

Two New Species of the Worm-like Lizard *Dibamus* (Sauria, Dibamidae), with Remarks on the Distribution and Ecology of *Dibamus* in Vietnam

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Abstract. -Within Vietnam and the southern part of China there dwell 5 species of worm-like lizards of the genus *Dibamus*, two of them (*D. greeri* sp. nov. and *D. bogadeki* sp. nov.) are new to science. Some new data on the distribution, ecology, morphology, coloration, as well as the structure of hemipenes and the autotomy and regeneration of the tail is given for the species studied. The specific peculiarities of the body and tail coloration in some dibamids may apparently draw the attention of birds of prey, and in connection with this are regarded as the manifestation of attractive coloration and as Batesian mimicry.

Key words: Reptilia, Sauria, Dibamidae, *Dibamus*, China, Vietnam, ecology, taxonomy.

Introduction

According to the current data, the genus of worm-like lizards *Dibamus* Dumeril et Bibron, 1839 includes 9 species widely distributed on the mainland and on a number of big and small islands in Southeast Asia. As to the mainland part proper of this vast area, registered here were only 4 species of which *D. alfredi* is known mainly from the Malay Peninsula, and the three others (*D. bourreti*, *D. montanus*, and *D. smithi*) occur only within Vietnam (Greer, 1985). *Dibamus bourreti* was earlier reported from southern China (Liu and Hu, 1962) and recently was found in Hong Kong (Lazell and Lu, 1990).

From 1982 to 1988, while conducting field herpetological investigations in different regions of mainland and insular Vietnam, the author collected some new material which considerably expands the former views on the distribution as well as the morphological characters and ecology of the genus *Dibamus* within that country. The results of the treatment of the material and the description of the new species are given below.

Methods

All in all, 12 individuals of the genus *Dibamus* were studied, mainly from Vietnam. They were taken by the author and his colleagues in the course of several

Vietnamese-Soviet zoological expeditions from 1982 to 1988. Different species of the genus from other parts of its range were also examined for comparison. Measurements of snout-vent length (SVL) and tail length (TL) were made by adpressing the animals against a plastic rule taped horizontally to a bench top. All drawings were made under an "Opton" stereomicroscope with a camera lucida attachment. X-ray photos were taken with the Japanese apparatus "Softes". In the description of the elements of scuttellation, I mainly applied the terminology used by Greer (1985).

The following acronyms were used: ZIN- Zoological Institute, Russian Academy of Sciences, St. Petersburg (Leningrad); BM- British Museum Natural History; MNHP- Museum Natural History, Paris; IEMEM- Institute of Animal Evolutionary Morphology and Ecology, Moscow; MCZ- Museum of Comparative Zoology; ZMMU- Zoological Museum, Moscow State University; CAS- California Academy of Sciences.

Species Accounts

Dibamus bourreti Angel
Figs. 1, 3, 4, 5, and 11.

This species was described by Angel (1935) who had one specimen available from Tamdao, Vinhphu Province, northern

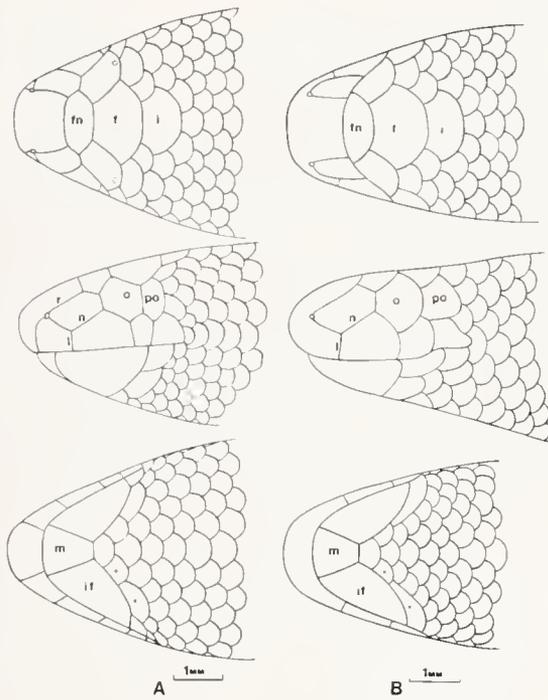


FIG. 1. Head in dorsal, lateral and ventral view of A- *Dibamus bourreti* (ZIN 20012); B- *Dibamus bogadeki* (holotype, MCZ 172041); sutures: r- rostral; n- nasal; l- labial; fn- frontonasal; f- frontal; i- interparietal; o- ocular; po- postocular; m- mental; if- infralabial.

