EXPANDED DESCRIPTION OF THE POORLY KNOWN PITVIPER *Trimeresurus kanburiensis* SMITH, 1943, WITH CONFIRMATION OF THE VALIDITY OF *Trimeresurus venustus* VOGEL, 1991 (REPTILIA: SERPENTES: CROTALIDAE)

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The description of the rare Thai species *Trimeresurus kanburiensis* Smith, 1943 is expanded on the basis of recently collected specimens. We provide a detailed comparison with *Trimeresurus venustus*, a species described from South Thailand and regarded by several authors as a synonym of *Trimeresurus kanburiensis*. The existence of 14 characters differentiating the populations referred to *Trimeresurus kanburiensis* from those regarded as *Trimeresurus venustus* definitely supports the validity of this latter species.

Keywords: Reptilia, Serpentes, Crotalidae, *Trimeresurus kanburiensis*, *Trimeresurus venustus*, Thailand.

Smith (1943:519) briefly described a new species of pitviper, *Trimeresurus kanburiensis*, on the basis of a single specimen from Kanchanaburi Province (western Thailand). The validity of this species has been accepted by subsequent authors, although Regenass and Kramer (1981) suggested that its holotype might have been an aberrant specimen of *Trimeresurus purpureomaculatus* (Gray, 1832). The species remained enigmatic for several decades, as no additional specimen were found until the mid-80's, when three pitvipers collected in Kanchanaburi Province were identified as *Trimeresurus kanburiensis* by Warrell et al. (1992). In between, Vogel (1991) described, as *Trimeresurus venustus*, a morphologically close pitviper from Nakhon Si Thammarat Province (Southern Thailand).

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The validity of *Trimeresurus venustus* was briefly questioned by Warrell et al. (1992) and was not accepted by Viravan et al. (1992), who regarded *Trimeresurus venustus* as a synonym of *Trimeresurus kanburiensis*. During the last five years, the validity of *Trimeresurus venustus* has been the subject of rather vivid controversies. However, these positions, as far as may be ascertained from the content of the publications, were often not based on critical evaluations of the available material and were, at best, based only on data of the literature. To the contrary, Vogel (1991), David and Ineich (1999), and David and Pauwels (2000), who examined specimens of both taxa then available in collection, regarded them as distinct species.

The availability of new specimens of *Trimeresurus kanburiensis*, preserved or alive at the time this paper was prepared, allows a critical re-evaluation of the external morphological characters of *Trimeresurus kanburiensis*, and new comparisons with *Trimeresurus venustus*. The differences in selected characters, regarded as diagnostic, are discussed, followed by an expanded description and a chresonymy of both taxa.

MATERIAL AND METHODS

The present paper is based on six preserved and two living specimens of *Trimeresurus kanburiensis* (all from the vicinity of the type locality of the species) and 32 (23 males, 9 females) preserved specimens of *Trimeresurus venustus*, plus a dozen of specimens alive at the time of

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writing this paper. Preserved specimens are listed in *Appendix II*. Living specimens of *Trimeresurus venustus* used for this paper will be deposited in the collections of the Queen Saovabha Memorial Institute (Bangkok, Thailand; QSMI) upon their death.

We retained standard morphological characters used by previous authors (Pope and Pope [1933] and Regenass and Kramer [1981], along with other morphometrical and meristic characters adapted from How et al. (1996). Measurements, except body and tail lengths, were taken with a slide-calliper to the nearest 0.1 mm; measures on body (all in millimeters) were measured at the nearest millimeter. Ventral scales were counted according to Dowling (1951). The terminal scute is excluded from the number of subcaudals. The number of dorsal scale rows is given at one head length behind head, at midbody (i.e. at the level of the ventral plate corresponding to half of the total ventral number), and at one head length before vent, respectively. Statistical calculations are based on Mann–Whitney's *U*-test (Siegel, 1956). Measurements used in ratios of scale sizes and in the Thickness index (see Character 3 below) were obtained only from adult specimens (SVL > ~400 mm), in order to avoid the influence of ontogenetic variation.

