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NOTE ON VIPERA RUSSELII (SHAW)

by

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with textfigs. 1-2, and plates I-III.

This note deals mainly with the systematic position of the subspecies of *Vipera russelii* occurring in the Malay Archipelago, and with its distribution; some remarks are added concerning the distribution of *V. russelii* outside the archipelago.

Two subspecies of *Vipera russelii* have been described from the Malay Archipelago. Mertens (1927, p. 183) made a specimen from Endeh Island the type of a new subspecies: *Vipera russelii limitis* Mertens. In a later paper, Mertens (1930, p. 327) refers the two specimens taken in the island of Komodo by Dunn (1927, p. 4) to this same subspecies, and according to Neuhaus (1935, p. 49) the Javan specimen described by him also belongs to *Vipera russelii limitis*. Kopstein (1936, pp. 259-262, pl. 3) discusses the differences that he believes to be present between the Javan specimens and Mertens's *V. r. limitis*. Although Kopstein did not arrive at a definite conclusion as to the Javan specimen differing subspecifically from *V. r. limitis*, he proposed the name *Vipera russellii sublimitis* Kopstein for the Javan form should it prove to be distinct. De Haas (1950, p. 609), Wegner (1953, p. 6), and Van Hoesel (1954, p. 135, fig.) recognize *Vipera russelii sublimitis* as a distinct subspecies.

Under the heading *Vipera russelli siamensis*, Smith (1943, p. 484) describes the colour pattern of specimens from southern Burma, Siam, China, and the East Indies; this may mean that Smith refers the specimens from these areas to *V. r. siamensis*, and that he considers *V. r. limitis* and *V. r. sublimitis* (mentioned by him on p. 485) as synonyms of *siamensis*.

The systematic position of these two forms was discussed again by Mertens (1957, p. 25) after comparing a Javan specimen to the type of *V. r.*

limitis. Mertens arrives at the conclusion that the specimens from Komodo and those from Java belong to *Vipera russelii siamensis* Smith, of which *V. r. sublimitis* is a synonym; *Vipera russelii limitis* Mertens is maintained for the form occurring in Endeh Island. Recently, Van Hoesel (1958) recorded *Vipera russelii* from the islands of Flores and Lomblen (Lesser Sunda Islands); this author mentions the differences that in his opinion exist between specimens from Java and those from Flores. The name *Vipera russellii limitis* is used for the Flores specimens (Van Hoesel, 1958, p. 35), but on pp. 34 and 36 it is stated that Mertens (in litt.) is of the opinion that *limitis* and *sublimitis* are both synonyms of *Vipera russelii siamensis* Smith.

Mr. J. K. P. van Hoesel kindly presented the Rijksmuseum van Natuurlijke Historie, Leiden, with two specimens of *Vipera russelii* from Flores. These specimens were compared to a series of ten specimens from Java, and this comparison leads me to the conclusion that the vipers from Java and Flores belong to one and the same subspecies. Whether this subspecies is identical with *Vipera russelii siamensis* Smith is not yet clear, and therefore I use the name *Vipera russelii limitis* Mertens for the specimens from the archipelago.

The synonymy of *Vipera russelii limitis* Mertens given below contains the references to its distribution in the archipelago, in so far as they are based on recent records from the area. All references to the presence of Russell's Viper in Sumatra have been omitted, as well as those mentioning the species from Java prior to Kopstein's paper of 1935; in the paragraphs dealing with the distribution of *Vipera russelii* it will be shown that there is no trustworthy evidence that the species occurs in Sumatra, and that the records from Java published before 1935 are erroneous.

Vipera russelii limitis Mertens

Vipera russellii, Dunn, 1927, p. 4; Burden, 1927, p. 114; Werner, 1929, p. 190; Kraus & Werner, 1931, p. 72; Chopra, 1936, p. 1074; Kopstein, 1936, p. 259, pl. 3; Ditmars, 1937, pp. 149, 161; Kostein, 1937, pp. 131, 139; Kopstein, 1938, pp. 146, 154; Kopstein, 1939, pp. 165, 173; Cochran, 1943, in explanation of fig. 1 of pl. 9 (not the figure); Cochran, 1944, in expl. of fig. 1 of pl. 9; Van Hoesel, 1954, p. 334; Vianney, 1957, p. 31; Van Hoesel, 1958, pp. 32-34, figs. on pp. 32, 33.

Vipera russelli, Dunn, in: Burden, 1927, p. 216; Kopstein, 1930a, p. 109; Kopstein, 1930b, p. 340; Kopstein, 1932, p. 253; Kopstein, 1935, pp. 117, 118; Pasteur, 1941, p. 86; Tweedie, 1941, p. 31; Anonymus, 1943, p. 18; Loveridge, 1945a, pp. 174, 176, and 1945b, pp. 166, 167; Anonymus, 1948, p. 7 (not fig.), p. 10; Tweedie, 1953, p. 114; Darlington, 1957, p. 227.

Vipera russelii, Mertens, 1927, p. 182; Mertens, 1930, pp. 138, 158, 174, 182, 203; Brongersma, 1934, p. 246; Mertens, 1934, pp. 67, 139.

Vipera russeli, Brongersma, 1929, p. 68; Brongersma, 1930, p. 302; Rensch, 1936, pp. 43, 95.

Viperia russelii, Mertens, 1930, p. 173 (err. typogr.).

Vipera russelii limitis Mertens, 1927, p. 183; Mertens, 1930, pp. 154, 155, 197, 327, pl. 8

fig. 6; Rensch, 1930, p. 130; Neuhaus, 1935, p. 49; Pope, 1935, p. 385; Mertens, 1957, pp. 25, 26.

Vipera russellii limitis, Werner, 1929, p. 190; Kopstein, 1936, pp. 259, 261; De Haas, 1950, p. 609; Van Hoesel, 1958, p. 35.

Vipera russelli limitis, Smith, 1943, p. 485.

Vipera russelii (Rasse *limitis*), Rensch, 1936, p. 151.

Vipera russellii limitri, Bourret, 1936, p. 444.

Vipera russeli limitans, Brongersma, 1930, p. 302.

Vipera russellii sublimitis Kopstein, 1936, p. 261; Kopstein, 1937, p. 139; Kopstein, 1938, p. 154; Kopstein, 1939, p. 173; De Haas, 1950, p. 609; Wegner, 1953, p. 6; Van Hoesel, 1954, p. 135, fig.; Van Hoesel, 1958, p. 36.

Vipera russelli sublimitis, Smith, 1943, p. 485.

Vipera russelli siamensis, Smith, 1943, p. 484.

Vipera russelii siamensis, Mertens, 1957, p. 25.

Vipera russellii siamensis, Van Hoesel, 1958, pp. 34, 35.

Specimens examined:

♀, Sepandjang near Surabaia, E. Java, 1934, Kopstein collection, M.L. no. 10341; this is the cotype of *Vipera russellii sublimitis* figured by Kopstein (1936, pl. 3), and it is here selected as lectotype of *sublimitis*.

♂, Sepandjang, 1935, Kopstein collection, M.L. no. 10148.

♂, Sepandjang, 1937, Kopstein collection, M.L. no. 10340.

♂, Kembang Kuning, Surabaia, leg. J. K. P. van Hoesel, received 1.VIII.1956, M.L. no. 10318.

♀, Kembang Kuning, Surabaia, leg. J. K. P. van Hoesel (in the possession of Prof. R. A. M. Bergman, M.D., Amsterdam).

♂, ♀ (juvs.), Sepandjang, don. Dr. C. J. Keijzer, 1936, M.L. no. 6718.

1 ♂, 2 ♀♀ (neonati), born in the Surabaia zoo from a female caught in the surroundings of Surabaia, 14.III.1939, leg. Jhr. W. C. van Heurn, M.L. no. 7897.