Vietnam. The same type specimen (MNHP 35417) was reexamined by A. Greer in his revision of the family Dibamidae (Greer, 1985). Earlier, Liu and Hu (1962), having three specimens at their disposal, were the first to indicate this lizard for Kwangsi Province (= Guangxi Province) in southern China. Recently a specimen was found in Hong Kong (Lazell and Lu, 1990). In Vietnam, according to the literature, *D. bourreti* is also known from Ninhbinh, Hanamninh Province (Tran et al., 1982) and from the reserve Kukfiong, Hasonbinh Province (Darevsky and Sang, 1983). We also found this lizard in Tamdao, An Lac Shon Dong, Habac Province and on the Vietnam inshore island Katba, Haiphong Province (Darevsky, 1990), (Fig. 2).

The data on the morphology of all specimens we examined are given in Table 1. These data considerably expand the morphological characteristics of *D. bourreti* described by Greer (1985). Already in his

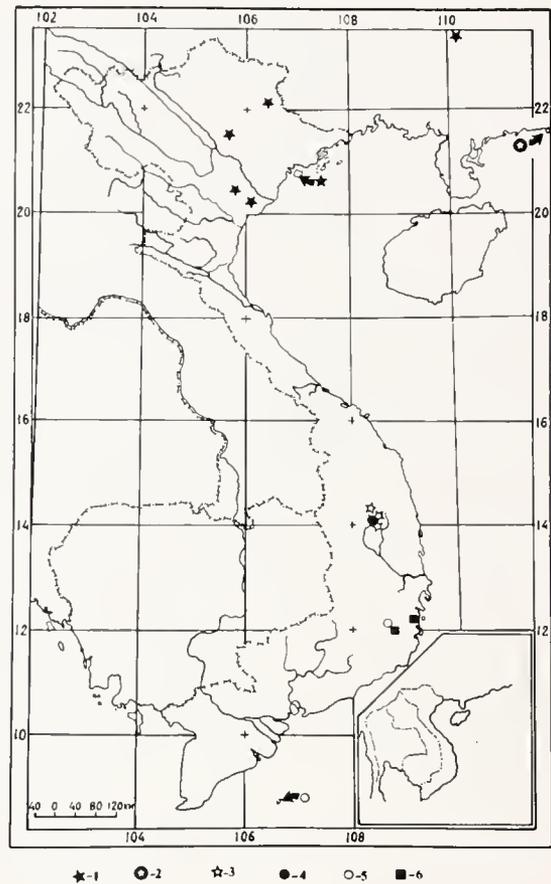


FIG. 2. Distribution of the known localities of *Dibamus* species in Vietnam and southern China: 1- *Dibamus bourreti*; 2- *Dibamus bogadeki*; 3- *Dibamus greeri*; 4- *Dibamus* sp.; 5- *Dibamus montanus*; 6- *Dibamus smiithi*.

first description, Angel (1935) noticed the typical white coloration on the back part of the tail in the specimen available. Lui and Hu (1962) also pointed to the same peculiarity of this species, for individuals from Guangxi Province, China. This distinguishes it from all other representatives of the genus *Dibamus* and the specimen reported from Hong Kong by Lazell and Lu (1990). I noted the bright milk white coloration on the end part of the tail in individuals from Katba Island, but specimens from Tamdao and Kukfiong lacked it, possibly because their tails were regenerated. Attention is also drawn to the fact that the coloration of the tail and the back part of the body in specimens from Katba Island and Hong Kong is not uniform. It is to be accounted for by the

TABLE 1. Investigated morphological characters of *Dibamus* specimens from Vietnam and southern China.