Main abbreviations used in text are:

Measures and ratios: HL, head length; SVL, snout-vent length; TaL, tail length; TL, total length; TaL/TL, ratio tail length/total length; **Meristic characters:** Cep, cephalic scales on the line separating the middle of supraoculars; DE, vertical diameter of eye; DLip, distance between the lower margin of eye and lip edge; DSR, dorsal scale rows; MSR, dorsal scale rows at midbody; Il, infralabials; InN, internasals; L, length of a scale; Sc, subcaudals; Sl, supralabials; SupOc, supraoculars; Ven, ventral scales; W, width of a scale. **Statistical calculations:** *n*, number of specimens; *x*, mean value; *s*, standard deviation; *P*, probability of occurrence of a value as extreme as or more extreme than the observed value; *U*, the statistic in the Mann–Whitney *U*-test.

Museum abbreviations. BMNH, The Natural History Museum, London, UK; MNHN, Muséum National d'Histoire Naturelle, Paris, France; PSGV, Private collection, Gernot Vogel, Heidelberg, Germany; QSMI, Queen Saovabha Memorial Institute, Bangkok, Thailand; ZMB, Zoologisches Museum für Naturkunde der Humbolt-Universität zu Berlin, Berlin, Germany; ZSM, Zoologische Staatssammlung München, Munich, Germany.

RESULTS

The most significant morphological and meristical characters obtained from preserved specimens of *Trimeresurus kanburiensis* are reported in *Appendix I*. Data for *Trimeresurus venustus* will appear under the description of this latter species.

The number of Ven (157) of the holotype of *Trimeresurus kanburiensis* is lower than in other specimens. The body of this specimen is severely damaged and separated into two parts, and we agree with Warrell et al. (1992) on the loss of a piece of the body. The tail also seems to have suffered from a loss, but the missing part is probably very small. It should be noted that our values of ventral numbers were obtained according to Dowling's method, what explains differences with values provided by Warrell et al. (1992).

We obtained 14 characters which we consider to be either diagnostic or useful to separate the populations from Kanchanaburi (*kanburiensis*) from those of South Thailand (*venustus*), as follows:

1. A different overall coloration and pattern, conspicuous in living specimens. In *Trimeresurus kanburiensis*, the overall color is drab olive brown or grayish-green (males), or light grayish-brown (females), with dark olive brown crossbands, whereas in *Trimeresurus venustus*, the body color is dark green or bottle green with reddish-brown crossbands.

2. A different condition of the ventrolateral stripe, as described under each species account. In both cases, this stripe is made of white or yellowish-white dots on scales of the first DSR. However, a vivid, large elongated dot is present on every scale in *Trimeresurus venustus*, whereas dots are fainter, narrower and especially scarcer (one out of every three or four scales) in *T. kanburiensis*.

3. A much stouter body in females of *Trimeresurus kanburiensis*. To quantify this character, we used the "Thickness index" (Ti) as described in Inger and Marx (1965). Among the five available females of *Trimeresurus kanburiensis*, two were not considered (QSMI 508, eviscerated, and QSMI 509, gravid with a Ti equal to 0.17). Other specimens showed an index Ti nearly twice as great in females *kanburiensis* (0.10 – 0.11; $n = 3$; $x = 0.10$; $s = 0.01$) than in females of *T. venustus* (0.05 – 0.06; $n = 6$; $x = 0.05$; $s = 0.01$). The sole available male of *T. kanburiensis* has a Ti of 0.05, at the upper limit of those of *Trimeresurus venustus* (0.03 – 0.05; $n = 13$; $x = 0.04$; $s = 0.01$).

4. A lower number of MSR in *T. kanburiensis* (19) than in *T. venustus* (21; rarely 19). Only two specimens out of 32 specimens of the latter species have 19 MSR.

5. Females of *T. kanburiensis* have a lower value of the ratio TaL/TL than females of *T. venustus*, namely 0.124 – 0.139 ($n = 5$; $x = 0.130$; $s = 0.006$) in *T. kanburiensis* vs. 0.137 – 0.148 ($n = 9$; $x = 0.145$; $s = 0.005$) in *T. venustus*. The character is significant, with $P^{***} < 0.001$ ($U = 0.5$).

6. As a correlation to character (5), females of *T. kanburiensis* show a lower number of subcaudals than in *T. venustus*: 41 – 51 ($n = 5$; $x = 46.8$; $s = 3.0$) vs. 51 – 58 ($n = 9$; $x = 54.7$; $s = 2.4$). This character is also significant, with $P*** < 0.001$ ($U = 0.5$).

The male of *T. kanburiensis* has a number of Sc (59) lower than in males of *T. venustus* (63 – 72).

