THE GROUP OF PSENULUS PULCHERRIMUS (BINGHAM) (HYMENOPTERA, SPHECIDAE)

BY

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Abstract

The distribution in the Indo-Australian and East-Asiatic regions of the group is discussed. The material studied originates from localities in a triangular area formed by Gujarat in the West, Japan in the North and northeastern Australia in the South. The subgenus *Eopsenulus* Gussakovskij, 1934, was erected for *Psenulus iwatai* Gussakovskij, 1934 (Japan). This form is regarded here as the Japanese representative of the group of *Psenulus pulcherrimus* (Bingham, 1896). The provisional classification as a group is preferred as long as other subgenera of *Psenulus* are not yet defined. The relationship between the forms from western India and those from northeastern Australia is very close; *P. carinifrons* Cameron, 1902 (Deesa) and *P. scutellatus* Turner, 1912 (Queensland), are considered to be subspecies only. Even *P. iwatai* may prove merely to be a subspecies of the Indian form. *P. sinclairi* Lal, 1939 (Bombay), which could not be examined, and a probably new subspecies from South India, are also very closely related to *P. carinifrons*. A key to the species and subspecies is provided. The distribution of the eleven forms is given, together with new records of the species already treated in a previous paper. One new subspecies from New Guinea is described.

In a study on *Psenulus* (Van Lith, 1962) I have provisionally divided the Indo-Australian species (about 70 species and subspecies from this region have been described) into a number of groups, in order to facilitate the future definition of subgenera. GUSSAKOVSKIJ (1934) described the subgenus *Eopsenulus* for *Psenulus iwatai* Gussakovskij (Japan). This species differs very much from the other East-Asiatic congeners in having a narrow and protruding carina between the antennae. It is evident now that the group of *P. pulcherrimus* is identical with the subgenus *Eopsenulus* Gussakovskij. The characters of the latter group are: a slender body, a narrow and protruding carina between the antennae, a largely or completely black scutum, an almost interstitial first recurrent vein of the fore wings, and the female with triangularly or bluntly protruding anterior margin of clypeus and narrow pygidial area. There is a great contrast between the females and the males in the sculpture of the back of the propodeum, viz., almost smooth in the female and coarsely reticulate in the male.

It seems premature to delimit more subgenera of *Psenulus*; therefore I prefer to use in this paper the provisional term "group of *P. pulcherrimus*".

During the last few years I received material from a larger area than that studied in 1962 and this brings the total number of species and subspecies of the group to ten, probably eleven. The components are distributed over a large triangular area, reaching from Gujarat in India, northward to Japan and from there south-