Species	Museum No.	Sex	Locality	SVL (mm)	TL (mm)	% TL of SVL	mid-body scales	sub-caudals	post-oculars	scales on		postsacral vertebrae	hind-limbs (mm)	hindlimbs % of SVL	body diameter	body diameter % of SVL
										posterior edge of infralabial	posterior edge of infralabial					
<i>D. bourreti</i>	MNHIP 35417	F	Tamdao	154	32 cut	20.7%	24	52+	1	2	129	23+	-	-	5.0 mm	3.2%
<i>D. bourreti</i>	ZIL 20278	M	Tamdao	95	25 cut	-	23	16+	1	2	125	12+	2	2.1%	4.2 mm	3.2%
<i>D. bourreti</i>	ZIL 19803	F	Kukfong	72	9 cut	-	22	30+	1	2	124	19+	-	-	3.2 mm	4.4%
<i>D. bourreti</i>	ZIL 20012	F	Lac Shon	122	52	42.6%	20	88	1	2	115	46	-	-	4.1 mm	3.3%
<i>D. bourreti</i>	ZIL 20014	M	Katba Island	138	51 cut	-	21	73+	1	2	129	40+	3.1	2.2%	4.2 mm	3.0%
<i>D. bourreti</i>	602021	M	Guangxi, China Liu & Hu 1962	130	35 cut	27.0%	23	57+	-	-	-	-	-	-	-	-
<i>D. bourreti</i>	603570	F	Guangxi, China Liu & Hu 1962	150	72	48.0%	23	99	-	-	-	-	-	-	-	-
<i>D. bourreti</i>	603571	M	Guangxi, China Liu & Hu 1962	130	55	42.3%	23	-	-	-	-	-	-	-	-	-
<i>D. bogadeki</i>	MCZ 172041	M	Hong Kong	177	40 cut	22.5%	23	51+	1	2	135	25+	4.7	2.6%	6.0 mm	3.3%
<i>D. greeri</i>	ZIL 20011	M	Kontarang	82	23	-	20	53	1	1 & 3	96	31	1.8	2.1%	4.1 mm	4.9%
<i>D. greeri</i>	ZIL 20016	F	Tram-Lap	84	20	-	20	54	1	1 & 3	111	28	-	-	3.3 mm	3.9%
<i>D. greeri</i>	IEMEM 101	F	Buoenloy	86	5 cut	-	20	-	-	-	99	-	-	-	4.0 mm	4.6%
<i>D. montanus</i>	ZIL 20017	M	Konda Island	111	23	20.7%	22	59	4	2	137	36	1.8	1.6%	2.7 mm	2.4%
<i>D. smithi</i>	ZMMU R-6567	M	Whatrang	83	5 cut	-	19	13+	2	3	115	11+	2	2.4%	2.6 mm	3.1%
<i>Dibamus sp.</i>	IEMEM 102	F	Buoenloy	?	?	-	19	91	?	?	126	49	-	-	-	-

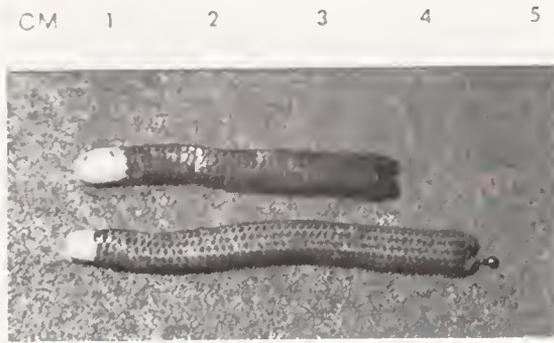


FIG. 3. Two autotomic tails with regenerated tips of *Dibamus bourreti* (upper, ZIN 20014a); (lower, ZIN 20014b).

location of the pigment on every single scale. It is concentrated more compactly in its front part and is poorly marked at the rear (Fig. 3). Greer (1985) mentions the presence of four preanal pores on each side of the anal opening in the only female he examined (MNHP 35417). In this connection it should be noted that these pores were not observed in any of the 5 specimens I examined (3 males and 2 females). This character is apparently not constant in *D. bourreti*.

Field Notes.—All the *D. bourreti* specimens currently known were caught under stones or wood debris on the ground of a tropical forest at an elevation of 450-900 m. Liu and Hu (1962) found two specimens in China on the surface of the ground in a hilly forest.

In discussing the milky white coloration on the end part of the tail in *D. bourreti*, it should be observed that this species can also be characterized as having a comparatively very long tail, its length reaching 40% or more of the SVL in both males and females (in other representatives of the genus the length of the tail does not exceed 20-25% of the SVL). The long tail with a bright coloration at its end contrasting sharply with the dark unicolor body of the animal may qualify as a good example of attractive coloration. My observations show that in case of danger (when the stone under which the animal hides is lifted) a *Dibamus* abruptly