♂ (juv.), Ndao, 2 km from the village of Endeh [1]), Flores, 26.II.1957, leg. J. K. P. van Hoesel, M.L. no. 10342.

♀ (juv.), Mbomba, 5 km W of the village of Endeh, Flores, 30.IV.1957, leg. J. K. P. van Hoesel, M.L. no. 10343.

The colour pattern plays an important part in distinguishing between the subspecies of *Vipera russelii* (Shaw). Smith (1917, p. 223) states that *Vipera russelii siamensis* differs from *V. r. russelii* only in possessing an additional series of small, elongated spots on either side of the body. According to Mertens (1930, p. 328) *V. r. russelii* has three rows of spots, *V. r. siamensis* has five rows, and *V. r. limitis* has seven rows of spots. The study of the specimens from Java and Flores proved that they do not differ from *V. r. siamensis* as far as the number of rows of spots is concerned. Smith (1915, p. 182: *Vipera Russellii*; plate upper fig.: *Vipera Russelli*) gave a more complete description of the specimen that later became the type of *V. r. siamensis*; in this description Smith mentions three rows of large spots, an additional series on either side, and others that adorn the flanks lower down, and thus one would arrive at seven series of spots. However, the

1) Not to be confused with Endeh Island off the south coast of Flores.

additional series on either side may just as well be described as representing two rows of spots; the spots of the upper row alternating with those of the lower row. Thus the total number of rows of spots becomes nine; in the neonatus small additional spots may be present, forming another series on either side. In the following description I have considered the spots that are placed in longitudinal rows at different levels of the sides as representing separate series, which I have indicated with the numerals I-VI (fig. 1). The

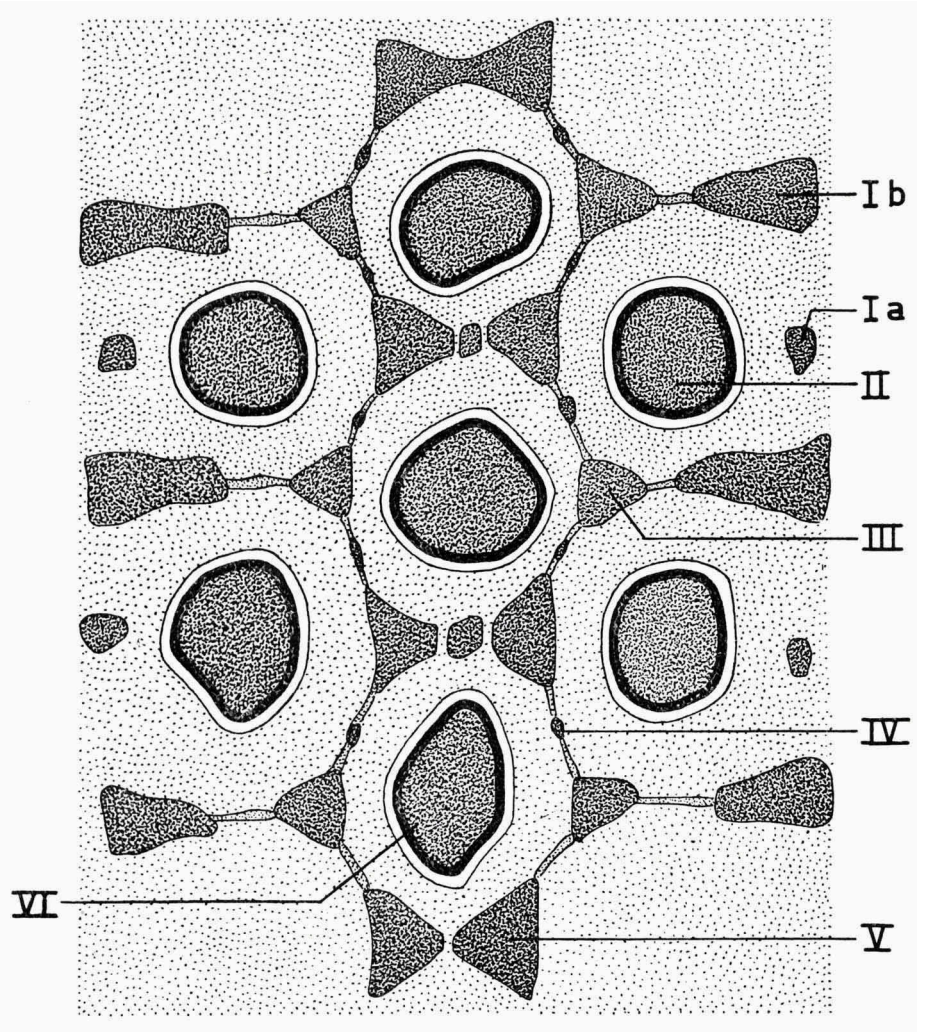

Fig. 1. *Vipera russelii limitis* Mertens, diagram of the colour pattern in the neonatus; the roman numerals indicate the series of spots described in the text.

colour pattern consists of the following series of spots (fig. 1; Pl. I fig. 1; Pl. II fig. 3).

I. Marginal spots. These spots occupy the outer border of the ventrals and the lower rows of scales. At the level of the large lateral spots of series II, the marginal spots are small; there they cover the borders of the ventrals and the scales of the first row (Ia); in the neonati these spots are sometimes connected to those of series II. Between the large spots of series II, the marginal spots are present as short vertical bars (Ib), reaching dorsally to the fourth row of scales; this is the case in neonati, but in somewhat older specimens these vertical bars may break up into marginal spots like Ia, and small spots on the adjoining borders of the second and third scale rows. In the adult the upper part of the bar may still be indicated by a small black dot, or it has disappeared completely.

II. Lateral spots. Each spot consists of a brown centre with a darker (sometimes black) border, surrounded by a white rim. In the neonatus the white rim is hardly distinct as it differs but slightly from the pale ground-colour; in the adult the rim is distinct, but it may be broken up into small white spots, or it may become indistinct. The lateral spots are large, they occupy the upper part of the second scale row, and they reach dorsally to the eighth row. On the sides of the neck the lateral spots sometimes have fused into a longitudinal band; the same may happen to the lateral spots just in front of the level of the vent.

III. Dorso-lateral spots. These are more or less triangular in outline, with the apex pointing downwards; they are situated on the scales of the sixth to eighth rows, or on those of the seventh to ninth rows. In the adult the dorso-lateral spots become more elongate, and they may show a white rim. The spots of this series are placed above the vertical bars of series Ib.

IV. Latero-dorsal spots. These do occur less regularly than those of the other series; when present they are found on the ninth or tenth scale row between the spots of series III and V.

V. Para-vertebral spots. Triangular or trapezoid in shape, with the apex pointing to the vertebral line. They are situated on the tenth to fourteenth or fifteenth scale rows. These spots may fuse across the back into short transverse bars, the outer ends of which are broader than the middle part, or the spot of one side may be separated from its fellow on the other side by a narrow pale interspace, by a small dark spot on the vertebral line or by a few dark dots. In the adult these para-vertebral spots are still well-developed and trapezoid in shape in some specimens (Pl. I fig. 2), or they have become more elongated.

VI. Vertebral spots. A series of large spots on the vertebral region, occu-

pying the eleventh to nineteenth scale rows. Like the large, lateral spots (II) the vertebral spots consist of a brown centre with a dark border and a white rim. Subsequent vertebral spots may be separated from each other by an interspace of about one or two scales between the white rims. This interspace may show the ground-colour, or it may bear a small dark spot or a group of small dark dots, or a transverse dark bar may be present (as mentioned under V). In various specimens subsequent vertebral spots fuse along the back (see below).