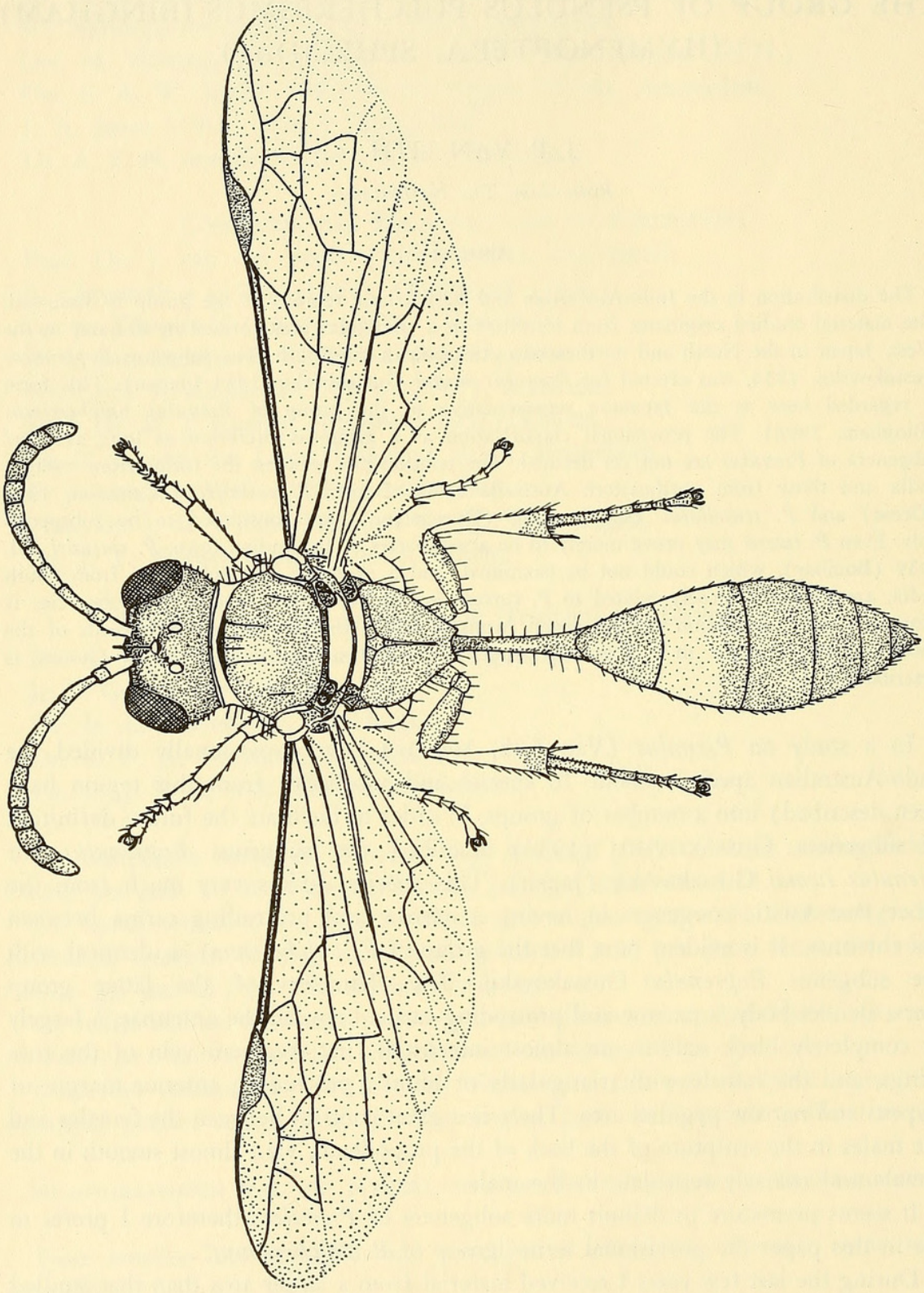


Fig. 1. *Psenulus carinifrons xanthognathus* Rohwer, ♀, from Negros (Philippine Islands)

ward over New Guinea to northeastern Australia (Fig. 2). It is interesting that the forms from the outer angles of this area are not only closely related but even conspecific (*P. carinifrons carinifrons* (Cameron), from Gujarat and *P. carinifrons scutellatus* Turner, from northeastern Australia) or probably conspecific (*P. iwatai* from Japan). There is one "island" in this area, formed by the range of distribution of *P. sogatophagus* Pagden, the female of which is different, having one tooth more on the mandibles; this species has been found in Malaya, Thailand and Assam. Another species, *P. pulcherrimus* (Bingham), showing distinct specific differences, with more pointed clypeus and red gaster, inhabits Tenasserim, and has a subspecies, *P. pulcherrimus projectus* Van Lith, in Java. The two subspecies, *P. carinifrons xanthognathus* Rohwer and *P. carinifrons rohweri* Van Lith, seem to be closely allied and are characterized in the male sex by the coarser carination of the back of the propodeum. They occupy the large area formed by Malaya and the Indonesian islands (*P. carinifrons rohweri*), and the Philippines (*P. carinifrons xanthognathus*).

Some of the forms of the group of *P. pulcherrimus* are somewhat variable as to the extent of the yellow marking, especially on the pronotum and the scutellum, and also on the fore and mid femora. Examples of the variation of the markings of the thorax in females of *P. sogatophagus* are presented in Fig. 3 and 4 and of the variation in two males of *P. carinifrons scutellatus* in Fig. 6 and 7. The fact that the Bornean specimens of *P. carinifrons rohweri* all have darker legs than those from the more southern islands, may be of a greater systematic value and I am not excluding the possibility that they represent a different subspecies. The males of *P. carinifrons xanthognathus* which I studied from the neighbouring island of Mindanao, have also darker fore and mid femora than the specimens from the northern Philippine Islands. Apart from the colour of the gaster there is a great resemblance between the females of *rohweri* and *xanthognathus*. However, more material, especially from the southern Philippines and from Borneo would be very welcome for getting a better idea of the distribution of the forms and their true systematic status. The total number of specimens examined for the present study is limited, viz. 230, originating from 21 different islands and continental countries.

The new subspecies from New Guinea is presumably a near relative of *P. carinifrons scutellatus* Turner (NE Australia). The former is very dark and in the latter the pronotum is often also darkened in both sexes, sometimes even completely black.

In 1939, K. B. LAL described *Psenulus sinclairi* from Bombay, apparently from one single male. I was not able to examine the holotype but from LAL's drawing it is evident that his species belongs to the group of *P. pulcherrimus* and is closely alied to *P. carinifrons*. From South India a single male of *P. carinifrons* is known which may be a different subspecies, as the puncturation of the scutum is coarser than usual. More material of both sexes from these localities is necessary to determine the status of these males.

A key to all the East-Asiatic and Indo-Australian species of the group, is given below. It is followed by a discussion of most of the forms, and some new data on

