# A Revision of the Perileptine Trechid Beetles in the West Pacific and Adjacent Areas

I. Introduction and the Subgenus Parablemus

By

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#### Introduction

The tribe Perileptini is a group of minute trechid beetles mainly distributed in the Old World tropics. It was established by JEANNEL (1926, pp. 397–401), who gave at the same time a revision of the theretofore known species. According to the French author, the tribe is characterized by the following combination of morphological features: Size usually very small; body nearly always depigmented and pubescent; eyes pubescent; clypeus tuberculate; mandibles tridentate, with retinacular and premolar teeth prominent and acute; labium not fused, with the sensory organ adjoining the basal border of mentum, whose tooth is always simple; submentum with a transverse row of numerous hairs; labial palpus with multisetose penultimate segment; elytra elongate, without apical striole and apical carina; setiferous dorsal pores rudimentary, sometimes absent; apical group of setae incomplete; aedeagus poorly sclerotized, particularly on the dorsal side, but the basal bulb is closed; inner sac devoid of differentiated armature except for a few scales or small nodules.

As a whole, Jeannel's observation seems accurate regarding the external features. However, the pubescent eyes are not peculiar to the tribe. Jeannel himself (p. 438) stated that the eyes are "glabres" in the genus *Apoplotrechus*, which indubitably belongs to Perileptini. On the other hand, the eyes are pubescent, though not so pronouncedly as in *Perileptus*, in many species of the genus *Trechisibus* belonging to Homaloderina of the tribe Trechini (cf. Uéno, 1972, etc.), and also in the genus *Oroblemus* of Trechina of the same tribe (cf. Uéno and Yoshida, 1966). Be that as it may, almost all the external characteristics pointed out by Jeannel, with probable exceptions of the depigmented body and the tuberculate clypeus, show that the group is very primitive and much isolated from the other tribes of Trechinae. Jeannel was certainly right in placing Perileptini at the top of his classification, that is, in regarding the tribe as the most primitive of the subfamily.

JEANNEL maintained the same view until later (e.g., 1942, pp. 265–268), but in 1964, he reorganized his classification of trechid beetles, divided them into two major groups, Trechoditae and Trechitae, and placed Perileptini in the latter group together with Homaloderini and Trechini (cf. JEANNEL, 1964, p. 233). A similar opinion was

offered by Moore (1972, pp. 5, 57), who regarded Trechodini as the most primitive group of the subfamily and Perileptini as a modern one. I agree with Moore in considering that the perileptines are "still in process of expansion" and that the Australian forms of *Perileptus* "represent a comparatively recent incursion of an essentially Oriental stock." It should, however, be disputed whether or not the tribe is an advanced group.

Both JEANNEL and MOORE based their opinions on the belief that the basal part of aedeagus is formed by two symmetrical lobes in trechodines but that the basal bulb is closed in perileptines just as in trechines. It is true that in Perileptini, the aedeagus is more or less bent at the basal part and has its basal orifice at the ventral position; but its dorsal side largely remains membraneous, especially in basal half, and at the basal part, only the ventral and ventro-lateral walls are sclerotized. These sclerotized ventro-lateral walls of the basal part of perileptine aedeagus no doubt correspond to the symmetrical basal lobes of trechodine one. The convex side of the same part is so fragile in perileptines, that it is often broken and the ejaculatory duct is exposed as in trechodines (cf. Uéno, 1974, p. 161, fig. 2). Besides, the perileptine aedeagus is always very simple and incomplete as compared with those of trechodines and trechines, and scarcely varies throughout the tribe. I have confirmed these matters by dissecting most of the species hitherto known in the world. It is probable that both the trechodine and trechine types of aedeagi have evolved from the perileptine type, as the latter seems to have the highest plasticity of the three, but the perileptine type cannot have been derived from either of the other two, even through regressive evolution. Thus, the primitiveness of Perileptini seems to be supported by both the external and genitalic features.