In the adult the spots of each of the series Ib, III, IV, and V are completely separated from those of the other series, and thus these spots appear as distinct series at different levels along the sides. In the neonati the situation is somewhat different. Narrow dark streaks (slightly darker than the ground-colour, but paler than the spots) connect the spots of series Ib to their neighbours in series III; the spots of series III are connected to the spots of series IV, and these in their turn are connected to those of series V; the spots of series V of one side are connected to their fellows of the other side. Where spots of series IV are absent, the spots of series III are connected to those of series V. The result is that either side shows an undulating lateral band (III-IV-V-IV-III, etc.), which at the top of the upward curves (V) is connected to that of the other side by a cross-bar; at the lowest point of the downward curves (III) vertical bars descend to the ventrals. The undulating lateral bands, cross-bars, and vertical bars together form a network with wide meshes. Each of these meshes contains one large spot (either a lateral spot of series II, or a vertebral spot of series VI). The spots of series III and IV are situated at the points where the undulating lateral band is joined by the vertical bars and cross-bars respectively. In the adult the connecting streaks between the spots have disappeared, but sometimes the bars across the back are still represented by black dots (Pl. I fig. 2). The colour pattern of the adult thus consists of separate series of spots, but if the pattern of the neonatus is taken as the starting point for the description, one might say that the spots of series III, IV, and V of the adult form one single undulating series on either side.

Kopstein (1936, p. 261) refers to the shape of the vertebral spots, which in his opinion are round in the Javan specimens, but more elongate in *V. r. limitis*. Van Hoesel (1958, p. 34) also is of the opinion that the large spots are round or almost round in the specimens from Java, while in the specimens from Flores these spots (especially those of the vertebral series) are somewhat more oval. It has been pointed out already by Mertens (1957, p. 25) that in the Javan male examined by him the vertebral spots are more elongate than those in the female figured by Kopstein (1936, pl. 3)

Kopstein (1936, p. 261) noted that the vertebral spots of the male are somewhat more oval than those of the female. As far as I can judge from the limited materials at my disposal the shape of the vertebral spots is dependent on the sex of the specimen; the differences in shape of the spots come about by a different mode of growth in males and females. Adult males and females differ markedly in proportions, the males are relatively slender, while the females are more thick-set; the increase in length of the males is relatively greater (or the increase in width is relatively less). This is apparent from the relative proportions of the body, but it is also evident in the shape of the head, which is more slender in males, broader and more triangular in females. The difference in the relative increase of length and width of the body also affects the shape of the vertebral spots. In the neonati the vertebral spots may be about as long as wide, or even slightly wider than long. There is no increase in the number of spots during life, but each of the spots grows proportionally in the same way as the body; hence the more slender males have more elongate vertebral spots than the females in which the body, and consequently the spots, remain relatively broader. There seems to be no difference between males and females in the number of scales occupied by one spot, but in accordance with the different mode of growth, the scales of the males become relatively longer and narrower than in females; thus the same number of scales that took part in forming an almost round spot in a male neonatus may form a narrow, oval spot in the adult male. In this respect the shape of the scales and that of the vertebral spots in females differs less from the situation in the neonati than is the case in males.

That the shape of the spots changes during growth is also apparent in the lateral spots (series II). In neonati these are about round, in the adult they become longitudinally oval, and more marked so in males than in females. The spots of series III and V also tend to become more elongated during growth.

As mentioned above, subsequent vertebral spots may fuse into an undulating vertebral band. Fusion of spots is present to a varying extent in seven out of ten specimens from Java, and in the two specimens from Flores. Fused spots are present already in neonati, and there is no reason to assume that changes take place during the life of the individuals. The shape of the fused spots offers some interesting data as to their mode of origin. Although the colour pattern tends to be symmetrical, some deviations do certainly occur. This does not apply only to the lateral spots, but also to the left and right halves of the vertebral spots. The right and left halves of the vertebral spots are more or less independent from each other as to the place where they originate. Besides with almost symmetrical vertebral spots (fig. *2a, b*) one

meets with spots of which one half is placed slightly more anteriorly than the other half. In this way spots are formed that are slightly asymmetrical (fig. 2*c*, *d*). When the difference in position is greater we meet with two

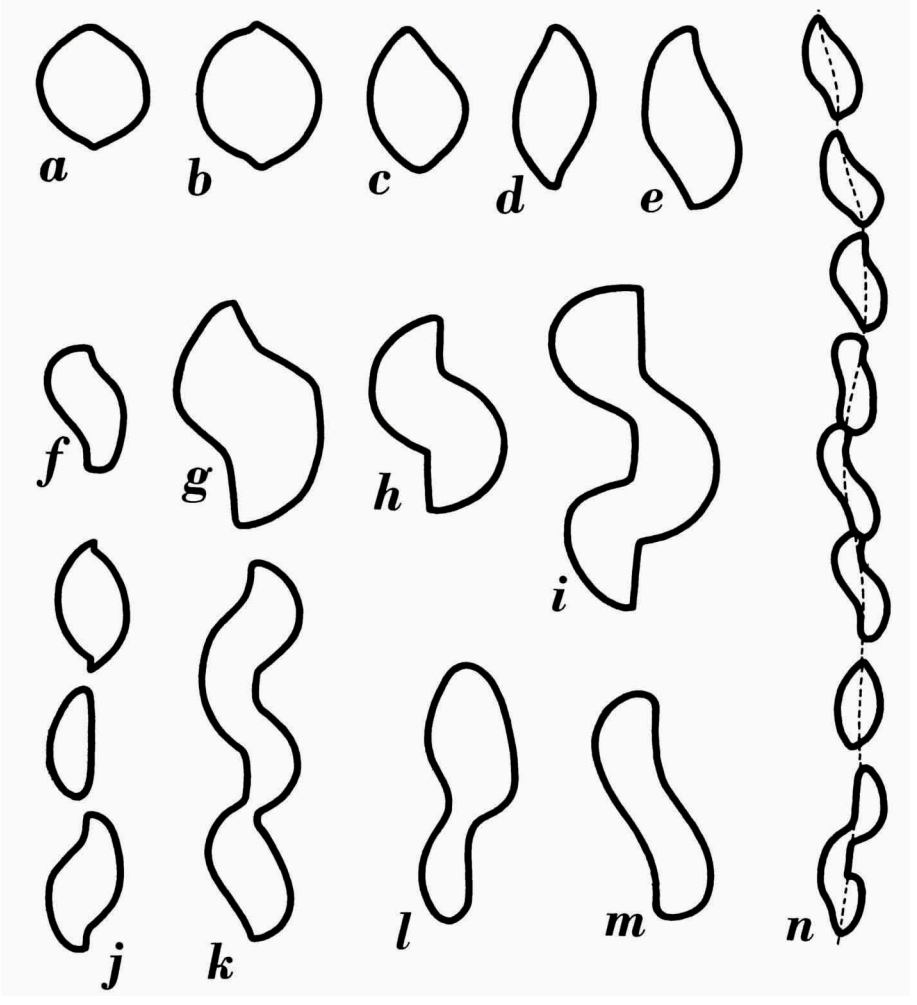

Fig. 2. *Vipera russelii limitis* Mertens, variations in the shape of the vertebral spots; *a*, *b*, *f*, *g*, *l*, ♀, M. L. no. 10341; *c*, *d*, *e*, *m*, *n*, ♂, M. L. no. 10148 (the broken line in *n* indicates the vertebral line); *h*, *i*, ♀, neonatus, M. L. no. 7897; *j*, *k*, ♂, juvenile, M. L. no. 6718.

semicircular spots (one on either side of the vertebral line), which are joined together on the median line over a longer or shorter distance (fig. 2 *h*, Pl. II fig. 2); in extreme cases spots are found that only just touch on the me-

dian line with their posterior and anterior tips. In the males the vertebral spots are elongate, and when the halves of these on one side are placed somewhat more posteriorly than those of the other side, elongate sinuous marks are formed (fig. 2 *m*). Sometimes a number of subsequent spots show this difference in position of the right and left halves, and then a chain is formed of semicircular spots, placed alternately on the left and right sides, joined together at their anterior and posterior tips (fig. 2 *i, k*); in the case of very elongated spots a truly undulating band is formed. Further evidence of the independence of the right and left halves of the vertebral spots is provided by the number of semicircular spots in a chain; often the numbers on the left and right sides are unequal (fig. 2 *i, k*); in one instance only the one half of a spot is present as a separate marking (fig. 2 *j*).