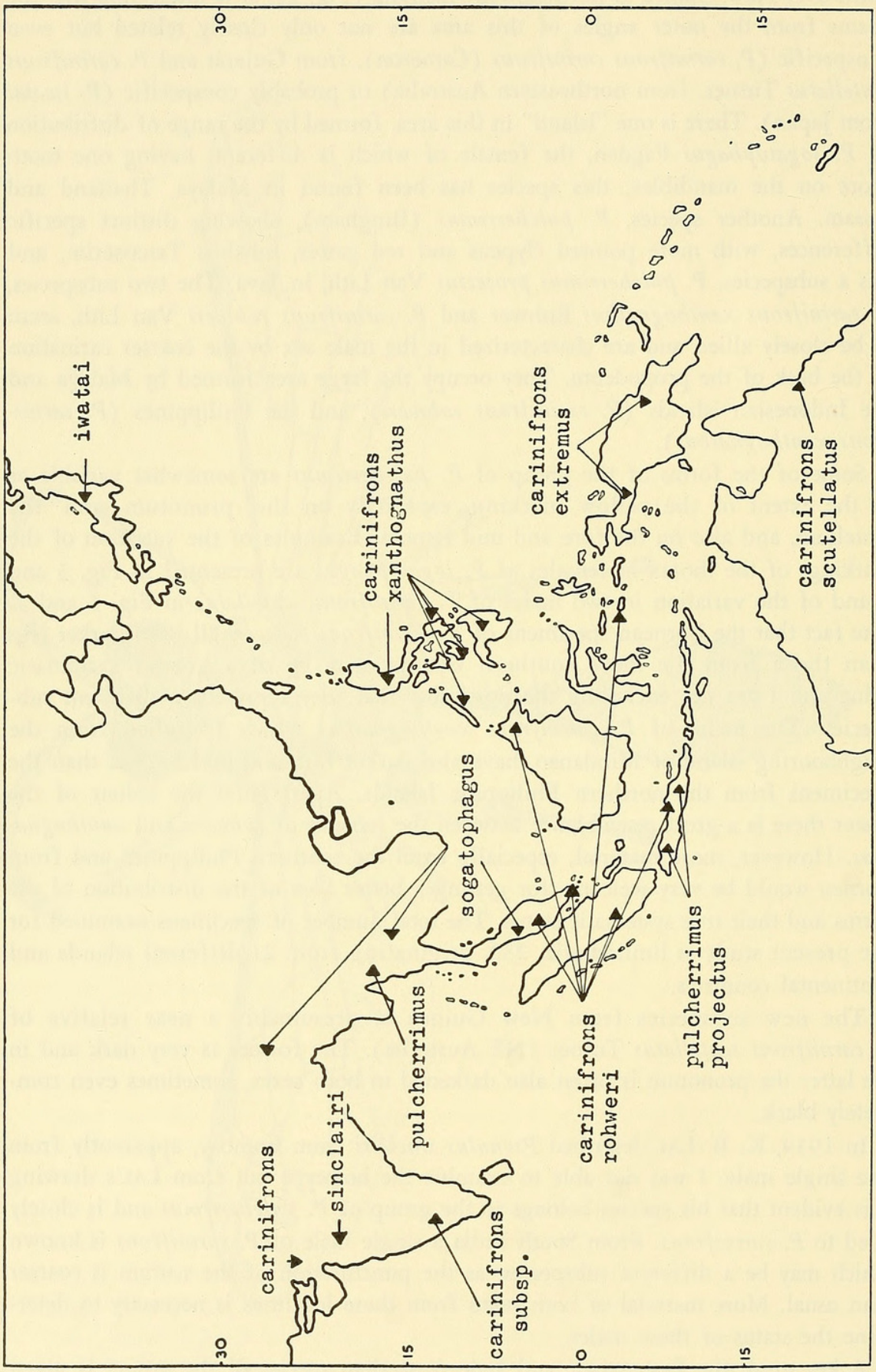


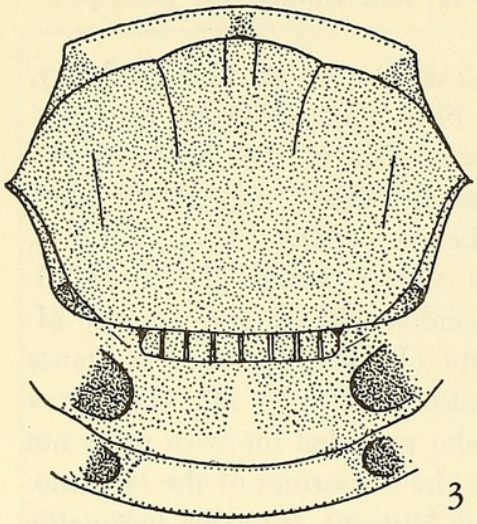
Fig. 2. Distribution of species and subspecies of the group of *Psenulus pulcherrimus*

their distribution which became available after 1962; and finally, the description of the new subspecies.

I am very much indebted to Dr. C. R. BALTAZAR, Bureau of Plant Industry, Manila (BPIM), Dr. G. R. FERGUSON, Scarsdale, New York (FERG), Prof. Dr. K. IWATA, Hyogo University of Agriculture, Sasayama (HUA), Dr. K. V. KROMBEIN, United States National Museum, Washington (USNM), Dr. M. A. LIEFTINCK, Rijksmuseum van Natuurlijke Historie, Leiden (ML), Prof. Dr. K. TSUNEKI, Fukui University, Prof. Dr. J. VAN DER VECHT, Leiden, Dr. I. H. H. YARROW, British Museum (Natural History), London (BM), and Dr. C. M. YOSHIMOTO, Bernice P. Bishop Museum, Honolulu (BISH), for their assistance and for the sending of material for study. I am also grateful to Mr. G. NIXON of the Commonwealth Institute of Entomology, who provided me with some not easily accessible literature. Special thanks are due to the authorities of the Hymenoptera department of the British Museum (Natural History) for their hospitality during the XIIth International Congress of Entomology, in July, 1964.