In my own view, Perileptini seem to be the most primitive group of the whole subfamily. This conclusion can be drawn not only from the morphological basis, but also from other reasons. All the known species of the tribe are fully winged and very agile. Almost all of them are ripicolous, living in gravel or sand banks of brooks and rivers. Only the exception is three halophilous species of *Perileptus*, which dwell in the intertidal zone at estuaries (cf. Uéno, 1974, p. 165). The tribe seems to have originated in the Old World tropics, since it is most diverse there and since only a limited number of non-specialized species occur at peripheral parts of the tribal distribution, except for certain isolated tropical islands. Of the remaining two tribes, Trechodini are doubtless more archaic than Trechini, without acquiring sclerotization of the aedeagal dorsal side. Trechodines are widely distributed in the southern continents and flourish above all in East Africa. Relatively primitive species of them (e.g., Trechodes and Cnides) are fully winged and very hygrophilous, always living by running water like perileptines, and mostly occur in the tropics. However, there are many others that have become flightless mesophiles, especially on high mountains of Africa. Such derivative groups (e.g., Pachydesus) show a remarkable speciation comparable to that of flightless trechines. Trechini, on the other hand, have evolved tubular aedeagus with completely closed basal bulb, and are mainly distributed in the

temperate regions of both the Northern and Southern Hemispheres. The tribe comprises an immense number of genera and species, which are largely restricted to intertidal zones, forest floors, alpine meadows, endogean habitats or caves. Their evolution and phylogeny are extremely complicated, and cannot be dealt with here in any detail.

It seems apparent from the brief sketch given above that the most primitive forms of Trechinae are primarily ripicolous, fully winged insects that mainly occur in the tropics. All the derivative forms tend to become flightless mesophiles that are distributed in the temperate regions and also on high mountains in the tropics. In the whole subfamily, Perileptini are the only group whose members are exclusively ripicolous and are commonly found in tropical plains. They can fly well and are active both in the daytime and at night. Consequently, they are usually widespread and can be met with, for instance in tropical Asia, wherever favourable environment exists. On the other hand, only a very few species have been able to spread into the cold temperate. Perileptus japonicus in northeastern Asia and P. areolatus in northern Europe are the rare examples of this. That perileptines are primarily tropical lowland inhabitants appears to be the main reason why they have not become much differentiated and remain homogeneous up to the present. However, certain ancestral perileptines must have served as the mother stock that gave rise to trechodines on the one hand and to trechines on the other.

The remarkable homogeneity of perileptines makes their classification extremely Male genitalia, which usually serve as one of the most important characteristics in the trechid taxonomy, are almost useless in this tribe. They vary according to individuals even within a single population of a species, though different species often show somewhat different ranges of variation. No entomologists have ever succeeded in proposing a satisfactory classification of perileptine species. In his classic monograph of Trechinae, JEANNEL (1926, pp. 397-440) revised the tribe on a world-wide basis. His paper is still useful, but naturally out of date. The number of perileptines known at present almost doubles that enumerated in his revision, and the species of subsequent description cannot be readily incorporated in his key. In my experience, proportions of various body parts, in particular those of pronotum, and the microsculpture of pronotum and elytra furnish useful characters for classifying perileptines. The former should be based on actual measurements, with a micro-ruler in the microscope ocular, of reasonably long series of specimens. This is a laborious and timeconsuming task, which has been attempted only exceptionally. The mode of microsculpture has been described only by certain authors.

About fifty described species have hitherto been known in the tribe Perileptini, and about ninety per cent of them belong to the genus *Perileptus*. The members of this genus are widely distributed in the warmer part of the Old World; they extend northeastwards to Japan and eastern Siberia, southeastwards to the New Hebrides and Victoria in Australia, southwestwards to Madagascar and the southern tip of South Africa, northwestwards to Scandinavia, and westwards through the Canary and Cape Verde Islands in the Atlantic to the West Indies in America. The genus contains still many

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other species that await descriptions, especially from tropical Asia. The remaining genera, *Neoblemus* and *Apoplotrechus*, comprise only a few species; the former occurs along the Himalayas and their continuations, from northern Viet-Nam and northern Thailand in the southeast to southern Iran and Kazakhstan in the northwest, and the latter is restricted to Madagascar.

The present paper is designed to assemble all the up-to-date knowledge concerning the perileptines from the West Pacific areas, which include Japan, Korea, China, Taiwan, the Philippines, Indo-China, the Malay Peninsula and Archipelago, New Guinea, the Solomon and New Hebrides Islands, and Australia. No perileptines have so far been known from New Caledonia and New Zealand, the latter of which was rather carefully surveyed by myself. In view of their close relationship with the Indo-Chinese species, the perileptines of the Indian Subcontinent and Ceylon are also included in this study. During the course of its preparation, I have seen the type materials of almost all the perileptine species hitherto described in the world, so that a global revision could have been intended, were it not for the taxonomic difficulty of African forms. As it is, I have to limit the scope of this paper to the said areas.

