

THE *HEMIPEPSIS* SPECIES OF JAVA
(Hym., Pompilidae)

by

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The spider wasps or *Pompilidae* of Indonesia are very imperfectly known, and even the identification of the largest species presents considerable difficulties.

The study of some hundreds of specimens of *Hemipepsis*, collected in different parts of Java, has shown that the number of species occurring in this island is at least sixteen. Eight of these were apparently unknown, and are described in the following pages; the others are redescribed since the existing descriptions are very short and incomplete.

While our study of this subject was in progress, we were informed about the very unfortunate fate of Dr H. HAUPT's monograph: "Die Gattungen der Pepsinae der Erde", which was in the press in 1945 in Halle, but was never published as a result of disturbances during the last days of the war. Dr HAUPT informed us that he did not know when the paper could be printed again and kindly sent us a proof for comparison with our preliminary manuscript. One of our new species proved to have been named by Dr HAUPT, and as his paper should have appeared before ours, the name applied to this species by Dr HAUPT is used in this revision and his description is verbally quoted from the proof.

The Javan species of *Hemipepsis* DAHLB. can be arranged in a small number of groups, some of which undoubtedly deserve to be regarded as subgenera. One of these groups is rather heterogeneous, and has therefore not been given a subgeneric name. In the opinion of the first author a satisfactory division into subgenera cannot be given on the basis of the limited material at hand ¹⁾.

Besides the material in the collections of the authors we have examined a considerable number of Javan *Hemipepsis* from other sources. The senior author studied the collections of the Museum Zoologicum at Bogor, the British Museum (Natural History) at London, the Naturhistoriska

¹⁾ The second author would have preferred an arrangement somewhat different from the one given in this paper.

Riksmuseum at Stockholm, the Musée Zoologique at Strassbourg, and that of Dr J. G. BETREM. Unfortunately the latter collection was partly destroyed during the war. The junior author examined the *Hemipepsis* species in the following collections in the Netherlands: Riksmuseum van Natuurlijke Historië, Leiden; Zoölogisch Museum, Amsterdam; Natuurhistorisch Museum, Rotterdam; Laboratorium voor Entomologie, Landbouwhogeschool, Wageningen. We wish to express our sincere thanks to the authorities of these institutions for their valuable cooperation.

The illustrations in this paper have been prepared by the junior author. The types of the new species are available for examination in the "Riksmuseum van Natuurlijke Historië" at Leiden.

Very little is known of the habits of the *Hemipepsis* species. Most species are inhabitants of dense forest growth. BINGHAM (Jl. Bombay Nat. Hist. Soc. 13, 1900, p. 177-180) published an account of a fight between *Hemipepsis sycophanta* GRIB. and a large spider of the genus *Galeodes*. This indication that the prey of these wasps consists of spiders appears to be confirmed by an observation made by WILLIAMS in the Philippine Islands (Bull. Haw. Sugar Exp. Station, Ent. Series, no. 14, 1919, p. 89): "A *Salix* sp., an insect fully as large as *Macromeris*, but with black and orange wings, and much like *Pepsis formosa*, or the "Tarantula Hawk" of the West and Southwest United States, was once seen hunting for a spider which she had flushed in the neighbourhood of a *Macromeris* nest". It seems fairly certain that this wasp was a *Hemipepsis*.

On the other hand, BINGHAM wrote concerning *Hemipepsis elizabethae* (BINGH.) in Jl. Bombay Nat. Hist. 8, 1893, p. 373: "It is not uncommon here (in Tenasserim) in the dense forests on the higher ranges at from 1,000 to 4,000 ft elevation. In May I chanced on one, a ♀, carrying a huge grasshopper clasped tightly between its forelegs". He was unable to procure this specimen, however, and the possibility that he actually observed a Sphecoid wasp and not a *Hemipepsis* cannot be excluded. A few years later, the same author stated that some species of "*Salix*" (a group including *Hemipepsis*, *Cyphononyx* and other genera) "provision their nests with cockroaches, or, like the *Larridae*, with crickets" (Fauna of British India, Hymenoptera, I, 1897, p. 123). On p. 148 of the same work BINGHAM claims to have seen one species of *Pompilus* carrying small cockroaches to its nest. We have considerable doubt as to whether these observations are reliable. Wherever detailed observations on the habits of the Pompilidae have been made, these wasps have always been found to prey on spiders. RICHARDS and HAMM (Trans. Soc. Brit. Ent. 6, 1939, p. 53) mention "two puzzling exceptions", but the first of these is certainly

based on a misidentification, for *Pseudagenia blanda* (GUÉR.), doubtfully recorded by SHELFORD as preying on crickets in Borneo, provisions her nests with spiders in India and in Java and undoubtedly does the same elsewhere.