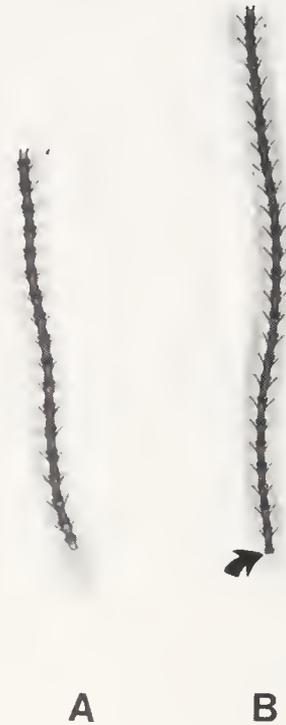


FIG. 4. X-ray photograph of the two autotomic tails with regenerated tips of *Dibamus bourreti* A- (ZIN 20014a); B- (ZIN 20014b). The arrow points to place of the fracture between two neighboring vertebrae.

raises its tail upwards which apparently immediately attracts the attention of a bird of prey, such as ground foraging birds like jungle or pea fowls rummaging about in the forest litter in search of food. Caught by a bird, the fragile tail easily breaks off, and the animal has time to hide itself under the ground. Here it may be noted that out of the 5 specimens examined, 4 had a regenerate tail to some degree. This is seen in the X-ray photo (Fig. 4).

Comment.—As Greer (1985) noted, the scales on the regenerate tail in *Dibamus* almost does not differ from the original. But the new tail may be distinguished by the arrangement of the scales on its end part. While a normal tail is somewhat sharp at the end and its point is covered with concentric rows of scales gradually becoming smaller, the regenerate tail ends

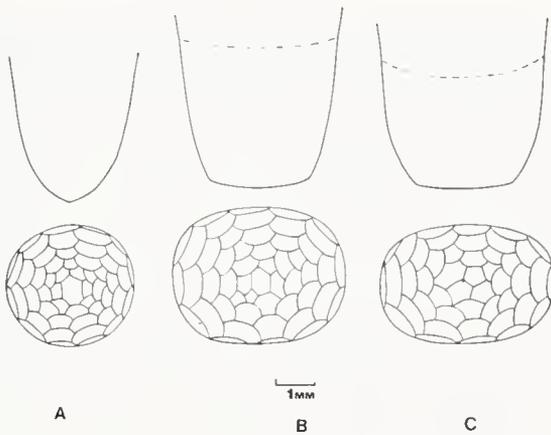


FIG. 5. Scales on the top of original (A) and regenerated (B, C) tails of *Dibamus bourreti*; A- (ZIN 20014a); B- (ZIN 20014b).

bluntly by a plane oval platform occupied by some relatively big irregularly arranged scales (Fig. 5). X-ray photographing clearly shows the fracture which can occur not only across one of the tail vertebrae, as it is in most other lizards, but on the border between two neighboring vertebrae as well. The new tail is longer owing to the fact that the connective tissues spread out both in length and width (Fig. 4). At the same time, a peculiar tail "blade" up to 1 cm long covered with scales is formed, acquiring the bright white coloration described above (Fig. 3).

Judging from the collection material examined and the literature data, *D. bourreti* is characterized by a distinct intraspecific variability. Angel (1935) and Greer (1985) noted the complete absence of labial sutures in the only specimen from Tamdao (MNHP 35417) they studied. The specimen caught by the author in Tamdao (ZIN 20011) is also deprived of labial sutures. In all other examined individuals from Vietnam, as well as from Guangxi Province, China (Liu and Hu, 1962), this suture is well developed. Within wider limits, *D. bourreti* shows variations also in mid-body scale rows (from 20-24). Some coloration differences in various individuals were discussed above. It is possible that the lizards from the type locality (Tamdao) may be isolated in a separate nominate subspecies *D. b. bourreti* Angel. Further

study is needed to settle this question. With respect to this it may be noted that the isolated tracts of forest of the Tamdao mountain ridge show marked endemics among reptiles, as well as some other groups of animals.

Dibamus greeri sp. nov.
Figs. 6, 7, 8, 11 and Plate 1.

Holotype.—ZIN 20011; Kontarang, Gilai-Contum Province, Vietnam; 850 m; I. S. Darevsky; 21 June 1983; male.

Paratypes.—ZIN 20016; Tram-Lap, Gilai-Contum Province, Vietnam; 800 m; A. Gorochoy; 12 December 1988; female. IEMEM 101; Buoenloy, Gilai-Contum Province, Vietnam; 750 m; December 1981; S. Smirnoff; female.

Diagnosis.—Differs from all other species of dibamids in the following combination of characters: medial rostral and nasal sutures incomplete; one postocular; two supralabials; frontal much larger than frontonasal and than infraparietal; posteromedial edge of the infralabials bordered by one narrow and long scale; 20 mid-body scale rows; 97-111 presacral vertebrae; 29-31 post sacral vertebrae (number of vertebrae is less than in all other *Dibamus* species).