Because of the difficulties of printing, the present paper will be divided into four parts. The first three parts will contain smaller groups, and the last will be devoted to the subgenus *Perileptus*. The abbreviations employed throughout these parts are as follows: AL—length of antennae; HW—greatest width of head, including eyes; PW—greatest width of pronotum; PL—length of pronotum, measured along the mid-line; PA—width of pronotal apex (which can be easily measured when pronotum is seen from the dorso-anterior side); PB—width of pronotal base; EW—greatest width of elytra; EL—greatest length of elytra; M—arithmetic mean; BM—British Museum (Nat. Hist.), London; MP—Muséum National d'Histoire Naturelle, Paris; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge; NSMT—National Science Museum (Nat. Hist.), Tokyo.

The present study was started many years ago with the advice and encouragement of Professor P. J. Darlington, Jr., who not only allowed me to freely use the rich collection of perileptines in the Museum of Comparative Zoology, but helped my study in every possible way. I wish to express my hearty thanks first of all to Professor Darlington. My study could not have been accomplished but for the facilities kindly provided by the authorities and staff of many museums, in whose collections the types of perileptines are kept. Above all, I have received invaluable aid from Dr. E. B. Britton, Mr. J. Balfour-Browne and Mr. P. M. Hammond of the British Museum (Natural History), London, and the late Professor R. Jeannel and Mr. A. Descarpentries of the Muséum National d'Histoire Naturelle, Paris, at various stages of this study. My deep gratitude is due to all these scholars. The names of other museums and persons will be mentioned at the heads of relevant parts. For making field works in Southeast Asia, I have been given ample facilities from the Center for Southeast Asian Studies, Kyoto University, and am especially indebted to Professors Joji Ashida and Kunio Iwatsuki. Expenses of the expeditions and other works were

partly defrayed by grants from the Center and from the Ministry of Education of Japan.

#### Key to the Genera and Subgenera

- 1 (4) Protibiae not carinate on the postero-external face; humeral border of each elytron not angulate, either extending in an arc to the base of stria 5 or disappearing at shoulder; eyes pubescent; body more or less elongate and usually depressed.
- 2 (3) Protibiae not grooved on the external face...........Gen. Perileptus SCHAUM.
  - a (d) Pronotum entirely bordered at the lateral sides.

  - c (b) Pubescence on elytra arranged in a single row of hairs on each interval; body convex and not parallel-sided......Subg. Parablemus G. MÜLLER.
- 3 (2) Protibiae deeply grooved on the external face......Gen. Neoblemus JEANNEL.

Apoplotrechus Alluaud (1915, p. 286; Jeannel, 1926, pp. 402, 437, 1946, pp. 322, 325) is a monotypic genus endemic to Madagascar. It was erected for *Perileptus strigipennis* Fairmaire (1903, p. 17), a remarkable species which is no doubt most highly specialized in the tribe Perileptini. In spite of the extraordinary modification of its external features, the male genitalia of this species remain unchanged and are perfectly similar to those of other perileptines (cf. Jeannel, 1946, p. 326, fig. 145).

JEANNEL (1926, pp. 402, 405, 428) recognized the subgenus *Pyrrotachys*<sup>1)</sup> SLOANE (1896, p. 374) for three flat species of *Perileptus* from Australia and Africa, and regarded them as the relicts of the Gondwanian fauna (cf. JEANNEL, 1942, p. 266). However, various intermediate forms occur between the typical species of *Pyrrotachys* and those of *Perileptus* (s. str.), so that the former cannot be considered to constitute a distinctive group. This view was already suggested by BASILEWSKY (1951, p. 286), and was definitely expressed by MOORE (1972, p. 12).

## Subgenus Parablemus G. MÜLLER, 1939

Perileptus subg. Parablemus G. Müller, 1939, Miss. biol. Paese dei Borana, Roma, 2 (1), pp. 201, 202; type-species: Perileptus latimargo G. Müller, 1939.

<sup>1)</sup> JEANNEL emended the spelling of this name as "Pyrrhotachys", but SLOANE's original spelling is "Pyrrotachys".