Fusion of lateral spots may occur anteriorly on the neck, and posteriorly just before the level of the vent; only rarely one meets with fused lateral spots at mid-body (Pl. II fig. 4). On the tail the vertebral spots and those of either lateral series have fused into longitudinal streaks.

The head (Pl. II fig. 1) shows a lozenge-shaped dark spot, between the eyes, and two elongated spots on the occiput. These spots have a black border and a more or less distinct white rim, but they may show considerable reduction. The centre of these spots may become pale greyish like the ground-colour, the black border may become broken up into a series of small black dots, and the white rim may become reduced to a few pale dots. This may result in the spots becoming rather indistinct (male from Java, M.L. no. 10318; Pl. III fig. 1). All specimens have a dark subocular spot, and a dark oblique bar from the orbit to the angle of the mouth. Sometimes this oblique bar has fused posteriorly with the occipital spot. The upper labials are white or cream-colour with dark spots on their posterior border; sometimes a dark mottling encroaches upon the whitish colour of the labials, and then the subocular spot may become less distinct (Pl. III fig. 3). The converging white lines on the upper surface of the head stated to be present in *V. r. russelii* are absent in the specimens from Java and Flores.

The ground-colour in all specimens examined by me is greyish, in some specimens darker than in others; the two specimens from Flores, which have been preserved in formalin, are much darker than the Javan specimens, which have been preserved in alcohol. Neuhaus (1935, p. 49) describes the ground-colour in a living specimen as being greenish brown-grey; Mertens (1927, p. 183) states that the ground-colour in the type of *V. r. limitis* is of a rather dark grey; Van Hoesel (in litt.) remarks that the ground-colour in living specimens from Flores is ash-grey. Although there is some variation in the ground-colour all authors agree that it is of some kind of grey. The centre

of the large, vertebral and lateral spots may show the same colour as the ground-colour, or it may be greyish-olive or a dull chocolate-brown.

The ventrals are whitish or cream-colour with dark grey or black semicircular spots; they may be powdered or mottled with grey to a varying extent. The shields and scales of the chin and throat have dark grey or black posterior tips (Pl. III fig. 2).

The scale counts are given in table 1, in which I have included some data published by Mertens (1927, p. 183; 1957, pp. 25-26), Neuhaus (1935, p. 49), and Kopstein (1936, p. 260). Although the number of specimens is too small to arrive at definite conclusions, it seems that in the Javan series the number of ventrals is slightly higher in females (160-162, average 161. 2) than in males (156-162, average 157.6); the males have a slightly higher number of subcaudals (48-54, average 50) than the females (44-46, average 45). In the Komodo-Flores area the number of ventrals seems to be slightly lower (2 ♀♀: 154-156; 3 ♂♂: 149-153) than in the Javan series. An interesting feature of the two Flores specimens is the presence of one (♀) or more (♂) single subcaudals. The Javan male described by Neuhaus is stated to have 27 scale rows at mid-body; two of the specimens examined by me have 27 rows on the neck; the female from Surabaia in the possession of Prof. Bergman has 31 rows on the neck and 29 rows at mid-body, all the other specimens have 29 rows on the neck and at mid-boy. The two specimens from Flores have 27 rows on the neck, and 29 rows at mid-body. The holotype of *V. r. limitis* from Endeh Island has 27 rows on the neck and at mid-body.

Kopstein (1936, p. 261) believed that the Javan specimens differed in several features from the type of *V. r. limitis*. These differences were discussed by Mertens (1957, p. 25), who showed that some of them may be due to difference in sex. Recently Van Hoesel (1958, p. 34) again referred to differences between the specimens from Java and those from Flores, and a brief discussion becomes necessary.

According to Van Hoesel the three spots on the head (the interocular spot and the two occipital spots) are always well-developed in Javan specimens, whilst they show a distinct reduction in specimens from Flores. As has been described above these spots may become reduced in Javan specimens too; one male shows but very faintly developed marks (Pl. III fig. 1). The vertebral and lateral rows of spots are stated to be round or almost round in the Javan specimens, and here they rarely fuse into chains of spots; in the Flores specimens the spots (especially those of the vertebral series) are somewhat more oval, and more often they fuse along the back (Van Hoesel). I have explained already that the difference in shape is due to a difference in the

proportions of the body, and hence depends upon the sex and the size of the individual. Elongated, oval spots are present in males from Java, and fusion of spots is not rare; indeed, the photograph of a Javan specimen (Van Hoesel, 1958, p. 32) shows several fused spots. The Javan specimens are described as being thick-set, with a rather blunt head; those from Flores are said to be more slender with a more acuminate head (Van Hoesel). As mentioned above the proportions of the body and those of the head are dependent on the sex of the specimen. Males are more slender than females, although there is a marked individual variability within each of the two sexes. The width of the female described by Kopstein (1936, p. 260) is contained 17.8 times in the length of head and body, and the greatest circumference of the body 5.90 times; in the male (Kopstein, 1936, p. 260) the width of the body is contained 23.2 times in the length of head and body, and the greatest circumference 7.55 times.

The only difference that remains is that in size. Seven specimens from Java examined by Van Hoesel (1958, p. 34) reached a length of about one metre or more; the male described by Neuhaus (1935, p. 49) had a total length of 1115 mm. Wegner (1953, p. 6) mentions a maximum length of 165 cm, but this refers probably to a specimen from India (*V. r. russelii*) of which the length is given as being 5 ft. 6 in. (Smith, 1943, p. 484). Of the Flores specimens examined by Van Hoesel (1958, p. 34) only a few attain a length of between 90 cm and 1 m; Van Hoesel (in litt.) mentions a male from Soa (near Bedjawa, Flores) with a total length of 102.5 cm (tip of tail lost). I do not believe that the difference in size is sufficiently large to allow of recognizing two distinct subspecies in the archipelago. Neither do I believe that the slight differences in numerical characters (Table 1) are sufficient to distinguish between two subspecies.

Van Hoesel (1953, p. 138; 1958, p. 36) is of the opinion that *V. r. limitis* Mertens (from the Lesser Sunda Islands) is much more like *V. r. siamensis* Smith than the Javan *V. r. sublimitis* Kopstein; Kopstein's subspecies is stated to resemble the Indian *V. r. russelii* in coloration. There can be no doubt but that the specimens from Flores and Java have the same type of colour pattern as *V. r. siamensis* Smith from Thailand; however, specimens from Flores, Java, and Thailand differ widely from the Indian *V. r. russelii* (Shaw). I would not hesitate to refer the specimens from the archipelago to the Thai subspecies, such as is done by Mertens (in: Van Hoesel, 1958, pp. 34, 36), were it not that the ground-colour shows marked differences. *V. r. siamensis* Smith from Thailand is pale brownish, or rather yellowish brown with bright, chestnut spots; the form from the archipelago is more greyish in colour, the centre of the large spots is grey, greyish-olive or dull