Description of Holotype.—Medial rostral and nasal sutures incomplete and barely extending to anterior edge of rostral pad; the labial suture well developed; frontonasal wider than long; frontal very big, approximately four times bigger than frontonasal; interparietal divided into two, each part bigger than adjacent nuchal scales (in paratype intraparietal not divided); two supralabials posterior to rostral pad; only one narrow scale located along the posteromedial edge of the infralabial with bordering posteromedially by three small scales situated between the second postmental and second infralabial; 20 midbody scales; 54 subcaudals; 97 presacral vertebrae; 32 postsacral vertebrae; SVL 82 mm; TL 23 mm; preanal pores absent; hind limbs very short, 1.4 % of SVL.



FIG. 6. X-ray photograph of *Dibamus greeri* (holotype, ZIN 20011).

Comment.—Greer (1985) noted a considerable morphological resemblance between the species of *Anelytropsis* and *Dibamus* and in particular he singled out the species *D. bourreti* which is most close to *Anelytropsis papillosus* in having a complete rostral suture passing through the nostril, a complete nasal suture, and in some other features. As to *D. greeri*, this species resembles *A. papillosus* in the presence of one narrow and long scale bordering on the posteromedial edge of the infralabials (Fig. 7).

Coloration.—Living animals (Holotype) uniformly purplish-brown above and below with three distinct brightly blue rings, 6-9 body scale rows wide, two on the body and one on the tail. Shortly after capture, one of the rings on the body disappeared and the two others remained (Plate 1). The two other known individuals (females) had the same coloration as the holotype in life, but

they lacked the blue rings.†

Hemipenis.—Everted hemipenes are quite smooth conic formations tapering to the apex with a small hollow near the tip (Fig. 8). The length of the organ is 1.1 mm, and the width is 0.4 mm. No accounts about hemipenes in the family Dibamidae have been given prior to this account (Greer, 1985).

Distribution. All three known specimens were taken in the central part of the Gilai-Contum Province in southern Vietnam (Fig. 2). It can be assumed that this

† I observed whitish-gray rings on the body and the tail in some preserved *Dibamus novaeguineae* specimens from the Philippine Islands (CAS 26647, 26678, 27538, 140218, and others). It is very possible that in living animals the rings were blue as in *D. greeri*.