KEY TO THE SPECIES OF THE GROUP OF *Psenulus pulcherrimus*

1. Scutum, often also propodeum, with yellow marks; gaster red, petiole yellowish or black. Clypeus of female triangularly projecting ..... 2.
— Scutum and propodeum black; gaster black, at most with red spots on second tergite. Clypeus of female bluntly projecting ..... 3.
2. Scutum laterally with elongate yellow mark above the tegulae and with median yellow spot in front of scutellum. Petiole yellowish, darkened at apex. Male unknown. (Tenasserim) ..... *pulcherrimus pulcherrimus* (Bingham)
— Scutum only with median yellow mark in front of scutellum. Petiole black or dark brown. (Java, Krakatau) ..... *pulcherrimus projectus* Van Lith
3. Female : mandibles quadridentate, clypeus less protruding. Male : frons below antennae indistinctly punctate, back of propodeum not very coarsely carinate (much less than in *P. carinifrons xanthognathus* and *P. carinifrons rohweri*), antennal segments thicker, last segment less flattened and less pointed in lateral view. Both sexes : gaster completely black, fore and mid trochanters and femora yellow, basal $^2/_3$ of hind tibiae yellow; pronotum, scutellum and metanotum generally yellow but these parts sometimes partly or completely darkened. (Malaya, Thailand, Assam) ..... *sogatophagus* Pagden
— Female : mandibles tridentate (including inner tooth), clypeus more protruding. Male : antennae more slender, last segment more flattened (pointed in lateral view). Both sexes : gaster not always completely black, in some forms fore and mid femora partly black or brown ..... 4.
4. Pronotum, scutellum and metanotum black or nearly black. Gaster black. Propodeum of male not very coarsely carinate, more sloping ..... 5.
— Pronotum, scutellum and metanotum more or less yellow, never all these parts completely black. Gaster completely black or second gastral tergite with red spots. Propodeum of male in some forms very coarsely carinate and in lateral view more angular ..... 6.
5. Female : fore and mid trochanters, femora and tibiae yellow, basal $^3/_5$ of hind tibiae yellow. Male : fore and mid trochanters black, fore and mid



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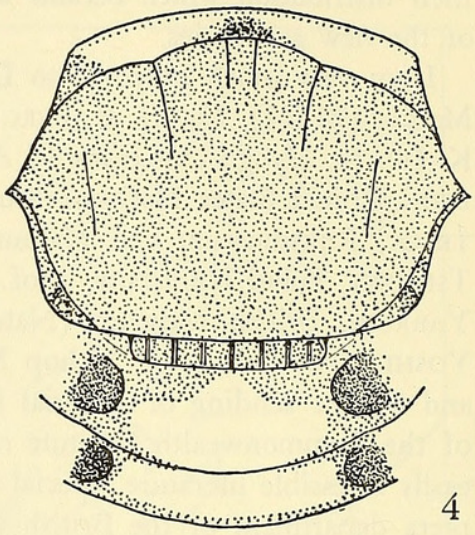

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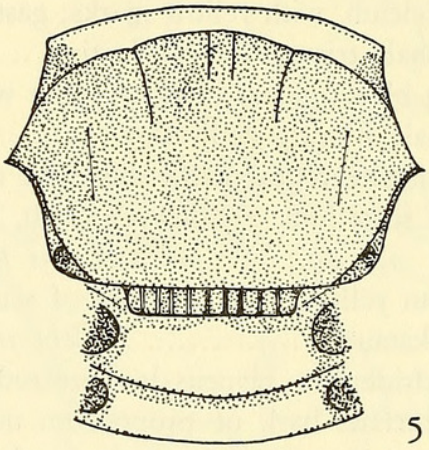

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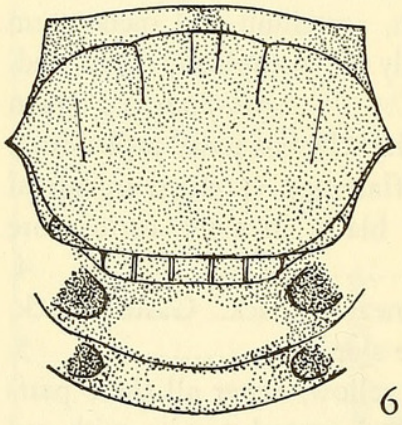

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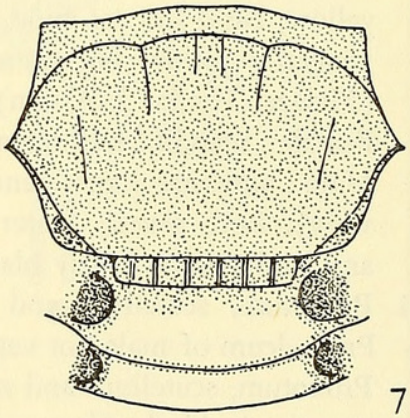

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Fig. 3—7. Dorsal side of thorax of two species of the group of *Psenulus pulcherrimus*, showing variation in colour-pattern. 3, *P. sogatophagus* Pagden, ♀, from Malaya; 4, *P. sogatophagus* Pagden, ♀, from Thailand; 5, *P. carinifrons scutellatus* Turner, ♀, from Halifax, NE Australia; 6 and 7, *P. carinifrons scutellatus* Turner, ♂, both Halifax, NE Australia

femora dorsally black with yellow knees, fore and mid tibiae yellow, basal half of hind tibiae yellow. (Japan) ..... *iwatai* Gussakovskij

— Fore and mid trochanters and femora in both sexes black or brown, fore femora partly yellow below. Female : fore and mid tibiae yellow, basal $^1/_3$ of hind tibiae yellow. Male : fore tibiae yellow or partly darkened, mid tibiae partly brown, hind tibiae almost completely dark brown or black, base paler. (New Guinea). ..... *carinifrons extremus* subsp. nova

6. Males (probably also the unknown females) with red spots on second gastral tergite (see also female of *P. carinifrons xanthognathus*). Pronotum and scutellum yellow, sometimes with a tendency to reduction, metanotum yellow ... 7.