7. In *T. kanburiensis*, the occipital and temporal scales are strongly keeled. In *T. venustus*, these scales are distinctly keeled too, but not to such an extant and with lower keels on temporal scales. Although this character is difficult to quantify, it is conspicuous when specimens of both species can be compared (see Fig. 3).

8. The number of cephalic scales is higher in *Trimeresurus venustus* than in *T. kanburiensis*, with 8 – 12 ($n = 30$; $x = 9.6$; $s = 0.9$) vs. 7 – 9 ($n = 6$; $x = 8.2$; $s = 0.5$). This character is also significant, with $P*** < 0.001$ ($U = 4.5$), and is not sex related.

9. In *Trimeresurus venustus*, 14 out of 31 specimens have internasals in contact, whereas it is separated by 1 or 2 scales in all available specimens of *T. kanburiensis*.

10. The third Sl is less frequently in contact with the subocular in *T. kanburiensis* than in *T. venustus*. The third Sl is separated from the subocular in 7 occurrences out of 64 (32 specimens) in *T. venustus*, whereas this condition appears in 8 out of 12 possible occurrences in *T. kanburiensis*.

11. The 4th Sl is separated from the subocular in all specimens of *T. kanburiensis*, whereas the 4th Sl is in contact with the subocular in 12 of 64 occurrences (32 specimens) in *T. venustus*.

12. The internasals are wider in *Trimeresurus venustus* than in *T. kanburiensis*. The ratios W-InN/L-InN are 1.50 – 1.91 ($n = 20$; $x = 1.62$; $s = 0.14$) in *T. venustus*, vs. 1.37 – 1.55 ($n = 5$; $x = 1.45$; $s = 0.08$) in *T. kanburiensis*, with $P* < 0.05$ ($U = 10.0$).

13. The internasals are wider than the supraocular in *T. venustus*, with a ratio W-InN/W-SupOc of 1.00 – 1.47 ($n = 20$; $x = 1.18$; $s = 0.12$). In *T. kanburiensis*, the internasals are very small, with a ratio of 0.77 – 0.95 ($n = 4$; $x = 0.87$; $s = 0.09$).

14. The supraoculars are proportionnally wider, more ovoid in *T. kanburiensis* than in *T. venustus*. This condition is expressed by the ratio L-SupOc/W-SupOc. The values are 2.33 – 3.21 ($n = 21$; $x = 2.72$; $s = 0.27$) in *T. venustus*, vs. 1.69 – 2.19 ($n = 4$; $x = 2.02$; $s = 0.22$) in *T. kanburiensis*.

On the basis of these 14 characters, we regard *Trimeresurus kanburiensis* and *Trimeresurus venustus* as distinct species, although these two taxa seem to be related. If further material of *Trimeresurus kanburiensis* is necessary to ascertain the variation within this species, its distinct specific status in respect to *Trimeresurus venustus* is beyond doubt.

DISCUSSION

Trimeresurus kanburiensis Smith, 1943
(Figs. 1 – 3)

Trimeresurus kanburiensis Smith, 1943:519. **Type locality.** "In the limestone hills near Kanburi, southwestern Siam," near Kanchanaburi, Kanchanaburi Province, Thailand.

Holotype. BMNH 1946.1.8.91, female.

Trimeresurus puniceus (non *Craspedocephalus puniceus* Kuhl, 1824); Smith (1928:194; 1930:90); Suvatti (1950:521).

Trimeresurus kanburiensis; Klemmer (1963:433); Taylor (1965:1078); Dowling et al. (1966:118); Leviton (1968:567); Burger (1971:109); Hoge and De Lemos Romano (1974:151); Harding and Welch (1980:73, 136); Hoge and Romano-Hoge (1981:259, 290); Regenass and Kramer (1981:196); Trutnau (1981:184); Thumwipat and Nutphand (1982:98 [partim]); Anonymous (1986); Mehrtens (1987:364 [partim]); Sokolov (1988:342); Welch (1988:137); Coborn (1991:548); Cox (1991:376 [partim]); Vogel (1991:24, 27); Green and Campbell (1992:421); Golay et al. (1993:101); Welch (1994:117); Frank and Ramus (1995:260); Jintakune and Chanhome (1995:151 [partim]); Warrell (1995:521 [partim], 564 [as *Trimeresurus kanaburiensis*]); Malhotra and Thorpe (1996:116 [partim]); Wüster et al. (1997: 332); Chanhome et al. (1998:311 and 313 [partim]); Cox et al. (1998:22 [partim]); Gumprecht (1998a: 25 [partim], 1998b: 46 [partim]; 2001:28 [partim]; 2002a:45 [partim]); Chan-ard et al. (1999:37 [partim]); David and Ineich (1999:286, 376); McDiarmid et al. (1999:337 [partim]); Thirakhupt (2000:168); Bulian (2001:62 [partim]); Iskandar and Colijn (2001:158); Gumprecht and Ryabov (2002:37 [partim]); Orlov et al. (2002:192 [partim]); Gumprecht and Bulian (2003:16 – 17).