In our opinion much more reliable evidence is needed before we can conclude that there exist indeed Pompilids which have deviated so far from the usual pattern of behaviour of the members of this family as to prey on insects instead of spiders. It seems desirable to stress this point, because certain insufficiently founded statements have found their way into modern textbooks of entomology. ESSIG, for instance, writes in "College Entomology" (1942): "They [the nests of the Pompilidae] are usually provisioned with spiders, and rarely with crickets, cockroaches, beetles, and other insects".

Key to the species

Females

- 1. Distal end of marginal cell broadly rounded (fig. 1); first transverse cubital vein strongly curved. Mesoscutum and scutellum with median carina. Second abscissa of radius longer than the third (subg. *Moropepsis* BANKS) 2
- Distal end of marginal cell more or less acute (figs. 2-5); first transverse cubital vein slightly curved or almost straight. Second abscissa of radius shorter than the third 3
- 2. The second recurrent vein meets the cubitus beyond the middle of the base of the third submarginal cell. Fore wing dark, with a well defined subcircular hyaline spot, which is covered with a fine silvery, very slightly yellowish, tomentum (fig. 1). Length 40-50 mm *avicula* (SAUSS.)
- The second recurrent meets the cubitus before the middle of the base of the third submarginal cell. Fore wing without hyaline spot, fuscous at base (less dark than in *H. avicula*), paler beyond the basal vein, here yellowish brown, apical margin darker, especially at tip. Length 40-50 mm *anthracina* (SMITH)
- 3. Hind tibiae dorsally with a distinct carina or with a row of separate teeth. In most species mandibles bluntly rounded at apex 4
- Hind tibiae without carina or separate teeth, at most with faint indication of blunt carina in apical fourth. Posterior angles of mesopleura projecting. Mandibles thin, with acute tip. (In the Javan species abdomen red, first segment partly or entirely black; wings fuscous). (subg. *Rhodopepsis* n. subg.) 13

4. Hind tibiae with a row of separate teeth. (Second abdominal segment without distinct transverse groove. Second discoidal cell with fairly distinct pocket in lower proximal corner. Wings fuscous) 5
- Hind tibiae with continuous carina; this carina may be more or less serrate, but it is always well visible between the teeth 6
5. Posterior rim of propodeum with distinct lateral angles. Declivity of propodeum not distinctly transversely striate. (Black; mouth parts, antennae, tibiae and tarsi more or less extensively dark ferruginous). Length 23-27 mm *vulcanica* n. sp.
- Lateral angles of propodeal rim rounded, not projecting. Declivity of propodeum transversely striate. (Body more extensively ferruginous). Length 18-22 mm *aeruginosa* (SMITH)
6. Dorsum and declivity of propodeum not clearly differentiated, in profile forming an unbroken arc. Length 14 - 18 mm 7
- Dorsum and declivity of propodeum clearly differentiated, the boundary more or less angular, often marked by one or two transverse ridges which are higher than the others on the dorsum 8
7. Apex of mandibles bluntly rounded. POL: OOL = 1:2. Postnotum long, on each side of the middle about as long as the postscutellum; its surface not distinctly transversely striate. Dorsum of propodeum with or without median furrow. Marginal cell of fore wings more than three times the length of the stigma. (Wings fuscous or yellowish hyaline) *mellerborgi* (DAHLB.)
- Apex of mandibles rather acute. POL: OOL = 10:11. Postnotum shorter than postscutellum. Dorsum of propodeum without median furrow. Marginal cell of fore wing hardly more than twice as long as the stigma. (Wings fuscous) *jacobsoni* n. sp.
8. Posterior ocelli small, distinctly closer to each other than to the eyes; POL: OOL = 4: 6 to 7. (Wings dark fuscous, fore wing with large spot or band of fine silvery pubescence, fig. 2). Length 38-46 mm, rarely smaller *speculifer* (LEP.)
- Posterior ocelli relatively large, about as far from each other as from the eyes. (Wings orange yellow, sometimes slightly infuscated at apical margin) 9
9. Last segment of hind tarsi strongly curved and distinctly longer than the third. Inner spur of hind tibiae short, less than one fifth of the metatarsus, its bare apical part much shorter than the brushy base (fig. 9a). Third submarginal cell twice as wide as high (fig. 3). Lateral (vertical) areas of postnotum not costate. Length 35-50 mm. *gigas* (TASCH.)