— Gaster of male black, gaster of female black or black with red spots on second tergite ..... 8.

7. Male with distinct red markings on second tergite. Fore and mid trochanters and femora completely yellow. Basal $^6/_7$ of hind tibiae yellow. Scutum finely punctate. Back of propodeum moderately carinate, gradually sloping. Female unknown. (North India) ..... *carinifrons carinifrons* (Cameron)

— Red markings of male less distinct. Fore and mid trochanters yellow. Base of fore and mid femora black or dark brown. Basal $^3/_4$ of hind tibiae yellow. Scutum strongly punctate. Back of propodeum more coarsely carinate. Female unknown. (South India) ..... *carinifrons* subsp. nova?

8. Pronotum, scutellum and metanotum yellow with a tendency to reduction of yellow markings, pronotum sometimes completely black or dark brown. Fore and mid femora yellow. Female : gaster black, basal half or even less of hind tibiae yellow. Male : about basal $^2/_3$ of hind tibiae yellow. Back of propodeum as in nominate subspecies. (NE Australia) ..... *carinifrons scutellatus* Turner

— Pronotum, scutellum and metanotum yellow with a tendency to reduction but never completely black. Female : more than basal half of hind tibiae yellow. Male : hind tibiae usually with more yellow. Back of propodeum very coarsely carinate, in lateral view more angular ..... 9.

9. Gaster of female with two red spots (sometimes fused) on second tergite. Male : frons raised on both sides of median carina, distinctly punctate; fore and mid femora and trochanters completely yellow or partly darkened (Mindanao!); basal $^2/_3$ to $^5/_6$ of hind tibiae yellow. (Philippines) .... *carinifrons xanthognathus* Rohwer

— Gaster of female black. Male : frons less raised and indistinctly punctate, fore and mid femora and trochanters completely yellow, basal $^5/_6$ of hind tibiae yellow (Java) or trochanters completely and fore and mid femora partly black and basal $^3/_4$ of hind tibiae yellow (N Borneo). (Malaya, Sumatra, Java, Kangean Islands, Buru, Borneo) ..... *carinifrons rohweri* Van Lith

Psenulus pulcherrimus pulcherrimus (Bingham)

1896, Bingham, J. Linn. Soc. Zool. 25 : 443, ♀ (*Psen pulcherrimus*).
1897, Bingham, Fauna of British India 1 : 263.
1962, Van Lith, Zool. Vrh. 52 : 101 (*Psenulus pulcherrimus*).

The type from Amherst (Tenasserim) is in the collection of the British Museum (Natural History), London. It seems to be the only specimen known so far.

Psenulus pulcherrimus projectus Van Lith

1962, Van Lith, Zool. Verh. 52 : 102—103.

A fair number of specimens was recorded in 1962 from East and West Java and also a female from Krakatau. There are no new records.

Psenulus sogatophagus Pagden

1933, Pagden, Trans. Royal Ent. Soc. London 81 : 97—101.
1962, Van Lith, Zool. Verh. 52 : 109—110.
?1963, Tsuneki, Etizenia, Fukui Univ. 4 : 15—16 (*P. carinifrons*).

This species closely resembles *P. carinifrons rohweri*, having a black gaster and the tendency to reduction of the yellow markings of the thorax (Fig. 3 and 4). The female is easily distinguished from *P. carinifrons* by the quadridentate mandibles; the clypeus is somewhat less protruding. In the male the back of the propodeum is less coarsely carinate than in *P. carinifrons rohweri*; the last antennal segment is less flattened and less pointed than in *P. carinifrons.*

Hitherto this wasp was only known from one locality in Perak, Malaya. I received for identification from Prof. IWATA a female from Thailand which I could compare with a paratype from Malaya; undoubtedly it also belongs to *P. sogatophagus.* It was collected at Prew, 10 Jan., 1963, by A. NAGATOMI (HUA). The yellow marking on the pronotum is slightly reduced medially and laterally; the yellow marking on the scutellum is larger, covering the posterior half and medially produced triangularly so that it reaches the anterior margin (Fig. 4).

It is possible that the male mentioned by TSUNEKI (1963) from Thailand (Pakpanang), 14 July, 1961, coll. K. IWATA (HUA), belongs to the same species and not to *P. carinifrons rohweri.*

The species seems even to occur also in Assam. I have studied two males from Chabua, 29 Oct., 1943, coll. D. E. HARDY (USNM). They have a nearly black pronotum, the lower half of the pronotal tubercles is yellow whilst the scutellum and the metanotum are black except the reddish-black posterior margin. The identification should be confirmed, however, by the capture of a female in this locality.

Psenulus iwatai Gussakovskij

1934, Gussakovskij, Mushi 7 : 84—86, ♀ (*Psenulus (Eopsenulus) iwatai*).
1938, Iwata, Mushi 11 : 23—25.
1956, Tsuneki, Akitu 5 : 9, ♀ and ♂.
1958, Tsuneki, Akitu 7 : 54.
1962, Van Lith, Zool. Verh. 52 : 100.