Description. Body moderately elongated in males, stout in females, head ovoid, rather short, wide at its base, flat but thick, distinct from the neck; snout average, accounting for 19 – 29% of total HL or 1.4 – 1.9 times as long as diameter of eye, rounded when seen from above, truncated when seen from lateral side, with a moderate canthus rostralis; eye large (ratio DE/DLip of 0.8 – 1.1); tail long in the single examined male, average in females, distinctly prehensile.

We could not examine in detail the hemipenes. *In situ* (BMNH 1992.535), it reaches the 25th SC, and is long, largely smooth, with its tip calyculate.

Maximal known TL: 667 mm (SVL: 572 mm; TaL: 95 mm; BMNH 1987.943).

Fig. 1. *Trimeresurus kanburiensis*. Adult male in life (photograph by Lawan Chanhome).

Fig. 2. *Trimeresurus kanburiensis*. Adult female in life (QSMI 508) (photograph by Lawan Chanhome).

Fig. 3. Females *Trimeresurus venustus* (left) and *Trimeresurus kanburiensis* (right) (photograph by Lawan Chanhome).

Fig. 4. *Trimeresurus venustus*. Adult male in life (photograph by Lawan Chanhome).

Body scalation. Ven: (157?)170 – 178 (+ 1 – 2 preventrals); Sc: 41 – 59, paired; DSR: 21–23:21:15, rhomboid, strongly keeled, first row smooth. The reduction from 21 to 19 rows appear between Ven 18 and 28 (4 specimens).

Ratio TaL/TL: 0.124 – 0.176 (see Table 1).

Head scalation. Rostral triangular, visible from above; nasals subrectangular, undivided; two pairs of small internasals, barely larger than adjacent snout scales, separated each from the other by 1 or 2 barely smaller scales; 3 or 4 canthal scales bordering the canthus rostralis between the internasal and the corresponding supraocular, not larger than adjacent snout scales; 1 triangular loreal between upper preocular and nasal; two elongated upper preoculars above the loreal pit, both in contact with the loreal; lower preocular forming lower margin of loreal pit; 2 postoculars; 1 ovoid, relatively short but wide supraocular on each side, about 1.7 – 2.2 times as long as wide and about 1.1 – 1.3 times wider than internasals; supraoculars indented on their inner margin by a row of distinctly enlarged head scales; 6 – 7 snout scales on a line between the scales separating the internasals and a line connecting the anterior margins of eyes, enlarged and juxtaposed; cephalic scales smaller, irregular, juxtaposed, with traces of keeling on upper head surface, strongly keeled posteriorly on occipital region; 7 – 9 cephalic scales in a line between supraoculars; temporals rather small, subequal, in 3 rows, strongly keeled; one thin, crescent-like subocular; 9 – 11 Sl (10 in 7 occurrences out of 12); 1st Sl triangular, short, separated from the corresponding nasal by a furrow or totally separated as two different scales; 2nd Sl forming the anterior border of loreal pit, separated from nasal by 1 rather large scale; third Sl largest, pentagonal, approximately as high as long, either in contact (4 out of 12 occurrences) or separated from the subocular by one scale (8/12); 4th Sl elongated but shorter or subequal to third Sl (0.7 – 1.0 time as high), separated from the subocular by 1 large scale or a row of scales; the 5th and other posterior supralabials small, about of same size than lower temporals, 5th Sl separated from the subocular by 2 scales; 11 – 13 infralabials, those of the first pair in contact with each other, pairs 1 – 2, rarely pairs 1 – 3 in contact with the chin shields; 7 rows of gular scales; 5 – 7 pairs of throat scales regularly arranged.