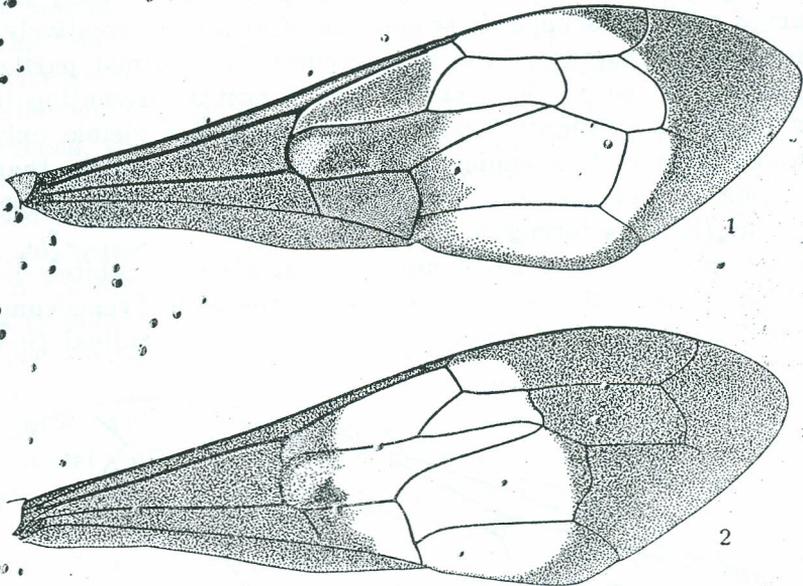


Fig. 1. *Hemipepsis avicula* (SAUSS.), ♀, fore wing. Fig. 2. *H. speculifer* (LEP.), ♀, fore wing.

- Last segment of hind tarsi normal, about as long as the third. Inner spur of hind tibiae $\frac{1}{4}$ - $\frac{1}{3}$ of metatarsus, its bare apical part relatively longer (fig. 9b) 10
- 10. Posterior rim of propodeum with prominent lateral angles. (Propodeum ferruginous; sixth abdominal tergite with dark brown pubescence and black bristles. Apex of wings slightly infuscated ¹⁾). Length 25-35 mm **australasiae** (SMITH)
- Lateral angles of propodeal rim bluntly rounded. (Propodeum dark brown or black; pubescence and bristles on sixth tergite ferruginous, sometimes a little darker on the basal part of the tergite) 11
- 11. First abscissa of cubitus in fore wing (fig. 3) strongly thickened, running in a flat S-shaped curve; first abscissa of discoideus (base of first discoidal cell) only three fifths of length of first recurrent vein; proximal part of first discoidal cell strongly plicated, with an opaque and densely pubescent spot in its centre; third submarginal cell twice as wide as high. Lateral (vertical) areas of postnotum not transversely costate. (Femora almost entirely fuscous). Length 40-50 mm **crassinervis** n. sp.

1) A female from Ledokombo, East Java, measures only 16 mm and has the apical margin of the wings more strongly infuscated than usual.

- First abscissa of cubitus in fore wing (fig. 5) moderately thickened, curved only at the base; first abscissa of discoideus relatively longer, about three fourths of the first recurrent; proximal part of first discoidal cell with a long and narrow fenestra, presenting itself as an oblique and slightly opaque streak which is visible only when viewed from certain angles; third submarginal cell less than twice as wide as high. Lateral (vertical) areas of postnotum transversely costate. (Femora ferruginous) 12
12. Large species, length 25-40 mm. First abscissa of cubitus distinctly thickened and rather strongly curved at the base. Propodeum rather wide and short, its dorsum with a shallow longitudinal furrow on