P. iwatai is the Japanese representative of the group. It is easily recognized by the completely black thorax (except the pronotal tubercles which are brownish); the legs for the greater part are yellow. In *P. carinifrons extremus* from New Guinea the thorax is nearly completely black but the legs are much darker than in the Japanese form.

The inner tooth of the mandibles is very distinct.

I suppose that *P. iwatai* is closely allied to *P. carinifrons* and probably is a subspecies of the latter. It is advisable, however, to defer a decision until more material will become available.

The subgenus *Eopsenulus* which Gussakovskij created for this Japanese species should certainly include the whole group of *P. pulcherrimus.*

Psenulus carinifrons carinifrons (Cameron)

1902, Cameron, J. Bombay Nat. Hist. Soc. 14 : 288—289, ♂ (*Psen cerinifrons*).
1962, Van Lith, Zool. Verh. 52 : 103—104.

There are two males in the British Museum (Natural History), collected by Col. C. G. NURSE. One is the holotype (no. 21.834) bearing the label "Deesa 6.98"; the paratype is labelled "Deesa 6.97". Deesa is situated in Gujarat, India.

In the holotype the red anterolateral parts of the second gastral tergite are confluent; in the paratype these red markings are well-separated. The fore and mid trochanters and the fore and mid femora are completely yellow, the hind tibiae are for the greater part yellow, only about the apical seventh part somewhat brown.

The female is unknown.

P. sinclairi Lal from Padegaon, Bombay, is certainly closely related. As the collecting localities of *P. carinifrons* and *P. sinclairi* are not so far distant one from the other, further study of the latter holotype and of females from both localities would be interesting.

Psenulus carinifrons scutellatus Turner

1912, Turner, Ann. & Mag. Nat. Hist. [8] 10 : 54, ♀ (*Psenulus ? scutellatus*).
1916, Turner, Ann. & Mag. Nat. Hist. [8] 17 : 128 (*Neofoxia scutellatus*).
?1917, Turner, Mem. Dept. Agric. India 5 : 173 (*Neofoxia scutellatus*).
1962, Van Lith, Zool. Verh. 52 : 108 (*Psenulus scutellatus*).

In the female of this subspecies the transverse carina below the antennae is only slightly raised, but still distinct, whereas in the other forms of the group this carina is hardly visible. The course of the recurrent veins of the fore wings often varies somewhat in *Psenulus;* apparently it is also the case in this subspecies, the first recurrent vein being interstitial in the female from Halifax whilst in the female from Cairns, according to the original description, this vein ends just in the second submarginal cell. The extension of the yellow markings on the thorax is also very variable.

Female. — In the holotype from Cairns the pronotum is black, also the pronotal tubercles are black. In the female from Halifax only the outer ends of the pronotum are darkened, the pronotal tubercles are yellow.

In the female from Cairns the scutellum has a yellow band on the hind margin about half as broad as the scutellum, whilst in the female from Halifax (Fig. 5) the scutellum is almost completely yellow with the exception of a narrow anterior margin. Only the median part of the metanotum is yellow in the female from Cairns but the metanotum is completely yellow in the female from Halifax.

Male. — In the male collected by VEITCH in N Queensland the yellow band on the pronotum is somewhat reduced laterally; the pronotal tubercles are yellow. In one of the males from Halifax the dorsal yellow band of the pronotum is reduced to two long patches; in another male from this locality, collected on the same day, the pronotum is completely black (Fig. 6 and 7). In the latter specimen the yellow mark on the pronotal tubercles is slightly reduced.

In both males from Halifax the dark brown anterior margin of the scutellum is somewhat broader than in the female from this locality, especially on the sides. In the male from Cairns the fore part of the scutellum is not visible. In all males the yellow marking of the metanotum is more or less reduced laterally.

The fore and mid legs including the trochanters are yellow in both sexes. In the female about the basal half of the hind tibiae is yellow; in the male about two-thirds of the tibiae are yellow. The gaster is always completely black.

NE Australia, Queensland. Material examined : 1 ♀ (holotype, no. 21.839), Cairns, coll. R. C. L. PERKINS (BM); 1 ♀, Halifax, 30 June, 1919, coll. F. X. WILLIAMS (BISH); 1 ♂, June-July, 1918, R. VEITCH (BM); 2 ♂, Halifax, 8 and 30 June, 1919, F. X. WILLIAMS (BISH).

TURNER (1912) correctly remarked that this form, as well as *P. interstitialis* Cameron, differs from what he called the true *Psenulus*. In 1917 he also recognized *P. xanthognathus* Rohwer from Luzon as a closely allied species. I have not seen the female from Dacca (N India), mentioned by TURNER (1917) and provisionally named *P. scutellatus*, but I suppose that this will prove to be another subspecies. According to TURNER the insect from Dacca is nearer to the Queensland than to the Luzon form.

In 1962 I left the possibility open that *P. scutellatus* Turner and *P. carinifrons rohweri* Van Lith might prove to be synonymous. After the study of the aforementioned material from Australia and taking into account the difference in the sculpture of the hinder part of the propodeum in the males of the two forms, I now think that they are different subspecifically.