Coloration in life. Body and upper caudal surfaces are drab olive brown or grayish-green in available living males, with vertebral white dots every three to five scales, and grayish-brown in females, with on each side irregular, zig-zag-like dark brown or dark olive brown crossbands, one or two dorsal scale long and separated by one or two scale long interspaces, extending from the the four or five upper dorsal scale rows up to the vertebral row; lower part of the sides (DSR 1 – 3) paler than upper dorsal surface, with an irregular dark brown blotch below the crossbands. Scales of the first DSR irregularly marked with a cream spot on the upper part of the scale, often accompanied with a larger olive brown spot on the lower half of the scale; the cream spots are not present on all scales and do not constitute a continuous ventrolateral stripe.

The dorsal head surface and temporal regions are of same color than the body, marbled with a net of blotches of the same color than the dorsal crossbands. Supralabials and head sides slightly paler than upper head surface, with an indistinct postocular streak of same color than dorsal crossbands connecting the loreal pit to the mouth; a vertical streak of same color below the eye, and another one below the loreal pit. Eyes brown, slightly golden, with a black vertical pupil.

The infralabials, chin and throat are whitish-brown, with dark olive brown blotches on a few infralabials, more marked anteriorly. Belly cream, of same color than spots of the ventrolateral stripes, with, on half to two thirds of ventrals, an olive brown blotch on their tip. Ventral surface of tail as for the belly, becoming brownish-gray with more distinct olive-brown blotches posteriorly.

In preservative, the dorsal color turned to dark grayish brown. The dorsal crossbands became less contrasted and the cream color of the ventral surface and of ventrolateral dots turn to yellowish-brown.

Range. Thailand. Known only from Kanchanaburi Province.

Remark. Specimens identified or cited as *Trimeresurus kanburiensis* in Nootpand (1971:45, 49), Reitinger and Lee (1978), Thumwipat and Nutphand (1982:139, 157), Mehrtens (1987:364) and Nutphand (2001:294 – 295) belong to *Trimeresurus purpureomaculatus* (Gray, 1832). If the color and pattern of *T. kanburiensis* may remind those of *T. purpureomaculatus*, this latter species is easily distinguished by its much different number of DSR (25–27:[23]25–29:19–21), SC (54 – 67 in females) and Cep (12 – 16) (Regenass and Kramer, 1981).

Trimeresurus venustus Vogel, 1991
(Fig. 4)

Trimeresurus venustus Vogel, 1991:23. **Type locality.** Thung Song, Nakhon Si Thammarat Province, South Thailand.

Holotype. ZMB 48045.

Trimeresurus purpureomaculatus (non *Trigonocephalus purpureomaculatus* Gray, 1832); Nootpand (1971:45, 49); Thumwipat and Nutphand (1982:140); Mehrtens (1987:365); Lim and Lee (1989:107 [upper picture]); Nutphand (2001:298 – 299).

Trimeresurus sumatranus (non *Coluber sumatranus* Raffles, 1822); Kundert (1984:29, Fig. 106).

Trimeresurus venustus; Golay et al. (1993:108); Welch (1994:115); Frank and Ramus (1995:260); Malhotra and Thorpe (1996:119); Manthey and Grossmann (1997:404, 411); Trutnau (1998:349 – 352); David and Ineich (1999:286, 293, 376); Thirakhupt (2000:168); Iskandar and Colijn (2001:160); Gumprecht and Bulian (2003:16 – 17).

Trimeresurus kanburiensis (non *Trimeresurus kanburiensis* Smith, 1943); Cox (1991:376 and 398: Plate 153); Jintakune and Chanhome (1995:128, 151 [implicitly]); Malhotra and Thorpe (1996:116, 119, 121; 2000: 201, 205 – 209); Wüster et al. (1997:332); Chanhome et al. (1998:311, 313); Cox et al. (1998:22); Gumprecht (1998a: 25, 1998b: 46; 2001:28; 2002a:45, 2002b:4 – 5; 2003:37); Bulian (1999:61; 2001:62); Chan-ard et al. (1999:37 [implicitly], 197 – 198; 2002:127); McDiarmid et al. (1999:337); Gumprecht and Ryabov (2002: 37); Orlov et al. (2002:192); Bulian (2003:42).

Description. Body elongated in males, barely stouter in females, head triangular, wide at its base, rather short, thick, clearly distinct from the neck; snout average, accounting for 21 – 28% of total HL or 1.3 – 1.8 times as long as diameter of eye, rounded when seen from above, truncated when seen from lateral side, with a moderate canthus rostralis; eye large (ratio DE/DLip: 0.8 – 1.3); tail long in males, average in females, distinctly prehensile.