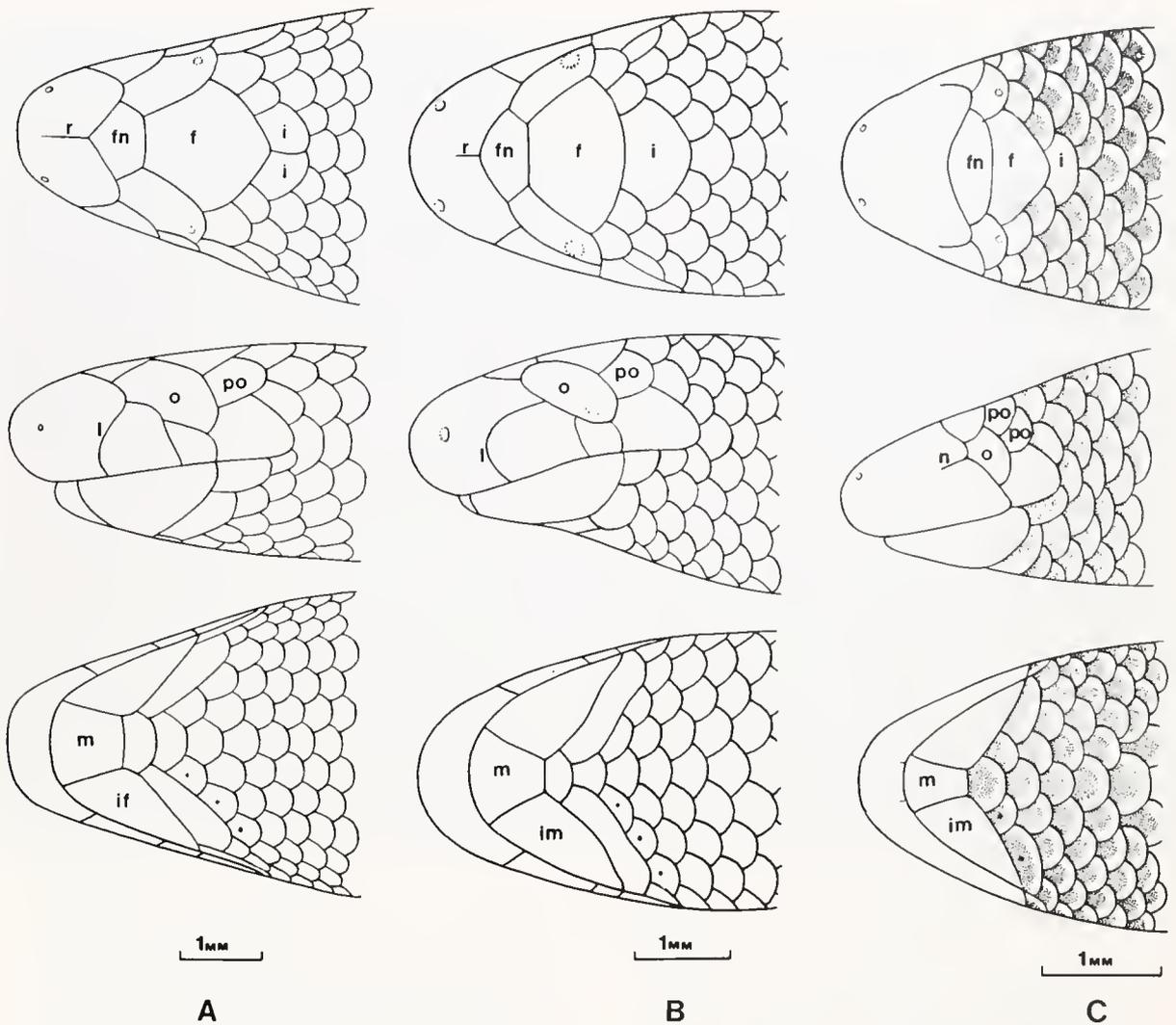


FIG. 7. Dorsal, lateral and ventral view of the head of A- *Dibamus greeri* (holotype, ZIN 20011); B- *Dibamus greeri* (paratype, ZIN 20016); C- *Dibamus smithi* (ZMMU R-6567). For abbreviations see Fig. 1.

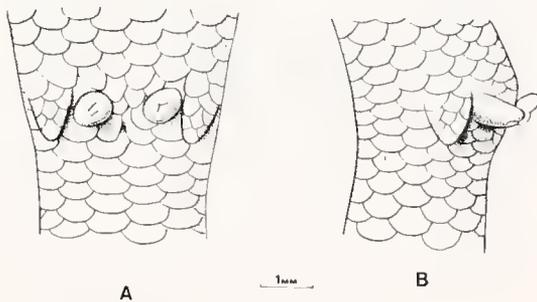


FIG. 8. Everted hemipenes of *Dibamus greeri* (holotype, ZIN 20011). A- Front view; B- Side view.

species widely occurs within the Pleicu Plateau occupying the central part of Gilai-Contum Province.

Etymology.—Named for Allen E. Greer, the author of numerous works in the field of taxonomy of various groups of lizards, including the fundamental study of the family Dibamidae.

Field Notes.—The type specimen was found in a big lump of the so-called “suspected” soil. The lump, which pierced through with plant roots of epiphytes, had fallen down from a tree at a height of about

three meters. It was torn to pieces by the author right after it fell to the ground. The trunk of the tree was twisted with liana up to three meters height and it was thickly overgrown with moss. The animal seems to have worked its way up under the cover of the moss. After capture the lizard behaved very aggressively, struggled to break loose, and opened its mouth to bite. The two other specimens were discovered in the wood litter under the cover of the forest. Specimens of two new species of lizards, *Sphenomorphus rufocaudatus* and *Ophisaurus sokolovi* (Darevsky and Sang, 1983) were found at the same locality.

The bright blue coloration in the form of separate spots, stripes or ocelli is known to occur in many species of diurnal lizards. It is usually regarded as one of the features of sexual coloration. But it is evident that the blue rings in worm-like lizards which live in the soil and are practically blind cannot play this role. Some other explanation must be found for it. Hence, it is of interest to note that the bright blue rings on the body of *Dibamus greeri* make the animal outwardly resemble some tropical motley colored earth worms of the Megascolicidae family living in the forest litter. If such worms are not edible or venomous, it may be assumed that this represents a peculiar case of Batesian mimicry. The ground-foraging birds, such as jungle fowl, spur fowl and pea fowl may have been important selective agents in the evolution of such a memetic resemblance as was shown for some species of uropeltid snakes (Gans, 1987). This assumption, however, must be supported experimentally, especially because the blue rings are capable of appearing and disappearing, and were found by the author only in one male. They were absent in females and have never been observed in other species of the genus *Dibamus*.

