin shields

about equal; ventrals 207 to 226; subcaudals 93 to 102; anal plate single.

Color (in alcohol) dark brown to black above, the dorsum crossed by white or yellow crossbars which are two scale rows wide middorsally but which widen laterally to cover about four scale rows; yellowish below, each ventral edged with black on anterior portion of body, the black becoming more dense posteriorly where the black forms rings.

Sexual dimorphism.—Males average slightly fewer ventrals than females although the extremes for the sample of females encompass those for the males. There is no appreciable difference in the number of subcaudal shields, nor in the total of ventral plus subcaudal shields, the tail length/standard length ratio, or in the number of crossbars on the body and tail (Table 4). The absence of any clear dimorphism between sexes in this subspecies is rather interesting inasmuch as this differs from trends among other subspecies of *B. dendrophila*. This fact, combined with rather sharp differences in color pattern, suggests that *B. d. latifasciata* is not as closely related to the other two Philippine subspecies as they are to each other.

TABLE 4.—Summary of variation between sexes in *Boiga dendrophila latifasciata*. *

Character	Male			Female		
	N	Mean	Range	N	Mean	Range
Ventrals.....	10	214.7	209-222	9	218.2	207-226
Subcaudals.....	10	97.8	96-102	9	97.2	93-101
Ventrals plus subcaudals.....	7	307.3	300-314	9	304.3	300-325
Tail length/standard length.....	7	0.273	0.263-.301	6	0.273	0.240-0.291
Bars on body.....	8	42.3	34-47	6	42.5	36-46
Bars on tail.....	8	15.6	12-18	6	15.8	14-18

*Includes data from Taylor (1922a) and Brongersma (1934) for specimens not otherwise examined in this study.

Ecological notes.—According to Taylor [(1922a) 200] specimens were seen and collected only in low brush and trees and were never encountered on the ground.

Taylor found that one specimen obtained by him had just eaten a bat. I have found the remains of a skink (?*Mabuya*) and a lizard egg in the stomach of one individual.

Eggs were found in the oviducts of two specimens, three eggs in one individual, one in the other. Unfortunately the dates when these specimens were collected are not known.

BOIGA DENDROPHILA MULTICINCTA (Boulenger).

Dipsadomorphus dendrophilus multicinctus BOULENGER (1896) 71 (type loc.: restricted to Puerto Princesa, Palawan Island by Brongersma (1934); types in British Museum; original description [in part]).

Boiga dendrophila multicincta, TAYLOR (1922a) 200 (Balabac, Palawan [Iwahig]; description, measurements and counts of material examined); BRONGERSMA (1934) 216 (Palawan [Puerto Princesa]; description, counts of specimens examined); LEVITON (1963) 378, 400 (listed from Balabac and Polillo).

Boiga dendrophila, GRIFFIN (1909) 599 (in part; Palawan [Iwahig]; listed), (1911) 263 (in part; Palawan; listed in key).

Range.—BALABAC: (without exact locality*). PALAWAN: (Brooke's Point*; Iwahig*; Puerto Princesa*).

Material examined (8).—PALAWAN: Brooke's Point (MCZ 25790); Iwahig (CAS 62175); Puerto Princesa (CAS 15802).

BALABAC: (CM 2543-2546). PHILIPPINES: exact locality unknown (MCZ 7806).

Taxonomic notes.—The description of *Dipsadomorphus d. multicinctus* was based on four specimens, one of which, from an unknown Philippine locality, was shown to belong to a population of *Boiga dendrophila* from Luzon Island named by Taylor as *Boiga dendrophila divergens* [Brongersma (1934) 217]. The three other syntypes had been obtained by A. Everett on Palawan Island. Brongersma [(1934) 217] restricted the type locality of Boulenger's variety "*multicinctus*" to Puerto Princesa, Palawan Island, thereby fixing the name to apply to that population.

Diagnosis.—Ground color black, with 58 to 84 narrow yellowish crossbars on the body; ventrals 216 to 240. Standard length: ♂ 890, ♀ 950; tail length: ♂ 281, ♀ 302.

Descriptive notes.—Head black above, with or without yellowish spots; nuchal bar occasionally reaching parietal; upper labials yellowish, edged with black, sometimes bars fusing across supralabials dividing yellow space into upper and lower portion; gular shields yellow, edged with black; 58 to 84 narrow yellowish crossbars on dorsum terminating on ventrals; 21 to 29 yellow bars on tail; venter black with ventrolateral series of yellow bars, continuations of dorsal crossbars; ventrals 216 to 240; subcaudals 105 to 117; usually 8 upper labials, third, fourth and fifth bordering orbit; nasal divided; temporals 2 + 3, rarely 3 + 3. [In part after Brongersma (1934) 246-247.]

Sexual dimorphism.—The sexes differ in the average of ventral shields, in the total of ventral plus subcaudal (vertebral) count, and in the ratio of tail length/standard length (Table 5). The principal differences between sexes are found in the dimensions of the body rather than the tail. Indeed, it is interesting to note that the differences in subcaudal counts between sexes are very slight compared to the differences in ventral count. Furthermore, the ratio of tail length/standard length is larger among the four females than the average for five males, indicating a longer tail in the female. The significance of this inversion of characters is not understood.