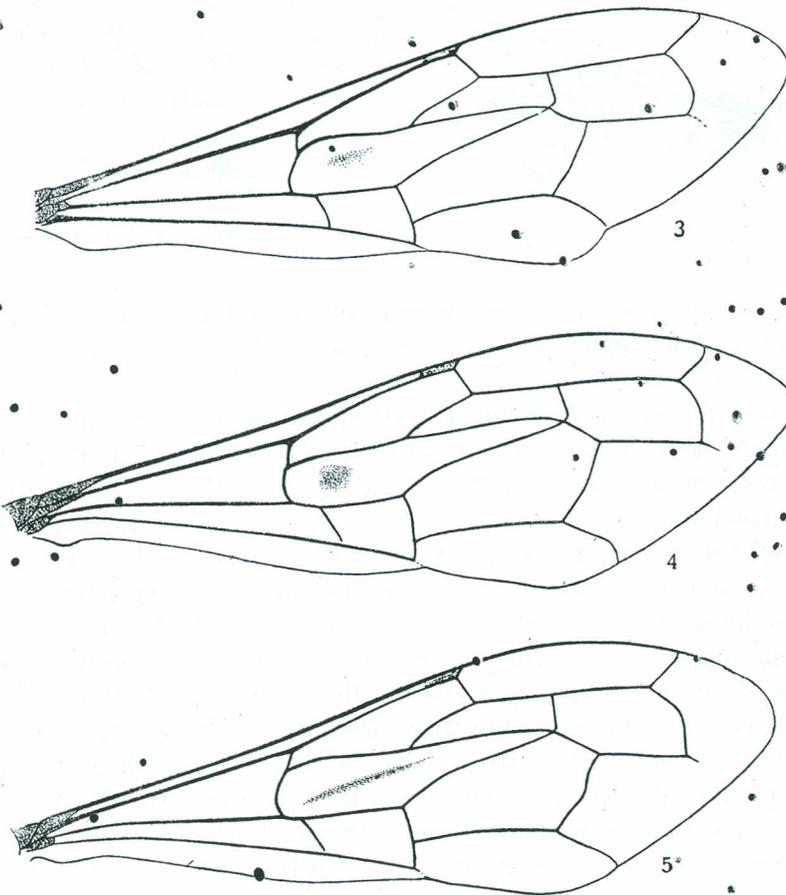


Fig. 3. *Hemipepsis crassinervis* n. sp., ♀, fore wing. Fig. 4. *H. gigas* (TASCH.), ♀, fore wing. Fig. 5. *H. aureomicans* HAUPT n. sp., ♀, fore wing.

- each side above the stigmal furrow; the latter less pronounced than in the following species; upper half of declivity with a few feeble transverse ridges **aureomicans** HAUPT n. sp.
- Smaller species, length 19-26 mm. First abscissa of cubitus scarcely thickened, slightly curved at the base. Propodeum relatively longer and narrower, its dorsal area rather evenly convex; the declivity almost smooth **velutina** n. sp.
13. Clypeus truncate anteriorly (fig. 10a). (Labrum black or dark reddish. Head not strongly shining. First abdominal tergite partly reddish). Length 20-25 mm **nigricornis** n. sp.
- Clypeus shallowly emarginate anteriorly (fig. 10b) 14
14. Head, pro- and mesonotum strongly shining. Labrum black, finely punctate, with distinct shining interspaces. (Antennae and first abdominal segment black). Length 18-22 mm . . . **quadridentata** n. sp.
- Head only very slightly shining, pro- and mesonotum dull. Labrum ferruginous, very finely and densely punctate without distinct interspaces. (At least the basal three antennal segments ferruginous above) 15
15. Head thick, much less narrowed behind the eyes than in the other species of this subgenus; in profile the temples more than half as wide as the eyes. Pronotum with a rather deep median impression. (First abdominal segment black). Length 25-30 mm **kangeanensis** n. sp.
- Head strongly narrowed behind the eyes, in profile the temples only one fourth as wide as the eyes. (First abdominal segment red, blackish at base). Length 15-22 mm **fervida** (SMITH)

Males ¹⁾

1. Distal end of marginal cell broadly rounded (fig. 1). Sixth abdominal sternite with median tooth or lamella. Mid and hind tarsi strongly compressed. (Large species, black with black pubescence). (subg. *Moropepsis* BANKS) 2
- Distal end of marginal cell more or less acute (figs. 2-5). Sixth abdominal sternite with on each side a longitudinal carina, ending at the hind margin in a small tooth 3
2. The second recurrent vein meets the cubitus beyond the middle of the base of the third submarginal cell. Antennae as long as hind tarsi or slightly shorter. (Fore wing dark fuscous, with large subcircular hyaline spot). Length 26-32 mm **avicula** (SAUSS.)