Maximal known TL: 680 mm (female; Gumprecht [2002a]). The longest male is 580 mm long (holotype).

Body scalation. Ven: 166 – 181 (+1 – 2 preventrals); Sc: 51 – 72, paired; anal shield entire; DSR: 21 – 23: (rarely 19) – 21: 15 scales, rhomboid, strongly keeled, first row smooth.

The reductions from 21 to 19 rows appear between Ven 106 and 111 (18 specimens). Two males from the same locality have 19 MSR, PSGV 600 (reduction from 21 to 19 at Ven 84, at two Ven before midbody), and PSGV 662 (reduction at Ven 22). For other characters, they are typical *Trimeresurus venustus*.

Ratio TaL/TL: 0.137 – 0.207 (19 males: 0.164 – 0.207, 9 females: 0.137 – 0.148).

Head scalation. Rostral triangular, visible from above; nasals subrectangular, undivided; 1 pair of elongated internasals, larger than adjacent snout scales, about half by half either in contact or separated each from the other by 1 small scale; 3 or 4 canthal scales bordering the canthus rostralis, not much larger than adjacent snout scales; 1 triangular loreal between upper preoculars and nasal; two elongated upper preoculars above the loreal pit, in contact with the loreal; lower preocular forming lower margin of loreal pit; 2 postoculars; 1 entire, elongated supraocular on each side, about 2.5 – 3.0 times as long as wide and about 0.7 – 1.0 time as wide as internasals, not indented on their inner margin by cephalic scales; 4 – 7 smooth, juxtaposed snout scales on a line between the internasals and a line connecting the anterior margins of eyes, moderately enlarged; cephalic scales small, irregular, juxtaposed, with traces of keeling on upper head surface, strongly keeled posteriorly on occipital region; 8 – 12 (usually 9 – 11) cephalic scales in a line between supraoculars; temporals small, subequal, in 3 or 4 rows, strongly keeled; one thin, crescent-like subocular; 9 – 11 Sl; 1st Sl triangular, short, fused with the corresponding nasal, either totally united or separated by a shallow furrow; 2nd Sl forming the anterior border of loreal pit, usually in contact with the nasal (38 out of 44 cases) or separated by 1 scale; third Sl largest, pentagonal, elongated, approximately 0.7 – 0.8 time as high as long, in contact with the subocular (separated by one scale in 7 out of 66 cases); 4th Sl shorter or subequal to third Sl (0.7 – 1.0 time as high), usually separated from the subocular by 1 or rarely 2 scales, but in contact in 12 out of 66 cases; 5th and other posterior supralabials small, barely larger than lower temporals, 5th Sl separated from the subocular by 1 or 2 scales; 9 – 13 (usually 11 – 12) infralabials, those of the first pair in contact with each other, pairs 1 – 3 in contact with the chin shields; 7 – 9 rows of gular scales; 4 – 6 pairs of throat scales regularly arranged.

Coloration in life. The dorsal and lateral body surfaces are grass green, olive green or bottle green, with irregular, zig-zag-like, sometimes X-like, rusty-brown, reddish-brown or purplish-red crossbands, one to three dorsal scale long and separated by one or two scale long interspaces, irregularly extending from the 2nd to 4th DSR up to the vertebral row. These crossbars may be or not in regard or confluent across the vertebral row. The length of these crossbars is variable, their lower part being often interrupted in a separate dot or vertical series of dots of same color. Scales of the first DSR of same color than the crossbars, regularly marked in their posterior part with a large, elongated bright white or cream spot; the cream spots are present on all scales and constitute a continuous ventrolateral stripe. Tail becoming progressively brown with green dots, with closer and indistinct dark purplish-brown crossbars; tail tip yellowish-brown.

The dorsal head surface and temporal regions are of same shade of dark green than dorsal surface, marbled with a conspicuous net of irregular blotches of the same color than the dorsal crossbands. Supralabials and head sides of same color than upper head surface, with a wide, conspicuous dark purplish-brown postocular streak connecting the loreal pit to the mouth; a broad blotch of same color below the eye, sometimes faint, not necessarily reaching the edge of the lip, and another, much nar-

rower one below the loreal pit. Eyes yellowish-brown or gold.