Similar to *Perileptus* (s. str.) in many respects, but the body is robust and convex, the elytra are oblong-ovate and not parallel-sided, and the pubescence is sparse on the head and pronotum and is arranged on the elytra in a single row down the middle of each interval. Head with large prominent eyes and very short genae; frontal furrows simple, deep, and not angulate; antennae not very long. Pronotum entirely bordered at the sides and more or less truncated at the base; hind angles nearly rectangular, not denticulate. Elytra distinctly striate at least on the disk, the striae being coarsely punctate; setiferous dorsal pores inconspicuous. Microsculpture degenerated at least on head and pronotum.

Range. Ethiopia, northern India and Burma.

Notes. This subgenus was originally erected for an isolated species of *Perileptus* from Malca Guba in southern Ethiopia. Its description was given in the report of an Italian expedition to southern Ethiopia, entitled "Missione biologica nel Paese dei Borana," a publication that is rare and difficult to obtain. Consequently, it has been overlooked by subsequent authors including Jeannel (1942, pp. 267–268, etc.). However, the discovery of *P. latimargo* G. Müller in Ethiopia is of special interest from both the taxonomic and zoogeographic points of view. Müller was certainly right in placing his new species at the side of *P. cameroni*, and the advanced mode of pubescence on the body surface of these species seems sufficient to recognize his subgenus *Parablemus*.

Besides the two species mentioned above, *P. birmanicus* JEANNEL from Upper Burma also belongs to this subgenus. Thus, the distributional range of *Parablemus* stretches across southern Asia and extends southwestwards into the northeastern part of Africa. The three known species are not so closely related to one another, and appear to represent the remains of an old fauna.

### Key to the Species

## Perileptus (Parablemus) cameroni Jeannel, 1923

(Figs. 1-2)

Perileptus cameroni Jeannel, 1923, Ann. Mag. nat. Hist., (IX), 12, pp. 397, 407, fig. 7; type-locality: Dehra Dun, Kaligad. —— Andrewes, 1935, Fauna Brit. Ind., Coleopt. Carab., 2, pp. 50, 54, fig. 6.

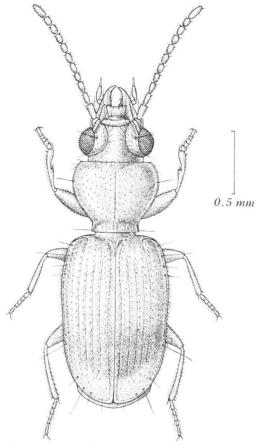


Fig. 1. Perileptus (Parablemus) cameroni JEANNEL, of paralectotype, of Kaligad in northern India.

Perileptus (s. str.) Cameroni: Jeannel, 1926, Abeille, Paris, 32, pp. 408, 427, fig. 205. — CSIKI, 1928, Coleopt. Cat., pars 98, p. 229.

Length: 2.15–2.40 mm (from apical margin of clypeus to apices of elytra).

Very remarkable, isolated species of relatively small size. Body robust, convex and not parallel-sided; surface covered with rather long, recurved pubescence, which is scanty on head, sparse on pronotum, and not dense even on elytra. Colour light reddish brown or yellowish brown, very shiny, with a vague dark patch behind the middle of each elytron; head more or less darker than prothorax and elytra, whose sides are narrowly edged with dark colour; palpi, legs and pubescence pale yellowish brown.

Head fairly large, depressed above though both the frons and supraorbital areas are gently convex; frontal furrows deep, rather widely distant at the mid-eye level and moderately divergent anteriad; surface almost impunctate and polished; eyes large and prominent; genae very short, one-twelfth or less as long as eyes, flat and a little oblique;

neck wide, with the anterior constriction deep at the lateral sides; clypeal central tubercle obtuse and not conspicuous; labrum shallowly emarginate at apex and without central tubercle; antennae very short, stout, moniliform, and dilated at apices, only reaching basal one-tenth of elytra, AL/EL 0.74–0.83 (M 0.78), with median segments about three-fifths as wide as long, terminal segment narrower than scape.