1) The males of *H. vulconica* n. sp. and *H. nigricornis* n. sp. are unknown.

- The second recurrent vein meets the cubitus before the middle of the base of the third submarginal cell. Antennae longer than the hind tarsi. (Fore wing light brown, darker at base and apex). Length 28-33 mm **anthracina** (SMITH)
3. Claws of front tarsi slightly curved; the basal two thirds broad and almost parallel-sided, with one small tooth on inner side at the end of this basal part. Posterior rim of propodeum rounded at the sides . . . 4
- Claws of front tarsi rather strongly curved, on inner side with two distinct and usually rather acute teeth (fig. 7). Posterior rim of propodeum with prominent lateral angles 5
4. Antennae distinctly crenulate. (Clypeus with a central dark spot (always?). Wings brown; abdomen black). Length 12-13 mm **aeruginosa** (SMITH)
- Antennae scarcely crenulate. (Clypeus yellow. Wings light brown with dark tip or entirely flavo-hyaline. Abdominal segments brownish yellow with dark broad apical band, the first tergite also dark at base). Length 11-13 mm **mellerborgi** (DAHLB.)
5. Claws of hind tarsi with one very blunt tooth at base, almost indented (fig. 6). (Wings dark, fore wing with large band or spot of fine silvery pubescence. Posterior lateral angles of dorsum of propodeum bluntly projecting. Large black species with black pubescence). Length 28-35 mm **speculifer** (LEP.)
- Claws of hind tarsi with two or three teeth 6
6. Disk of second abdominal tergite dull, densely covered with short blackish pubescence. (Metatarsi of mid and hind legs with basal comb, compare fig. 8; wings yellowish) 7
- Surface of second tergite not different from that of the others 8
7. Length 22 m, perhaps often larger **aureomicans** HAUPT n. sp.
- Length 13-18 mm. More slender than *H. aureomicans*; wings less strongly tinged with yellow; first abdominal segment longer in relation to its height (1.4:1, against 1.25:1 in *H. aureomicans*) and first discoidal cell more elongate (5:1, against 4.5:1) **velutina** n. sp.
8. Metatarsus of mid and hind legs with well developed basal comb (fig. 8). (Wings yellowish, propodeum dark brown or black) 9
- Mid and hind legs without metatarsal comb. 10
9. First abscissa of cubitus strongly thickened and running in a flat S-shaped curve (fig. 8); first discoidal cell rather short, widened proximally, and with a conspicuous longitudinal dark spot. (Tomentum on sides of thorax brownish. Front above antennae dark, except for

- a ferruginous line at inner orbits). Length 25-33 mm *crassinervis* n. sp.
- First abscissa of cubitus scarcely thickened and almost straight; first discoidal cell more elongate, its sides almost parallel; the basal dark spot almost circular. (Tomentum on sides of thorax brighter, more golden. Front above antennae ferruginous). Length 27-34 mm *gigas* (TASCH.)
10. Antennae 12-segmented. (Wings yellowish. Propodeum ferruginous). Length 18-60 mm *australasiae* (SMITH)
- Antennae 13-segmented. (Wings fuscous) 11
11. Posterior ocelli about as far from the eyes as from each other. Head, seen in front, not wider than high. Stigma of fore wing large, half as long as the marginal cell. (Head and pronotum dull ferruginous brown, front with dark median line; sides of pronotum partly blackish). Length 11-12 mm . . . *jacobsoni* n. sp.
- Posterior ocelli further from the eyes than from each other. Head wider than high. Stigma of fore wing shorter. Head and thorax black; antennae, mouth parts and legs more or less extensively ferruginous. Abdomen ferruginous, first segment partly or entirely black). (subg. *Rhodopepsis* n. subg.) . . 12
12. Head rather strongly shining; clypeus convex, its anterior margin depressed; labrum sparsely punctate; the shining interspaces much larger than the punctures; antennae short and thick, shorter than the hind tarsi, very