Psenulus carinifrons xanthognathus Rohwer (Fig. 1)

1910, Rohwer, Proc. U.S. Nat. Mus. 37 : 660, ♂ (*Psenulus (Neofoxia) xanthognathus*).
1921, Rohwer, Phil. J. Sc. 18 : 312 (*Diodontus xanthognathus*).
1923, Rohwer, Phil. J. Sc. 22 : 601.
1962, Van Lith, Zool. Verh. 52 : 104—107 (*Psenulus carinifrons xanthognathus*).

This seems to be a common species in the Philippines but nevertheless the following new records since 1962 may be of interest.

Luzon : Los Baños, 2 ♀, Aug. 1916 and 1917, F. X. WILLIAMS, 1 ♂, June, 1916, F. X. WILLIAMS, 1 ♂, July, 1916, F. MUIR (all BISH); 1 ♀, Pateros, Prov. Rizal, 27 Dec., 1953, S. R. CAPCO; 1 ♀, Baguio, Mountain Prov., 5000 ft., 20 Oct., 1954, C. R. BALTAZAR; 1 ♂, Lipa City, Prov. Batangas, 15 March, 1955, C. MACABASCO (all BPIM); 1 ♀, Manila, 21 Dec., 1952, TOWNES family (FERG).

Mindanao : 1 ♀ and 1 ♂, Lake Lanao, 3 Nov., 1921, F. X. WILLIAMS; 1 ♀, Zamboanga del Norte, Manucan, 25 km S, 500 m, 18 Oct., 1959, L. W. QUATE (all BISH).

The female from Manila has completely yellow fore and mid trochanters and

femora, as seems to be the rule in the females from Sibuyan and Negros. This proves again the variability of at least one of the species.

The abovementioned specimens from Mindanao show a distinct reduction of the yellow markings, in accordance with what I have found earlier. Only the basal $^3/_5$ or $^2/_3$ of the hind tibiae are yellow. In the females the pronotum, scutellum and metanotum are completely yellow but in the male from Lake Lanao the yellow markings of the pronotum and of the metanotum are reduced laterally, whilst the scutellum is darkened anteriorly. There is some difference in the extension of the red spots on the second gastral tergite, which are confluent in the female from Zamboanga del Norte, but separated, indistinct, and much darker in the female from Lake Lanao.

Psenulus carinifrons rohweri Van Lith

1962, Van Lith, Zool. Verh. 52 : 108.

This subspecies differs from the Australian *P. carinifrons scutellatus*, in which the gaster is also completely black in both sexes, by the larger extension of the yellow colour on the hind tibiae and by the more coarsely carinated back of the propodeum of the male.

Although this form has not been collected in large series it does not seem to be very rare; it has a comparatively large area of distribution, covering Malaya, Sumatra, Java, Kangean Islands, Buru and Borneo. Here are some new records from Java and Borneo.

Java : 2 ♂, Gopeng (= Kopeng?, E Java, Res. Semarang), coll. H. H. BANKS (OUM).

North Borneo : 1 ♀, Keningan, 12—17 jan., 1959, coll. T. C. MAA; 1 ♂, SE North Borneo, Forest Camp, 9.8 km. SW of Tenom, 19 Dec., 1962, coll. Y. HIRASHIMA (BISH).

In the Bornean specimens the legs are blacker than in the wasps from Java, the Kangean Islands and Buru. In the abovementioned female and male from Borneo all trochanters are black and the basal half or even a greater part of the fore and mid femora is black whilst in the Javanese form the fore and mid trochanters and femora are yellow. About three quarters of the hind tibiae are yellow which is also less than in the more southern material. The pronotal yellow band shows some lateral and median reduction.

Because the material is too restricted I hesitate to consider the Bornean specimens as a separate subspecies and have provisionally labelled these *P. carinifrons rohweri*. It is to be hoped that a later revision, based on good series, preferably from Malaya, Sumatra and Borneo, may solve this problem.

Psenulus carinifrons extremus subsp. nova

Female. — Head black, scape of antennae brown, foreside partly yellow, underside of flagellum brown. Mandibles yellow except brown base and reddish-brown tips. Palpi testaceous.

Thorax and gaster black, only posterior half of scutellum and median part of metanotum brownish-black. Pronotal tubercles and tegulae dark brown. Fore and mid femora and trochanters brown, ends of femora yellow. Fore and mid tibiae yellow, basal half of fore and mid tarsi yellow. Basal third of hind tibiae paler yellow, apical thorns yellowish. Veins of wings brown.

Frons indistinctly not densely punctate, slightly convex on either side of frontal carina. Vertex shining, punctures minute, hardly visible (30 ×). Thorax shining, punctures sparse and not sharp. Back of propodeum smooth, sides with fine and densely reticulate carination.

Pubescence of face silvery, mostly appressed below antennae. Pubescence of rest of body whitish, rather dense on mesosternum, last apical sternite and apices of hind tibiae.

Male. — Fore and mid legs brown, including trochanters, but outer end of trochanters somewhat yellow, also underside of fore femora, greater part of fore and mid tibiae and fore tarsi except last segment yellow. Hind tibiae dark brown, base paler brown. Apical thorns of hind tibiae pale yellow.

Propodeum with almost smooth base behind enclosed area, back of propodeum with dense irregular carination, not as coarse as in *P. carinifrons xanthognathus*.