Table 1, *Vipera*

specimen	sex	scale rows			ventrals	subcaudals	upper labials	
							r.	l.
Java, M.L. no. 10341	♀	29,27	29	21	162	42/42 + n	11	11 [1]
M.L. no. 6718	♀	29	29	21	160	45/45 + 1	11	10
M.L. no. 7897	♀	29	29	21	162	44/44 + 1	12	11
	♀	29	29	21	160	43/43 + 1	11	11
coll. Bergman	♀	31	29	23	162	43/43 + n	12	12
Komodo, Mertens (1957)	♀		29		154	40		
Flores, M.L. no. 10343	♀	27	29	21	156	26/26 + 1 + 19/20 + 1	10	10
Java, M.L. no. 10318	♂	29	29	21	158	44/44 + n	11	10
M.L. no. 10340	♂	29	29	21	156	38/38 + n	10	11
M.L. no. 10148	♂	29	29	23	157	50/50 + n	11	11
M.L. no. 6718	♂	27	29	21	156	48/48 + 1	11	11
M.L. no. 7897	♂	29	29	21	156	47/47 + 1	11	11
Neuhaus (1935)	♂	29	27	21	159	49/49 + 1		
Kopstein (1936)	♂	29	29	21	157	53/53 + 1		
Mertens (1957)	♂	29	29	20	162	48/48 + 1		
Komodo, Mertens (1957)	♂		29		153	43		
Endeh Id., Mertens (1927)	♂	27	27	21	153	48/48 + 1		
Flores, M.L. no. 10342	♂	27	29	19	149	20/20 + 3 + 1/1 + 4 + 2/2 + 2 + 13/13 + 1 + 2/2 + 1 + 2/2 + 1	10	10

[1] Including the supraocular.
[1] Third and fourth labials partly fused.

chocolate brown. Further studies will have to show whether *V. r. limitis* Mertens can be recognized as a distinct subspecies occurring in Java and some of the Lesser Sunda Islands; these studies should at the same time consider the Formosan subspecies *V. r. formosensis* Maki. These studies are also necessary to obtain a clear picture of the possible geographical variation in numerical characters, and in the size of the specimens.

Werner (1920, p. 517) states that juveniles of Russell's Viper sometimes tend to cannibalism, and a similar statement is made by Mell (1929c, p. 137). Cannibalism occurs also in *Vipera russelii limitis* in Java; the juvenile male (M.L. no. 6718) was killed when in the act of swallowing a slightly smaller female. The stomach of this young female (M.L. no. 6718) contained a frog. Van Hoesel (in litt.) informed me that a large male from Flores threw up some frogs.

russelii limitis Mertens

lower labials r.	l.	scales in contact rostral	scales between supra-oculars	scales round orbit [1]		scales between orbit and labials	number of vertebral spots	length of head + body (mm)	length of tail (mm)	umbilicus between ventrals
14(4)	14(5)	7	6	14	15	3	24	835	111 + n	
14(5)	14(5)	7	7	14	14	3	24	289	47	141-143
12(4)	14(5)	7	6	16	16	3	25	186	28	145-147
12(4)	12(4)	7	5	15	14	3	25	174	27	140-142
13(3)	15(4)	7	6-7	14	14	3	26	920	152.5 + n	
13(4)	13(4)	6	7-9	13	13	3	29	328	51	
13(4)	14(4)	6	5-7	14	14	2	25	967	105 + n	
14(4)	14(4)	6	5-7	13	12	3	23	902	118 + n	
13(4)	13(4)	6	7	14	15	3	25	578	106 + n	
13(4)	13(4)	6	7	13	12	3	24	319	52	137-139
11(3)	11(3)	6	5-7	16	13	3	22	184	32	137-139
(4)		6	4-7	11		2		970	145	
		6	5-7	13	14		25	592	103	
								850	140	
(4-5)		6	7	13		2		710	125	
11(4)	13(5)	6	6	10	10	3	23	187	36.5	130-132

Distribution. The references in literature concerning the distribution of *Vipera russelii* in the Malay Archipelago will be discussed in some detail. Before 1927 the species has been mentioned as occurring in the archipelago, but all references to this effect are based on two old records which prove to be erroneous.

The earliest reference to the presence of *Vipera russelii* in Java is the record by Duméril, Bibron & Duméril (1854, p. 1436: *Echidna elegans*) who mention a specimen said to have been taken in Java by Diard. A second specimen, doubtfully from Java, was mentioned by G. A. Boulenger (1896, p. 491). On one or both of these records are based the references to the presence of Russell's Viper in Java published between 1854 and 1927, viz.,

Vipera russellii, Strauch, 1869, pp. 85-87, 132; G. A. Boulenger, 1890, p. 421 (with some doubt); G. A. Boulenger, 1896, pp. 490, 491 (Java?); Flower, 1899, p. 607.

Vipera russelllii, Flower, 1899, p. 694.
Vipera russelli, Lydekker, no date, p. 203.

De Rooij (1917, p. 279) doubted the record by Duméril, Bibron & Duméril, and she considered it improbable that the species should occur in Java. However, when Russell's Viper was discovered in the Lesser Sunda Islands (Dunn, 1927, p. 4; Mertens, p. 182) the old record from Java became more plausible, and various authors mention the presence of *Vipera russelii* in Java as being "possible", "probable", or "not improbable", or they see no reason to doubt the record by Duméril, Bibron & Duméril; the following references pertain to this stage of the history of Russell's Viper in Java:

Vipera russellii, Dunn, 1927, p. 4.
Vipera russelli, Kopstein, 1930a, p. 113; Kopstein, 1930b, p. 340; Kopstein 1932, p. 253.
Viera russelii, Mertens, 1927, p. 182; Brongersma, 1934, p. 246.
Vipera russeli, Brongersma, 1929, p. 168; Brongersma, 1930, p. 302.

The specimen mentioned by Duméril, Bibron & Duméril is still in the Paris Museum, and I am much indebted to Dr. J. Guibé, Paris, for information about it. The specimen is very much bleached; its colour pattern consists of the usual three rows of large spots, and it resembles the colour pattern of specimens from India (of which I sent a sketch to Dr. Guibé). The specimen has 29 scale rows at mid-body; ventrals 170; anal 1; subcaudals 48/48, tail damaged; the length of head and body is 98 cm, that of the tail 17 cm. There are no traces of the additional series of spots that are characteristical of *V. r. siamensis* and *V. r. limitis.* The absence of these additional spots, and the high number of ventrals make it most unlikely that the specimen was taken in Java. Its collector, Diard, also visited India, and it is probable that he brought the specimen from there. The specimen that G. A. Boulenger (1896, p. 491) mentioned doubtfully from Java also has a high ventral count (172), and therefore it is more probable that it came from India. Thus, all references based upon these two specimens are erroneous after all, and they belong to the synonymy of the Indian *V. r. russelii* (Shaw). The first true record from Java is that by Kopstein (1935, pp. 117, 118).

From the Lesser Sunda Islands, *Vipera russelii* was recorded by Dunn (1927, p. 4), who took two specimens on the island of Komodo, and by Mertens (1927, p. 183), who obtained one specimen on Endeh Island(off the south coast of Flores). Vianney (1957, p. 31) reported upon the occurrence of this species in the island of Flores, and more recently this same author (under his worldly name: Van Hoesel, 1958, pp. 32-36) published notes on specimens from Flores and from the island of Lomblen. In this paper, Van Hoesel remarks upon the local names given to Russell's Viper

in Flores and other islands; inhabitants of various islands (Adonare, Solor, Alor, and Sumba) have told Van Hoesel that the species is well known in these islands, but as yet no specimens have been collected there, and it would be unsafe to include these islands in the range of the species until definite proof of its presence has been obtained.

As pointed out by Van Hoesel (1954, p. 134), and by Mertens (1957, p. 26) the reference to the presence of *Vipera russelii* in the island of Bali by Kopstein (1930a, p. 340; 1930b, p. 109) is due to a lapsus memoriae. The same applies to the record from the island of Lombok by Darlington (1957, p. 227).