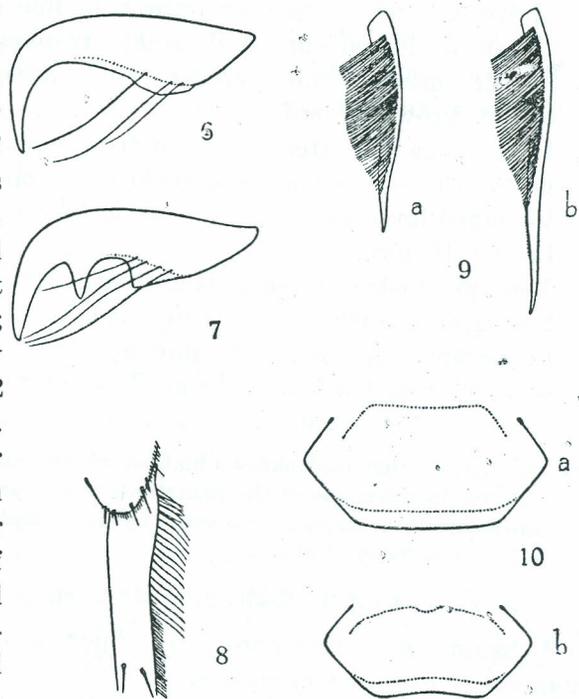


Fig. 6. *Hemipepsis specularifer* (LEP.), ♂, tarsal claw of hind leg. Fig. 7. *H. crassinervis* n. sp., ♂, tarsal claw of front leg. Fig. 8. *H. crassinervis* n. sp., ♂, basal comb of hind metatarsus. Fig. 9a. *H. gigas* (TASCH.), ♀, inner spur of hind tibia. Fig. 9b. *H. crassinervis* n. sp. ♀, do. Fig. 10a. *H. nigricornis* n. sp., ♀, clypeus. Fig. 10b. *H. fervida* (SMITH), ♀, do.

little crenulate; front with a fine impressed median line. Propodeum coarsely transversely costate; dorsum with a shallow longitudinal impression — widening posteriorly — on each side of the convex median part; the sides bluntly angular posteriorly; declivity steep and well separated from the dorsum. Black; second and following abdominal segments and the hind femora and tibiae dark red. Length 15-18 mm **quadridentata** n. sp.

— Head less shining; clypeus flattened, its anterior margin not distinctly depressed; labrum densely punctate, the interspaces smaller than the punctures; antennae longer than hind tarsi, distinctly crenulate; upper part of the median impressed line on the front widened and deepened. Propodeum dull, finely transversely striate; as seen in profile rather evenly rounded. Legs, except coxae and trochanters, bright brownish red 13.

13. Upper edge of flattened area of front above antennae straight, transverse. Clypeus truncate anteriorly. Pronotum with a rather deep V-shaped impression in the middle. (First abdominal segment black). Length 16 mm **kangeanensis** n. sp.

— The upper edge of the flattened area forms a curve on each side of the median furrow. Anterior margin of clypeus slightly concave. Pronotum only shallowly impressed in the middle. (First abdominal segment red, black at extreme base only). Length 12-14 mm **fervida** (SMITH)

Note. We suspect that the unknown male of *H. nigricornis* will agree with *H. fervida* (SMITH) in the shape of the pronotum; it will probably differ from this species in having the clypeus truncate anteriorly and the first abdominal segment more extensively black.

Group 1. Subgenus **Moropepsis** BANKS, 1934.

Labrum not incised anteriorly. Apex of mandibles bluntly rounded. Antennae of male not crenulate.

Thorax much higher than wide; pronotum short and high, its anterior face almost vertical. Mesoscutum posteriorly with a median carina, which is continued on the scutellum. Postscutellum scarcely convex lengthwise (both sexes), as long as the pronotum. Lower part of mesopleura not flattened or excavated; meso- and metapleura not projecting posteriorly. Dorsum of propodeum long, its junction with the short and almost vertical declivity well marked.

Second abdominal sternite in both sexes with a sharply defined transverse groove. Sixth sternite of male with a median tooth or lamella, and with a small tooth on each side at posterior margin.

Tarsi of mid and hind legs compressed, in the ♂ more strongly so than in the ♀. Dorsal carina of hind tibiae (?) entire or very weakly serrate, the spines along the inner side of the carina small and few in number. Claws in the ♀ with three teeth on inner side, the basal one small and sometimes indistinct, the apical one larger than the others; there are four closely set, strong, parallel bristles, and one fine bristle in front of these at the inner side of the claws. Claws of ♂ strongly bent, those of fore legs with two strong teeth on inner side, those of mid and hind legs with a variable number, usually 3 or 4, of minute teeth on inner side, sometimes these teeth almost obsolete.