TABLE 5.—Summary of variation between sexes in *Boiga dendrophila multicincta*. *

Character	Male			Female		
	N	Mean	Range	N	Mean	Range
Ventrals.....	7	224.0	216-233	9	232.1	224-240
Subcaudals.....	7	112.4	107-117	9	111.4	105-117
Ventrals plus subcaudals.....	7	332.6	328-348	9	342.3	338-350
Tail length/standard length.....	5	0.288	0.262-0.309	3	0.300	0.287-.318
Crossbars on body.....	4	69.8	58-80	4	78.3	71-84
Crossbars on tail.....	2	24.5	23-25	4	24.8	23-26

*Includes data given by Taylor (1922a) for specimens not examined in this study.

Females average slightly more crossbars on the body than males, although there is no difference in the range. The number of bars on the tail is the same for both sexes.

BOIGA SCHULTZEI Taylor.

Boiga schultzei TAYLOR (1923) 552, pl. 3, fig. 3 (type loc.: Palawan Island: type in Museum of Comparative Zoology, Harvard College; original description, comparison with *B. drapiezi* and *B. angulata*).

Boiga drapiezi LEVITON (1963) 400 (listed from Palawan Island).

Range.—(For Philippines only.) PALAWAN: without exact locality*).

Material examined (2).—PALAWAN: without exact locality (MCZ 25791, holotype; CAS 62153, paratype).

Taxonomic notes.—In 1923, Taylor described *Boiga schultzei*, based on two specimens from Palawan. It is difficult to separate Taylor's species from typical *B. drapiezi*. The two nominal forms seem to differ primarily in color pattern. Taylor [(1923) 553] stressed that *B. schultzei* differed from *B. drapiezi* in having "two instead of three labials entering the orbit; there are seven instead of eight upper labials; there

is a well-developed loreal present." However, of the two specimens Taylor had before him, both of which I have seen, one has seven upper labials and one eight. There are seven upper labials on the type specimen, the third and fourth bordering the orbit; the paratype has eight upper labials (on both sides, not on one side as indicated by Taylor [(1923) 553], and the fifth and sixth shields border the orbit. As Taylor pointed out, only two labials border the orbit; however, in *B. drapiezi* either two or three shields border the orbit. Taylor also suggested that the presence of a loreal will distinguish the two species, but the loreal is either present or absent in *B. drapiezi* (present in the one specimen of the Bornean population I have seen). Indeed only in color pattern do the two forms appear to differ, and even this is not great. In one of the two color patterns of *B. drapiezi* (see discussion under *B. angulata*) there is a series of narrow dark and light crossbars, numbering about 50; in *B. schultzei* there is a series of more than 70 narrow dark crossbars, each a scale row in width, separated by three to four rows of lighter scales.

Additional comments made under *B. angulata* apply here too, and it is necessary to wait until *B. drapiezi* is more clearly defined before it is possible to take a position on *B. schultzei*.

Diagnosis.—Scales in 19 longitudinal rows at midbody; loreal present or absent; preocular reaching upper surface of head; posterior chin shields equal to or longer than anterior pair; dark crossbands on dorsum, very narrow; a narrow dark line present along lateral side of ventrals; hemipenes spinose. Standard length: 956 mm [♂]; tail length: 370 mm [♀].

Descriptive notes.—Maxillary teeth 16; anterior maxillary teeth not strongly enlarged; 1 preocular, reaches upper surface of head and frequently in contact with frontal; loreal present or absent; 2 postoculars; temporals 2 + 2, 2 + 3, or 3 + 3; usually 8 upper labials, rarely 7, the third, fourth and fifth or rarely third and fourth, fourth and fifth, or fifth and sixth shields bordering orbit; anterior and posterior chin shields about equal; ventrals 250 to 276; subcaudals 114 to 163; anal plate single.

Hemipenes extends to eighth subcaudal plate, unforked; sulcus spermaticus unforked; spinose throughout, the spines gradually decreasing posteriorly; a few shallow calyces at distal end.

Color (in alcohol) light brown above with numerous darker brown transverse spots or narrow crossbars on dorsum; light brown below with numerous minute spots of dark brown and two usually distinct dark brown stripes extending the length of the body.

BOIGA PHILIPPINA (Peters).

Dipsas philippina PETERS (1867) 27 (type loc.: Ylases [=Ilocos Province, *vide* Taylor (1922a) 206], Luzon Island; type in Berlin Museum; original description); BOETTGER (1886) 113 (listed).

Dipsadomorphus philippinus, BOULENGER (1896) 77 (description after Peters).

Boiga philippina, GRIFFIN (1911) 263 (listed in key); TAYLOR (1922a) 206 (description after Peters).

Range.—LUZON: Ylases [= Ilocos Province].

Material examined.—None.

Taxonomic notes.—This species is known from the type specimen alone. I have not seen that individual. Based on the original description, it would seem that the species differs from *B. angulata* in the size of the anterior palatine teeth, in having two preoculars, and in the lower number of ventral counts. Boulenger [(1896) 77] states that it is "Like *D. irregularis*, but preocular divided." Boulenger neglects to point out that there are fewer scale rows than usual for *B. irregularis*. I suspect that this nominal species will be found to be conspecific to *B. angulata*.

Diagnosis.—Two preoculars, upper shield nearly in contact with frontal; anterior palatine teeth said to be greatly enlarged; scales in 19 longitudinal rows at midbody. Standard length.—435; tail length 155. (Ventrols 240, subcaudals 133.)

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