Summarizing we may state that *Vipera russelii limitis* Mertens is definitely known from Java, Komodo, Flores, Endeh Island, and Lomblen.

Vipera russelii

Russell's Viper has been mentioned in literature as occurring in Borneo, Sumatra, and the Malay Peninsula, but as yet there are no materials to substantiate these records, which as far as our present knowledge goes must be considered erroneous.

There is only one reference to the presence of this species in Borneo (Ditmars, 1937, p. 161: *Vipera russellii*), but this must be a lapsus, for the species has never been found there.

Many are the references that mention *Vipera russelii* from Sumatra:

Vipera russellii, Strauch, 1869, pp. 87, 132; G. A. Boulenger, 1890, p. 421 (with some doubt); G. A. Boulenger, 1896, p. 490; Flower, 1899, p. 607; Ditmars, 1910, p. 323; Ditmars, 1922, pp. 322-323; Dunn, 1927, p. 5; Werner, 1929, p. 190; Bourret, 1936, p. 444; Chopra, 1936, p. 1074; Ditmars, 1937, pp. 149, 161; Cochran, 1943, p. 20, and in expl. of fig. 1 of pl. 9; Ditmars, 1946, pp. 228-229.

Vipera russelllii, Flower, 1899, p. 694.

Vipera russelli, E. G. Boulenger, 1914, p. 174; Lydekker, no date, p. 203; Pasteur, 1941, p. 86; Anonymus, 1943, p. 18; Anonymus, 1948, pp. 7, 10; Darlington, 1957, p. 227 (doubtful).

Vipera russelii, Mertens, 1927, p. 182 (not so improbable); Brongersma, 1934, p. 246; E. G. Boulenger, 1937, p. 166.

Vipera russeli, Brongersma, 1929, p. 68; Brongersma, 1930, p. 302.

Russell's Viper, Tweedie & Harrison, 1954, p. 97.

Strauch's record (1869, p. 87) was based upon a specimen in the Leiden Museum, and at one time I saw no reason to doubt this locality record (Brongersma, 1930, p. 302; 1934, p. 246). Recently I examined this specimen again, and I arrived at the conclusion that it is very unlikely that it came from Sumatra. The specimen was received in 1828, and it is labeled "Sumatra" without any indication as to its collector. The colour pattern is that of

Vipera russelii russelii (Shaw) from India, and probably this specimen came from the continent. A further record was published by Ditmars (1910, p. 323), who mentions specimens said to have been collected in Sumatra by R. Weber. As stated by Dr. Th. Barbour (in Moulton, 1922, p. 207) "there is absolutely no reason whatever to suppose that Weber did not collect these creatures *in India* while he was passing through en route to Sumatra", and "Ditmars informs me that now he thinks of it, that all Weber's reptiles were dumped into large jars and remained lying about the Museum uncared for many years." The specimens are lost, and it is, therefore, impossible to obtain any further information about their probable provenience. To say the least the record by Ditmars is extremely doubtful, notwithstanding the fact that it has been published again by Ditmars in 1922 (pp. 322-323), and in 1946 (pp. 228-229). At the moment there is no trustworthy evidence at all that *Vipera russelii* ever has been found in Sumatra, and I agree at present with those authors that do not include *Vipera russelii* in the Sumatran fauna. It is possible of course that Russell's Viper will still be discovered in Sumatra, but it is just as well possible that it belongs to the group of species that occur on the Asiatic mainland and in Java, but that do not occur in Sumatra (Mertens, 1957, p. 25).

Various authors have mentioned the Malay Peninsula as part of the range of Russell's Viper:

Vipera russellii, Ditmars, 1910, p. 323 (fide Dunn, 1927, p. 5); Ditmars, 1922, pp. 322-323; Werner, 1929, p. 190; Kraus & Werner, 1931, p. 72; Ditmars, 1937, p. 161; Cochran, 1943, p. 20, and in expl. of fig. 1 of pl. 9; Cochran, 1944, p. 296, and in expl. of fig. 1 of pl. 9; Ditmars, 1946, pp. 228-229.

Vipera russelli, Lydekker, no date, p. 203; Ditmars, 1922, expl. of lower fig. of pl. 74.

However, the species has never been taken in the Malay Peninsula, and the following references mention *Vipera russelii* as not occurring in Malaya:

Vipera russelli siamensis Smith, 1917, p. 224.

Vipera russelli, De Rooij, 1917, p. 279; Moulton, 1922, pp. 206-207; Tweedie, 1941, p. 31; Smith, 1943, p. 485.

Russell's Viper, Tweedie & Harrison, 1954, p. 97 ("fortunately not in Malaya").

It may be mentioned that Reid (1955, p. 909) is of the opinion that at least two fatal cases of snake-bite in NW Malaya were probably due to Russell's Viper; this statement does not occur in a more recent note on snake-bite in Malaya (Reid, 1957).

Vipera russelii from Ceylon and India

Dunn (1927, p. 4) stated that the specimens from Komodo did not differ from Indian *Vipera russelii,* and recently Van Hoesel (1953, p. 138;

1958, p. 36) expressed the opinion that the Javan specimens closely resemble Indian specimens in coloration. These statements made it necessary to compare the Javan and Flores specimens to the subspecies from India. Deraniyagala (1945, pp. 110-112) recognizes three subspecies in the Indian area, viz., *Vipera russelii russelii* (Shaw) from India south of 20° N, *Vipera russelii nordicus* Der. from India north of 20° N, and *Vipera russelii pulchella* (Gray) from Ceylon. Without adequate series of specimens it is difficult to judge the status of these three subspecies. The forms from southern India and Ceylon seem to resemble each other very much; both have lateral spots of the same shape; Deraniyagala describes these spots as fig-shaped; they are formed by the spots of series II and Ia that are confluent. In the single Ceylon specimen (M.L. no. 4663) available to me such fig-shaped spots are present in the posterior two-thirds of the body; this specimen does not show spots of the series III and V, but in their place one meets with more or less triangular groups of dark dots, or with single dark dots. The northern subspecies recognized by Deraniyagala (*V. r. nordicus*) does not have fig-shaped, lateral spots; this is indeed the case in a specimen from Calcutta (M.L. no. 1609). This specimen shows an undulating series of black dots on either side in the space between the vertebral series and the lateral series of large spots; the undulating series of dots is not continuous. Occasionally a spot may be present that in position corresponds to a spot of series III. Only one neonatus from Bengal (M.L. no. 1606) was available to me; this specimen is rather bleached; it does not show any trace of the undulating, dark, lateral streak that is present in the Javan neonati. The large, vertebral spots are placed so close together that there is no space left for any dark cross-bars. The colour pattern of the Ceylon and Indian specimens is markedly different from that of the specimens of *Vipera russelii limitis*.

Vipera russelii siamensis Smith

Vipera russelii siamensis Smith was originally described from Thailand (Smith, 1917, p. 223, pl. fig. 1); on the Asiatic mainland it is also known from southern Burma (Smith, 1943, p. 484), and from southern China (Mell, 1929a, p. 217; Mell, 1929b, p. 239; Mell, 1929c, pp. 118, 122; Gee, 1930, p. 84 (fide Bourret); Pope, 1935, pp. 384, 385; Bourret, 1936, p. 445; Smith, 1943, p. 484); various authors mention *Vipera russelii* from China, without indicating the subspecies (Mell, 1922, p. 125; Mell, 1929b, pp. 225, 242; Mell, 1929c, pp. 5, 10, 27, 61, 85; Kraus & Werner, 1931, p. 72; Cochran, 1943 and 1944, expl. of fig. 1 of pl. 9). In China Russell's Viper is only known from the coastal region of Kwangtung. Pope (1935, p. 385) is convinced that *Vipera russelii siamensis* occurs also in southern Yun-

nan, but the author adds that he has no proof of this. Nevertheless, Yunnan is included in the range of the species by Cochran (1943, p. 20; 1944, p. 296). Mell (1929a, p. 217; 1929c, p. 28) expresses the view that without doubt Russell's Viper will be found in the island of Hainan, and Bourret (1936, p. 445) writes that specimens have been collected there. As to the presence of Russell's Viper in Indo-China, Bourret (1927, p. 294) states that none of the Viperinae have been observed in this region; in a later paper Bourret (1936, p. 444) writes that *V. r. siamensis* has been observed ("a été signalée") in Indo-China, and on p. 445 it is stated that the species very probably is present in the region. According to Smith (1943, p. 485) the species is not known from French Indo-China. Thus, just like in the case of the distribution in the Malay Archipelago, several localities are mentioned in literature that are not substantiated by definite proofs.