Fore wing: marginal cell rounded at distal end; first transverse cubital vein strongly curved, not very oblique; first abscissa of cubitus longer than second. Third submarginal cell higher, but not wider, than the second. In the hind wing the strongly curved cubitus originates before the end of the submedian cell.

Type: *Hemipepsis croesus* BANKS 1934.

Hemipepsis avicula (SAUSS.) (fig. 1)

1867. *Mygnimia aviculus* SAUSURE, Reise der Novara, Zool. 2, 1, Hymenoptera, p. 64, ♀, pl. II, fig. 28. (Java).

1911. *Cryptochilus (Mygnimia) aviculus* SCHULZ, Zool. Ann. 4, p. 102 (Java, Borneo).

1935. *Mygnimia avicula* KALSHOVEN, Entom. Meded. Ned. Indië 1, p. 53, pl. 4, fig. 1, ♂.

♀. — Length 40-50 mm, fore wing 35-40 mm. Body slender, thorax more than $2\frac{1}{2}$ times as long as wide before the tegulae.

Anterior margin of clypeus truncate, rounded at the sides, narrowly depressed; anterior portion of clypeus as long as the basal, interocular, part. Relative lengths of third and fourth antennal segments = 5:3. Interocular distance on vertex equal to length of third antennal segment. POL:OOL = 2:3. Postnotum long, with at least 9 transverse ribs, the median groove widened posteriorly. Dorsum of propodeum with a feeble median impressed line, irregularly transversely costate, the costae stronger at the sides, many of them interrupted in the shallow longitudinal impression on each side of the middle; the junction with the declivity marked by a sharply raised, short, transverse carina; the declivity subvertical and smooth, only half as long as the dorsum.

Dorsal carina of hind tibiae very weakly sinuate, on inner side with only one or two short spines; outer side of hind tibiae with two irregular rows of 8-9 (above) and 5-6 short, appressed spines. Inner spur of hind tibiae a little shorter than one third of the metatarsus. Fifth tarsal segment of mid and hind legs longer than the third, slightly curved.

Third submarginal cell much narrowed anteriorly, on the radial vein distinctly narrower than the second; it receives the second recurrent vein beyond the middle of its base.

Black; wings dark fuscous, with a feeble purplish lustre at the apex; fore wing (fig. 1) with a large subcircular hyaline spot; fenestra at base of first discoidal cell pale brownish.

Body clothed with brownish black pruinosity; head, thorax and coxae with rather dense and long erect black hairs; abdominal sternites with a few long hairs in the middle; sixth segment with numerous black setae.

♂. — Length 26-32 mm. Body slender; antennae thick and short, equal to length of hind tarsi; relative lengths of third and fourth antennal segments = 4:3. Labrum rounded. Inner orbits parallel, slightly converging above. Postscutellum distinctly convex transversely, bluntly longitudinally carinate, but scarcely convex as the thorax is seen in profile. Length of dorsum of propodeum more than twice the height of the short subvertical declivity, their junction angular. Sixth sternite with a median vertical lamella, the posterior edge of which is furrowed; the sides of this structure are concave, continuous with a round, concave and shining impression of the sternite on each side of the lamella; the usual apical teeth are small, situated at the outer margin of the impressions.

Legs long, slightly spinose; mid and hind tibiae and tarsi densely clothed with short erect hairs, less distinct at the sides; at the under side of the tarsi these hairs are as long as the obliquely placed spines, which are therefore much less conspicuous than in the female. Inner spur of hind tibia a little longer than two fifths of hind metatarsus. Mid and hind tarsi strongly compressed.

Outer ramus of stipes with a row of about 10 denticles at under side; inner ramus with a few short hairs on outer side at apex, on inner side with a subcircular incision, bordered proximally by a sharp spine.

West Java: Djampang Tengah: 1 ♀ 3 ♂ Mt Tjisuru, 1933, Mrs WALSH (Mus. Bogor); 1 ♀ 2 ♂ Mt Malang, 1935, Mrs WALSH (coll. v. D. V.); 1 ♀ Mt Malang, 3-4000', September 1937, and 2 ♂ Mt Tjiung, July 1937, Mrs WALSH (Br. Mus.). Sukabumi: several specimens of both sexes, coll. LINDEMANS (Mus. Rotterdam); 1 ♀, OVERDIJKINK leg. (Mus. Bogor). Wijnkoops Bay: 1 ♀ Tjisolak, December 1936, F. DUPONT leg. (coll. WILCKE). Radjamandala (between Bandung and Tjiandjur): 1 ♀ March 1938 (Mus. Leiden); 1 ♂ 30 June 1935, L. J. TOXOPEUS (coll. v. D. V.). 1 ♀ "Java, Fruhstorfer" (Mus. Strassbourg).