Dibamus bogadeki sp. nov.
Figs. 1, 9 and 10.

Dibamus cf. *bouretti* Lazell and Lu, 1990

Holotype.—MCZ 172041; Hei Ling

Chau, ca. 10 km southwest of Victoria, Hong Kong; A. Bogadek; 1 April 1987 (Fig. 10).

Diagnosis.—Differs from all other *Dibamus* in the following combination of characters: medial rostral suture absent; nasal sutures not complete; labial sutures present; interparietal large; one postocular; two supralabials; 23 midbody scale rows.

Description of Holotype.—Nasal suture incomplete; not present from lip to nostril and extending from nostril to the ocular only; the labial sutures well developed; frontonasal wider than long; fontal approximately 3 times bigger than frontonasal; interparietal larger than frontonasal; 2 supralabials posterior to rostral pad; one postocular; two scales bordering posterior edge of the first infralabial, one of them wider than the other; 23 midbody scales; 51+ subcaudals; 134 presacral vertebrae; 25 postsacral vertebrae in incomplete tail; SVL 177 mm; TL 40 mm; preanal pores absent; hindlimbs well developed, 2.7 % of SVL. According to Lazell and Lu (1990) and the description by Dr. J. D. Lazell (pers. comm.) the living animal was lilac or lavender-gray, irregularly mottled lighter and darker, at darkest, light plumbeous. Tail ash-white; head flecked with ash-white, but not as much as tail. As in *D. bouretti*, the white coloration of the back part of the tail apparently demonstrates a characteristic case of attractive coloration.

Distribution.—It is known only from the type locality. The only finding of this species during all the research history of the Hong Kong herpetofauna indicates that it occurs very rarely on this island (Fig. 2). According to J. D. Lazell (pers. comm.) the following reptiles are known from the type locality of *Dibamus bogadeki*, Hei Ling Chau: *Hemidactylus bowringi*, *Gekko chinensis*, *Typhlops braminus*, *Pareas margaritophorus*, *Python molurus*, *Ptyas corros*, *Trimeresurus albolabres*, *Naja haja* and other snake species.

Etymology.—The species is named for its first collector Fr. Anthony Bogadek,



FIG. 9. X-ray photograph of *Dibamus bogadeki* (holotype, MCZ 172041).

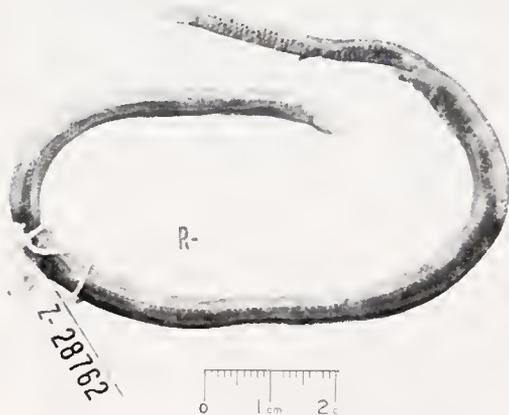


FIG. 10. Photograph of *Dibamus bogadeki* (holotype, MCZ 172041).

biologist at the St. Louis School, Victoria, Hong Kong, and coauthor of the book, *Hong Kong Amphibians and Reptiles* (Urban Council, 1986).

Comment.—On a number of characteristics, coloration included, this insular species is most close to *D. bourreti*, which drew the attention of Lazell and Lu (1990). At the same time, there is a clear-cut difference between *D. bogadeki* and *D. bourreti*, such as the important character of an incomplete nasal suture. It is also characterized by a large size of SVL 177 mm and by a markedly greater number of presacral vertebrae (136). See also Table 1.

Dibamus montanus Smith

Smith (1921) described this species having at his disposal a few specimens from the Langbian Plateau in the present Lamdong Province in southern Vietnam. All the type series has been recently reexamined by Greer (1985) who singled out the Lectotype (BMNH 1946.8.3.2) out of two specimens from Le Bosquet.