This subspecies is very similar to the Australian subspecies, *P. carinifrons scutellatus*, but it is easily recognized by the almost completely black thorax in both sexes. The legs are much darker than in any of the other subspecies.

New Guinea : 1 ♀ (holotype), NE New Guinea, Moife, 2100 m, 15 km northwest of Okapa, 11—13 Oct., 1959, coll. T. C. MAA (BISH); 2 ♂ (allotype and paratype), W New Guinea, near Kampong Agameda, coll. W. J. ROOSDORP (ML). According to information received from Mr. ROOSDORP the village of Agameda is situated near the Arabu River, about 10 km east of the Wissel Lakes.

Psenulus sinclairi Lal

1939, Lal, Indian J. Ent. 1 : 49—50, ♀ (recte: ♂).

Original description: "Female. — General colour of body dark. Mandibles, except teeth, which are black, scape of antennae, pronotum, fore and middle legs, except coxae and tarsi, hind tibiae except apices, a broad median transverse stripe on mesoscutellum and another narrower one on the metanotum deep yellow. Labial and maxillary palpi and fore and middle tarsi pale stramineous. The parts of antennae facing each other, tegulae, and apices of hind tarsi brownish orange. Wings clear hyaline, veins and stigma brown (Textfig. 1).

Head broad, transverse, deeply punctate, clypeus densely covered with silvery pubescence longitudinally arranged, antennae inserted a little further from the eyes than from each other, 13-segmented, scape twice as broad anteriorly as at base, pedicel hardly one-third the first flagellar segment, which is the longest, eyes large, extending from apex of clypeus to base of occiput, ocelli in middle of vertex, large, well separated from one another, forming a triangle and more or less transparent, frons sparsely pubescent, a small tuft of silvery pubescence immediately behind bases of antennae, frons faintly divided by a suture from anterior

ocellus to middle of area between antennal bases. Thorax broadest between tegulae, pronotum narrow and collar-like, mesonotum large, broad, punctate, sparsely pubescent, metanotum more densely pubescent than mesonotum, fore wing about three-fourths the lenght of body, of the three cubital cells, measured on the cubital nervure, the first is about twice and the second is slightly more than half as long as the third, hind wing with the cubitus originating beyond transverse median by a distance equal to the length of the transverse median, legs stout, hind tibiae with two apical spurs, a short stout one and another more than twice its length, basally pubescent. Petiole about one-third the length of abdomen, smooth and shining. Abdomen long, oval, segments with silvery white pubescence disposed in oblique curves diverging towards sides, except transverse narrow apical stripes of segments II, III and IV, ovipositor short. Length 7 mm.

Holotype obtained from the burrow of a stem borer in sugar cane at Padegaon, Bombay. Coll. G. S. KARKHANIS. (C.S. 79. 5.III.1937). It is deposited in the Pusa collection (H/7481).

Unfortunately I did not have the opportunity to examine the holotype. From the description and from the drawing representing the whole wasp (× 9) it is evident that it is a male, not a female; the author must have been misled by the gastral spine.

There is no doubt that this wasp is closely allied to *P. carinifrons*. The localities where *P. sinclairi* and the holotype of *P. carinifrons* have been found are not very distant. The description does not say anything, however, about the red parts of the second gastral tergite which are conspicuous in the nominate form. If the gaster is indeed fully black it is probable that the male described by LAL is a distinct subspecies of *P. carinifrons*. It certainly is also closely related, perhaps even identical with the male from Coimbatore mentioned in this paper as a probable subspecies of *P. carinifrons*. I prefer to defer a decision until also the females of these forms are known; an examination of the mandibles of the females would then be necessary to ascertain whether these are quadridentate as in *P. sogatophagus* or tridentate as in the other forms of the group.

Psenulus carinifrons subsp. nova?

A male from South India differs from the nominate subspecies in the following details: the base of the second tergite is indistinctly reddish coloured. Pronotum dorsally completely yellow. Basal half of fore and mid femora black or dark brown (trochanters yellow). The apical fourth of the hind tibiae is dark brown. Scutum strongly punctate. Frons slightly stronger punctate than in nominate subspecies.

The carination of the back of the propodeum seems to be coarser, but this part being covered by the wings, a good comparison was not possible.

As only one specimen is available and therefore only one sex could be studied, it seems to be premature to separate this form, although the strong puncturation of the scutum will probably prove to be a good character. The darkening of the fore and mid femora may be less important as this often also occurs in the Philippine subspecies *xanthognathus* whilst I have seen one or two females with completely yellow trochanters and femora. Also in *P. carinifrons rohweri* the colour of fore

and mid femora may vary. In how far this is related with insular isolation remains an interesting subject for later study after sufficient material would become available. For the present we shall have to be contended with the few specimens scattered over collections in the Old and in the New World.

Apart from the somewhat reddish second gastral tergite this subspecies closely resembles *P. carinifrons rohweri.* However, the scutum of the latter form is much finer punctate. Also *P. carinifrons xanthognathus* is closely allied but also has a slightly weaker puncturation of the scutum and the frons is more convex.

It is possible that the specimen from Coimbatore and *P. sinclairi* Lal from Bombay — no females from either locality are available — are identical but unfortunately I could not study the holotype of the latter form.

South India : Coimbatore, Sept., 1955, coll. P. S. NATHAN (FERG).

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