Pronotum cordate, convex, wider than long, widest at about five-sevenths from base and strongly contracted behind; PW/HW 1.12–1.17 (M 1.14), PW/PL 1.15–1.23 (M 1.19), PW/PA 1.24–1.35 (M 1.30), PW/PB 1.74–1.86 (M 1.82); surface sparsely covered with piliferous punctures of unequal size; sides strongly and regularly rounded from front angles to basal one-seventh or one-eighth, abruptly sinuate there, and then nearly subparallel or slightly divergent towards hind angles, which are either rectangular or slightly obtuse or somewhat sharp, but hardly projecting in any case; apex nearly straight or slightly arcuate, much wider than base, PA/PB 1.35–1.48 (M 1.40); front angles not advanced though distinct and narrowly rounded; base straight at middle, slightly oblique at each side but not emarginate; median line deep and sharply cut, widening near base; basal area depressed, with the transverse impression wide, continuous and coarsely rugose; basal foveae small, outwardly limited by short but evident postangular carinae, and not extending anteriad onto the disk.

Elytra oblong-ovate, convex, widest at about one-third from base, and slightly compressed at about middle; EW/PW 1.25–1.35 (M 1.29), EL/EW 1.58–1.62 (M 1.60); disk somewhat depressed in basal half; shoulders rounded, with the base slightly arcuate at each side; sides narrowly bordered, gently arcuate from behind shoulders to near apices and with a very slight but distinct emargination at about middle; apices separately rounded, with a small re-entrant angle at suture; striae distinct on the disk and coarsely punctate, stria 1 entire, 2–4 obsolete near base, 5 deeply impressed at the basal portion, 6 usually indicated only by punctures, sometimes disappearing altogether, 7–8 evanescent; intervals lightly convex on the disk but flat at the side, each with a row of fine piliferous punctures; stria 3 with three setiferous dorsal pores at about 2/9, 4/7 and 4/5 from base respectively, though not conspicuous.

No appreciable microsculpture.

Male genital organ small. Aedeagus two-sevenths as long as elytra, with fairly long basal part, which is strongly bent ventrad; apex narrowly rounded; ventral side slightly convex at middle. Styles small and short, each provided with two apical setae.

Type depository. British Museum (Natural History).

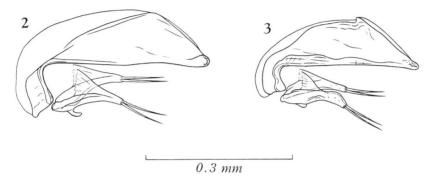
In the British Museum collection, there are two specimens (33) of *P. cameroni* bearing red type labels. This is evidently an error, and I selected one of them as the lectotype. Although Jeannel (1923, p. 407) stated that he described this species on five specimens, I have seen seven specimens of the type-series distributed to four museums (BM, MP, MCZ and NSMT). Probably, the original designation of "5 ex." may be a *lapsus calami*.

Specimens examined. 4 ♂♂, 3 ♀♀ (lectotype and paralectotypes), Kaligad, Dehra Dun, United Provinces (=Uttar Pradesh), India, 10-VII-1921, M. CAMERON leg.

(BM, MP, MCZ & NSMT); 1 &, Mangpo, Ghum District, Bengal, India, V-1931, M. CAMERON leg. (BM).

Range. Northern India. Widely distributed along the southern side of the Himalayas, though only three localities have so far been known. Andrewes (1935, p. 55) recorded this species from Shugnu of Manipur in Assam, but I could not locate the whereabouts of the specimen(s) in question.

*Notes.* Nothing has been known about the habitats of this interesting species. It seems probable that the beetle dwells on the gravel banks of streams, as most of the other perileptines do.



Figs. 2–3. Male genitalia, left lateral view. —— 2. *Perileptus (Parablemus) cameroni* Jeannel, paralectotype, of Kaligad in northern India. —— 3. *P. (P.) birmanicus* Jeannel, holotype, of Kyauktan in Upper Burma.

## Perileptus (Parablemus) birmanicus JEANNEL, 1930

(Figs. 3-4)

Perileptus (s. str.) birmanicus Jeannel, 1930, Abeille, Paris, 34, p. 62; type-locality: Kyauktan. —— CSIKI, 1933, Coleopt. Cat., pars 126, p. 1651.

Perileptus birmanicus: Andrewes, 1935, Fauna Brit. Ind., Coleopt. Carab., 2, pp. 50, 55, pl. 1, fig. 2.

Length: 1.95 mm (from apical margin of clypeus to apices of elytra).

Another remarkable species not very close to the preceding. Small but robust, moderately convex and not parallel-sided; pubescence sparse. Colour light reddish brown, very shiny, prothorax and epipleura more or less paler, though the apical and basal areas of pronotum are brown; palpi and legs pale yellowish brown; antennae becoming darker towards apices.