Vipera russelii is "capricious" in its distribution, it may be common in one district, and rare or absent in another area (Smith, 1943, p. 485). Therefore, it is rather dangerous to surmise that the species is likely to occur in a certain region because it has been found in adjoining areas. At present *V. russelii siamensis* is definitely known only from Thailand, from southern Burma, and Kwangtung in China.

Vipera russelii formosensis Maki

The form from Formosa has been referred to *Vipera russelii siamensis* by various authors (Oshima and other Japanese authors (fide Maki, 1931, p. 197): *Coluber russelli siamensis*; Mell, 1929a, p. 217; Mell, 1929b, pp. 239, 246; Mell, 1929c, p. 31; Bourret, 1936, pp. 444-445: *Vipera russellii siamensis*; Anonymus, 1949, p. 237, fig.: *Columber russeli siamensis*), but Maki (1931, p. 197, figs. 132, 133, pl. 72) described the new subspecies *Vipera russellii formosensis* (named *Coluber russellii formosensis* on p. 199). This Formosan subspecies is separated from *V. r. siamensis* by having two additional series of spots: one series between the vertebral spots, and the other between the lateral spots. However, these spots correspond to those of the series V and III of the description of the colour pattern of *V. r. limitis*, and they are also present in *V. r. siamensis*. In colour pattern *V. r. formosensis* (Maki, 1931, p. 197, fig. 133, pl. 72; Oshima, 1944, p. 236, pl.: *Coluber russellii*) strongly resembles *V. r. siamensis*; so much in fact that Maki's plate 72 has been reproduced in a pamphlet on snake-bite in Thailand (Anonymus, no date, pl.: Russell's Viper). Sauter (1914, p. 34) mentions a Formosan specimen with 29 scale rows, but all specimens mentioned by Maki (1931, p. 199) have 27 rows at mid-body. Without having specimens from Formosa for examination it is difficult to form a definite opinion on

the status of *V. r. formosensis* Maki, but it seems to differ but little from *V. r. siamensis* Smith.

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EXPLANATION OF PLATES

Plate I, *Vipera russelii limitis* Mertens

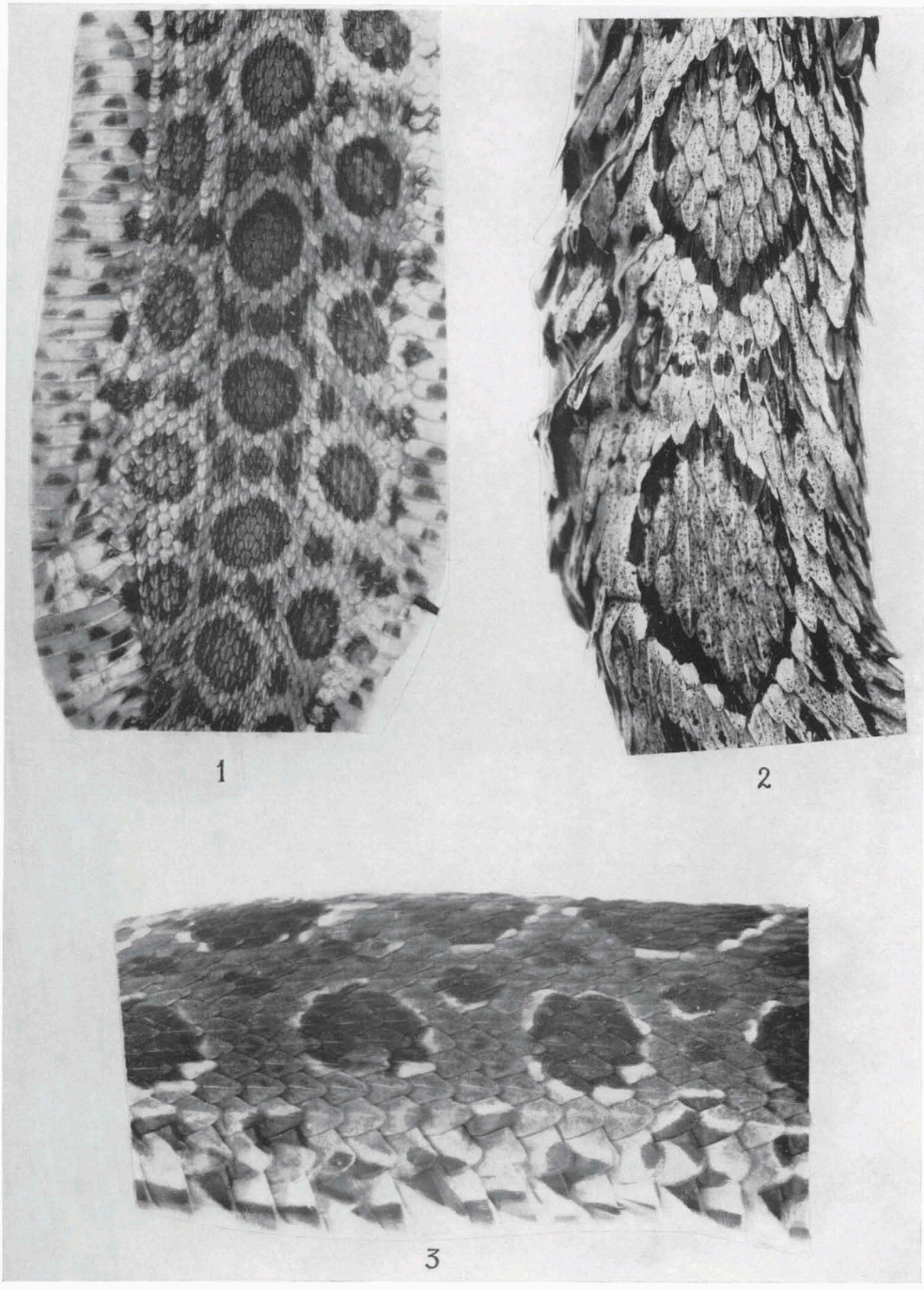
Fig. 1, ♂, neonatus, Java, M. L. no. 7897, colour pattern of the back.
Fig. 2, ♂, adult, Java, M. L. no. 10340, colour pattern of the back.
Fig. 3, ♀, juvenile, Flores, M. L. no. 10343, colour pattern of the left side.

Plate II, *Vipera russelii limitis* Mertens

Fig. 1, ♀, adult, Java, M. L. no. 10341, upper view of head.
Fig. 2, ♀, neonatus, Java, M. L. no. 7897, vertebral spots.
Fig. 3, ♀, neonatus, Java, M. L. no. 7897, left side.
Fig. 4, ♂, juvenile, Java, M. L. no. 6718, right side.