The infralabials, chin and throat are greenish-white or pale green, with some rusty-brown blotches on some anterior infralabials. Belly pale green, with tips of about one third of ventrals rusty- or reddish-brown; rarely some dots are present in the middle of ventrals. Ventral surface of tail as for the belly, becoming reddish-brown posteriorly, with white and green ventrolateral dots and sometimes with a row of white dots in its middle.

In preservative, the dorsal surface turned to dark brown, the crossbands becoming less distinct, but the white ventrolateral spots remain well visible.

Gumprecht (2002a; as *Trimeresurus kanburiensis*) described in captive-born juvenile an unusual dorsal pattern made of four longitudinal dark brown stripes, on lower part and upper part of each side respectively.

Range. Thailand. Known from the southern provinces of Krabi, Nakhon Si Thammarat and Surat Thani (Chanhome et al., 1998).

Data on the biology of these two taxa, especially new information on *Trimeresurus kanburiensis*, will appear in a subsequent paper (Vogel et al., in prep.)

Additional remarks. Gumprecht and Bulian (2003), published while this paper was being reviewed, rightly updated Gumprecht's (2001) checklist of *Trimeresurus* species known from Thailand in adding *Trimeresurus venustus* and *Trimeresurus sumatranus* (Raffles, 1822). Gumprecht (2001) stated that *Trimeresurus gramineus* (Shaw, 1802) was unknown from Thailand and that the citations of this South Indian species from Thailand were erroneous. In fact, the binomen *Trimeresurus gramineus* that has been applied to Thai populations by some authors (Welch, 1988; Hoge and Romano Hoge, 1981) was *Trimeresurus gramineus* sensu Pope and Pope (1933; non *Coluber gramineus* Shaw, 1802), the taxon now widely known as *Trimeresurus popeiorum*.

CONCLUSION

The validity of *Trimeresurus venustus* is confirmed as a species distinct from the long enigmatic *Trimeresurus kanburiensis*. Much work remains to be done on the taxonomy of pitvipers in Thailand, and even more on their distribution and ecology. However, in the case of venomous, and hence medically important snakes, the establishment of a sound taxonomy should be an immediate effort, in using an appropriate methodology. Synonymizations done without the necessary examination of voucher specimens should remain an exception, should they even happen. Taxonomical stability would gain great benefit.

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APPENDIX I. MAIN MORPHOLOGICAL FEATURES OF EXAMINED SPECIMENS OF *Trimeresurus kanburiensis*

Number	Sex	SVL	TaL	TL	TaL/TL	MSR	Ven	Sc	Sl	Cep	Il
BMNH 1992.535	♂	412	88	500	0.176	19	172	59	10/11	8	11/11
BMNH 1946.1.8.91	♀	472	68	540	0.126	19	157?	41	10/10	8	11/12
BMNH 1987.943	♀	574	93	667	0.139	19	178	51	10/11	8	12/13
BMNH 1988.383	♀	438	68	506	0.134	19	170	49	10/10	8	12/12
QSMI 508	♀	386	55	441	0.125	19	175	46	9/9	7	11/11
QSMI 509	♀	542	77	619	0.124	19	174	47	10/9	9	11/12

APPENDIX II

SPECIMENS EXAMINED

Trimeresurus kanburiensis (6). THAILAND. Kanchanaburi Province. BMNH 1946.1. 8.91 (holotype), "In the limestone hills near Kanburi, south-western Siam," near Kanchanaburi; BMNH 1987.943, Sai Yok, 14°09′ N 99°10′ E; BMNH 1988.383, Nongbuwa, 25 km NW of Kanchanaburi; BMNH 1992.535, Sai Yok; QSMI 508 – 509, no precise locality.

Trimeresurus venustus (32). THAILAND. Nakhon Si Thammarat Province. BMNH 1983.384–386, BMNH 1987.944 – 945, QSMI 352 – 353, ZMB 48045 (holotype), ZMB 48046, ZSM 127.1990, Thung Song, Nakhon Si Thammarat Province; PSGV 600, PSGV 662, Ampoe Lan Saka; QSMI 354 – 356, Khao Klab, Thung Song, Nakhon Si Thammarat Province; QSMI 357, Khao Klab, limestone, Thung Song; QSMI 517 – 518, Khao Klab, Thung Song, Nakhon Si Thammarat Province. QSMI 383 – 384, QSMI 512 – 513, no precise locality; No locality. MNHN 1990.9091 – 9095, SMF 82550 – 82552, ZFMK 79783 – 79784.