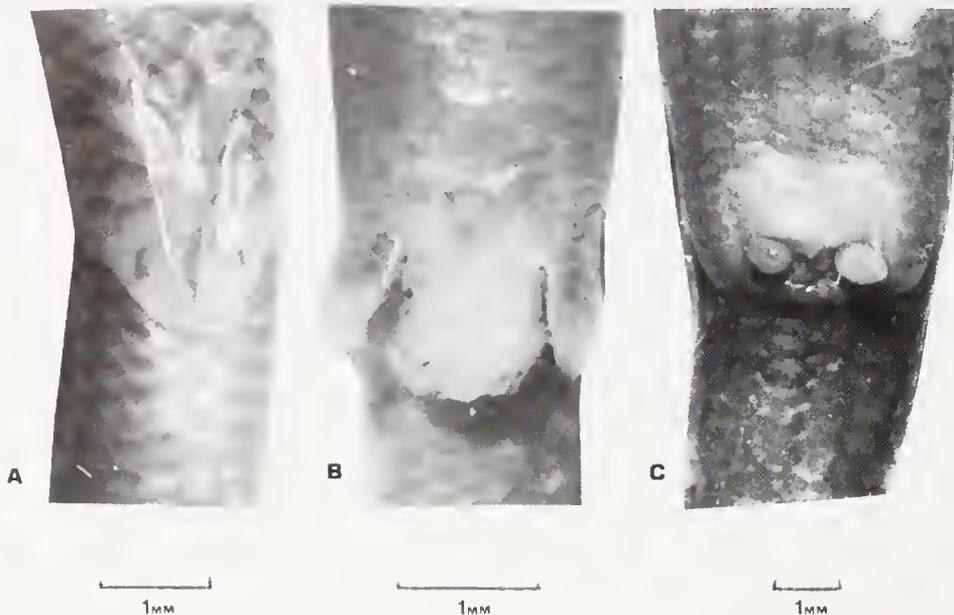


FIG. 11. Anal area with the male's hindlimbs of three *Dibamus* species: A- *Dibamus smithi* (ZMMU R-6567); B- *Dibamus bourreii* (ZIN 20278); C- *Dibamus greeri* (holotype, ZIN 20011).

Two specimens of *D. montanus* were captured by the author in April, 1987 at an elevation of about 500 m in a tropical forest on Condao Island (formerly Pulo Condore)[†]

Dibamus smithi Greer
Figs. 7 and 11.

Smith (1921) was the first to notice the differences between a part of the specimens from the Langbian Plateau he had at his disposal and the typical individuals of *Dibamus montanus*. Greer (1985) studied these specimens again and showed that they refer to the new species *Dibamus smithi* he had described. This species is known only from the type locality (Daban, Lamdong Province, Vietnam). I also had at my disposal a specimen (ZMMU R-6467) captured in April, 1985 by V. F. Goncharov from Nhatrang, Phykhanh

Province, Vietnam.

Comment.—*Dibamus smithi*, as well as the closely related species *D. montanus*, has a non-uniform body coloration. On each of the body scales the dark pigment is located more compactly in its front part forming a peculiar reticulate pattern (Fig. 11, A). On the whole, both of these species differ from the other representatives of the genus *Dibamus* in having a more slender body (see Table 1).

Dibamus sp.

I had at my disposal one headless specimen (a female) from Buoneloy, Gilai-Contum Province, Vietnam (IEMEM 102) identified by Iordansky (1985) as *D. bourreii* and used by him for studying the head muscles. The absence of the head prevents us from identifying the species of this specimen. But it should be noted that the 19 midbody scale rows clearly distinguish it from its sympatric species, *D. greeri* and the large number of postsacral vertebrae (49) makes it different from all

[†] Earlier these specimens were mentioned for Condao under the name *D. smithi* (Darevsky, 1990).

other species in the genus *Dibamus* from Vietnam. It is of interest to note that in this headless specimen, as was shown by Iordansky (1985), some rudiments of postfrontal bones are preserved. According

to Greer (1985), *Anelytropsis papillosus* also have such bones, while the specimen of *D. greeri* examined by Iordansky, as well as *D. novaeguineae* (Rieppel, 1984) lack them.

Key to the species of *Dibamus* from Vietnam and southern China.

1 (7). Mid-body scale rows 20-24.

2 (8). Medial rostral suture absent or incomplete (barely extending to anterior edge of the rostral pad).

3 (4). Nasal suture complete and extending between the nostril and the posterior edge of the rostral pad.....*D. bourreti*.

4 (3). Nasal suture absent or incomplete (not extending to the posterior edge of the rostral pad).

5 (6). Nasal suture reduced; medial rostral suture present.....*D. greeri*.

6 (5). Nasal suture present and extending from the nostril and ocular.....*D. bogadeki*.

7 (1). Mid-body scale rows 18-19.....*D. smithi*.

8 (2). Medial rostral suture complete extending to the tip of the snout*D. montanus*.

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Academy of Sciences, San Francisco).

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