Plate III, *Vipera russelii limitis* Mertens

Fig. 1, ♂, adult, Java, M. L. no. 10318, upper view of head.
Fig. 2, ♀, adult, Java, M. L. no. 10341, chin and throat.
Fig. 3, ♂, adult, Java, M. L. no. 10318, left side of head.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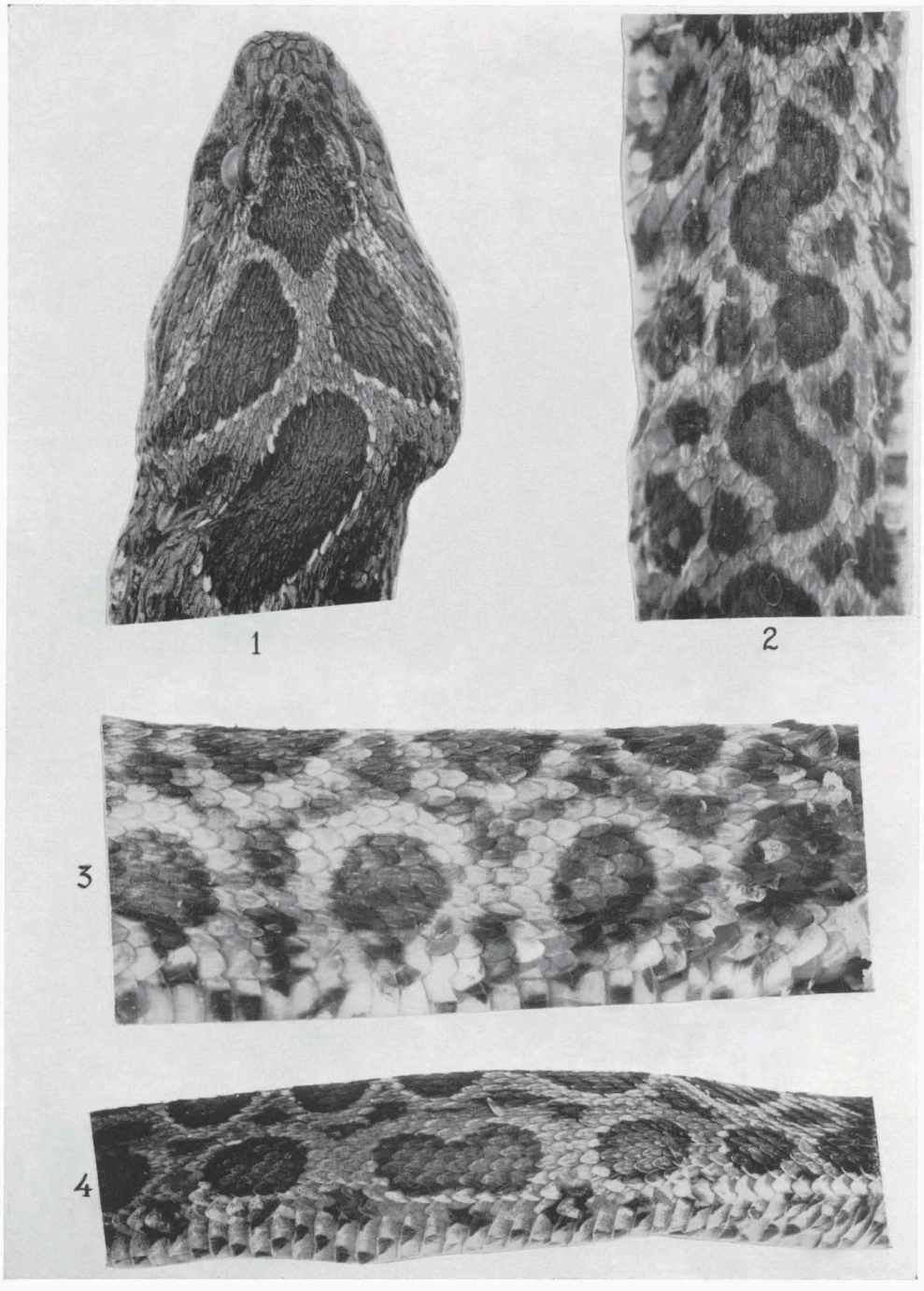
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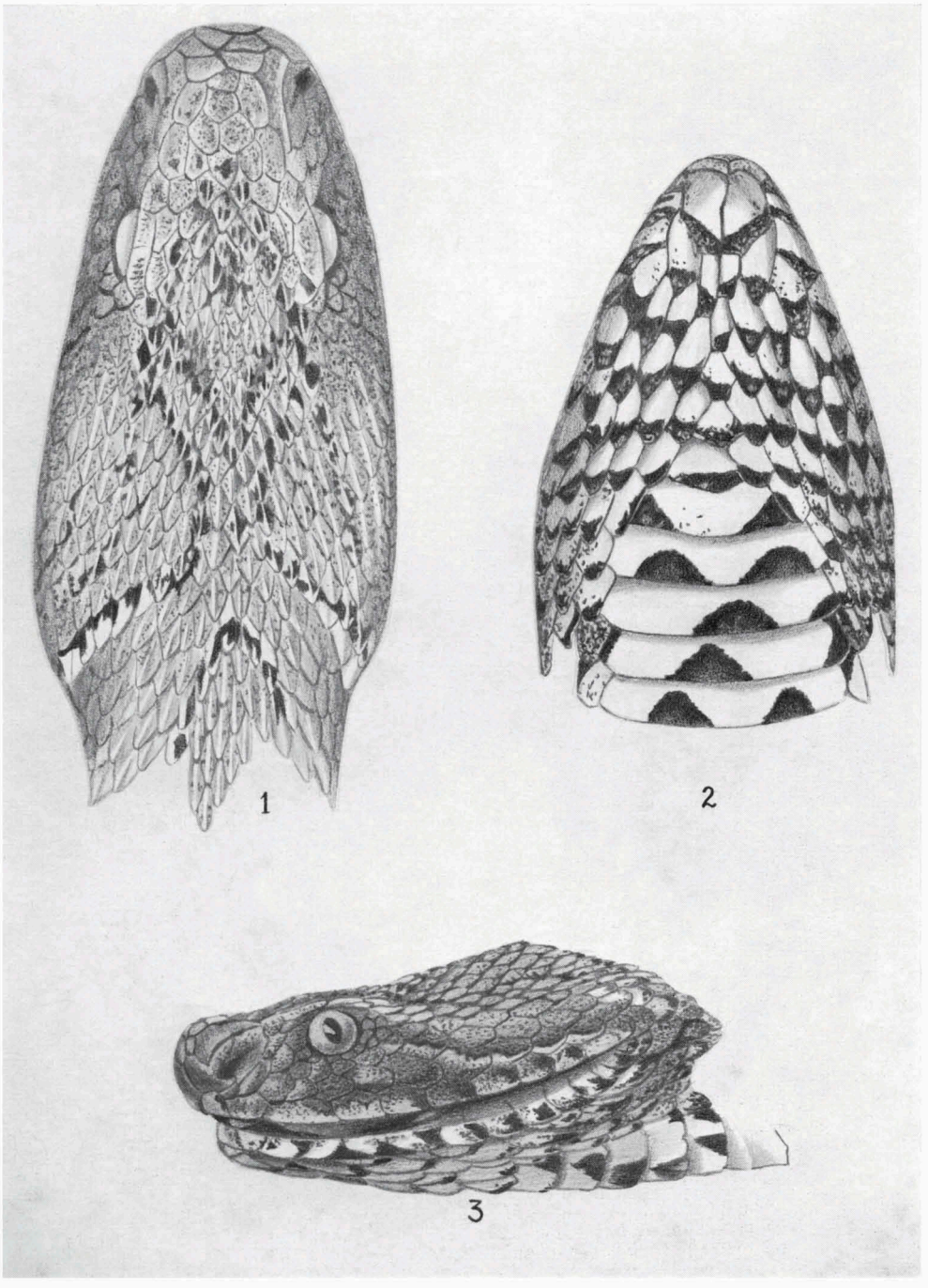
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