Head of moderate size, depressed above, with very large eyes and deep curved frontal furrows, the latter of which are only slightly divergent anteriad; both frons and supraorbital areas rather flat, with scanty pubescence; genae very short, only one-twelfth as long as eyes and a little oblique; neck constriction sharply marked at the lateral sides; clypeal central tubercle distinct; labrum widely emarginate, without distinct tubercle though its trace is perceptible; antennae fairly short, stout, submoniliform

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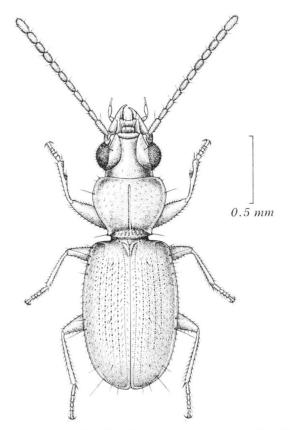


Fig. 4. Perileptus (Parablemus) birmanicus Jeannel, of holotype, of Kyauktan in Upper Burma.

and dilated at apices, reaching basal one-third of elytra,  $AL/EL\ 0.98$ , with median segments only twice as long as wide.

Pronotum transverse cordate, widest at two-thirds from base and contracted posteriorly; PW/HW 1.15, PW/PL 1.27, PW/PA 1.38, PW/PB 1.64; surface convex and sparsely covered with piliferous punctures, a vague longitudinal impression parallel to side border being present on each side in basal half; sides moderately rounded from front angles to ante-basal sinuation, which is distinct but brief and close to (at about one-ninth from) base; apex slightly emarginate at middle and evidently wider than base, PA/PB 1.19; front angles rounded; hind angles small, somewhat sharp, a little projecting laterally, each with a rudimentary carina; base nearly straight at middle, oblique at each side though only very slightly emarginate; median line deep and wide, almost reaching base; basal transverse impression shallow but uneven, laterally merging into basal foveae which are small but deep; basal area coarsely punctate and rugose.

Elytra relatively short, oblong-ovate, widest at about two-fifths from base, and

moderately convex though somewhat depressed on the disk; EW/PW 1.29, EL/EW 1.54; shoulders distinct, with the base perpendicular to the mid-line; sides narrowly bordered, distinctly, though feebly, arcuate from behind shoulders to near apices, which are separately rounded, leaving a small re-entrant angle at suture; striae shallow though distinct on the disk, coarsely punctate, stria 1 entire except for a small basal portion, 2–4 lightly impressed though basally disappearing, 5 somewhat deepening near base, 6 indicated only by punctures, 7–8 evanescent; intervals mostly flat though slightly convex near suture, each with an irregular row of sparse piliferous punctures; stria 3 with three setiferous dorsal pores but inconspicuous being mingled with coarse punctures.

Microsculpture almost absent on head and pronotum, though trace of reticulation is partially perceptible; that of elytra distinct throughout, consisting of isodiametric meshes.

Male genital organ small, but the ventral side of aedeagus is rather well sclerotized. Aedeagus short, two-sevenths as long as elytra, widely dilated towards large apical orifice in profile though ending in a short blunt tip; basal part small, strongly bent ventrad; ventral side nearly straight to apex. Styles small and short, each provided with two apical setae.

Female unknown.

Type depository. British Museum (Natural History).

Specimen examined. 1 & (holotype), Kyauktan, Shwebo Division, U. Burma, H. G. Champion leg. (BM).

Range. Burma. Known so far only from the type-locality.

*Notes.* The holotype of this interesting species, which is unique at present, is not in a perfect condition of preservation. The pubescence on the body surface is largely worn out, so that it is not easy to observe its actual arrangement. In the habitus drawing inserted in this paper, the pubescence is largely restored on the basis of minute punctures detected under high magnification.

Perileptus birmanicus was placed by JEANNEL (1930, p. 62, 1942, p. 267) in the group of *P. japonicus*, and by Andrewes (1935, p. 55) at the side of *P. cameroni*. The latter author is no doubt right, since the arrangement of its elytral pubescence is characteristic of the subgenus *Parablemus*. Besides, the lateral impressions on pronotum, remarkably developed in *P. latimargo* G. Müller (1939, p. 201, figs. 5–6) from southern Ethiopia, are still visible in the Burmese species, and the elytra are relatively short and ovate as compared with those in the members of the subgenus *Perileptus* (s. str.).

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