This beautiful species seems to be restricted to a few areas in South West Java, where the original vegetation has not been entirely destroyed. It is less common here than *H. speculifer* (LEP.).

The first author has seen a few specimens from Borneo, one female in the Museum Zoologicum at Bogor and two males in the British Museum; they appear to be subspecifically different from the Javan form.

The striking resemblance between this spider wasp and a species of the Cerambycid genus *Nothopeus* (= *Coloborhombus*) has been discussed by various authors (see KALSHOVEN, l. c.).

Hemipepsis anthracina (SMITH)

! 1855. *Mygymia anthracina* SMITH, Cat. Hym. Br. Mus. 3, p. 183, ♂ (Java, Sumatra).

1891. *Salius (Hemipepsis) anthracina* CAMERON, Mem. Proc. Manch. Lit. Phil. Soc. (4) 4, p. 447 (additions to original description).

! 1897. *Salius anthracinus* BINGHAM, Fauna Br. India, Hym. I, p. 126, ♂ (nec ♀) (locality records not reliable).

1915. *Hemipepsis anthracina* TURNER, Ann. Mag. Nat. Hist. (8) 16, p. 333.

In general build this species resembles *H. avicula*, but the thorax is a little stouter, the head is more rounded posteriorly and the legs are more strongly spinose.

♀. — Length 40-45 mm, fore wing 35-40 mm. Labrum more broadly truncate than in *H. avicula*. Ocelli small, POL: OOL = 5:9. Interocular distance on vertex less than length of third antennal segment (5:6), the latter 1½ times as long as the fourth segment. Postnotum and propodeum as in *H. avicula*, median furrow on dorsum of propodeum more pronounced.

Dorsal carina of hind tibiae not serrate, on inner side with 4-5 small spines; outer side of hind tibiae with two irregular rows of 8-9 and 7-8 spines, respectively. Spines on under side of tarsi slightly longer and thicker than in *H. avicula*. Inner spur of hind tibia about one third of length of hind metatarsus. Fifth tarsal segment of mid and hind legs longer than the third, slightly curved.

Venation of fore wing slightly different from that in *H. avicula*: first submarginal and first discoidal cells more elongate, third submarginal cell less narrowed anteriorly, it receives the second recurrent vein before the middle of its base.

Black, wings brownish yellow, darker at base and apex; fore wings beyond base of second discoidal cell covered with extremely fine silvery tomentum, visible only in certain lights; the apical and posterior margins bare.

♂. — Length 28-33 mm. Easily distinguished from *H. avicula* by the colour of the wings. Other differences are: antennae a little longer than

hind tarsi; labrum wider and more broadly truncate; sixth sternite with a median bifurcate carina which is less high and much wider than in *H. avicula*, the polished space between this structure and the small lateral spines scarcely impressed; hairs on mid and hind tarsi very short, on under side shorter than the spines; venation of wings as in the female.

Outer ramus of stipes with at least 15 denticles on under side; incision at inner side of inner ramus narrower, the spine at its base blunter.

J a v a : Specimens labelled "Java" without further indication of locality: 1 ♂ in British Museum (type); 1 ♂ in Oxford University Museum; 2 ♂, collected by REINWARDT, in Leiden Museum.

W e s t J a v a : Djampang Kulon: 1 ♀ February 1933, F. VERBEEK; 1 ♂ Mt Guha, 500 - 600 m, December 1939, Mrs WALSH (both in coll. v. D. V.). Bogor: 1 ♂ Tjiapus on Mt Salak, 24 February 1936, F. DUPONT (coll. v. D. V.).

E a s t J a v a : Mt Semeru: 1 ♂, Ranu Darungan, 800 m, M. A. LIEFTINCK (Mus. Bogor). Mt Tengger: 1 ♂ Nongkodjadar, 1200 m (coll. BETREM). Mt Idjen: 1 ♂ Coffee Estate "Blawan", 1939, H. LUCHT (coll. WILCKE); do., 4 ♂ (coll. Entom. Lab. Wageningen).

This species has often been confused with a large spider wasp which resembles it in coloration, but which is morphologically very different, and which belongs into another genus. The type of SMITH's *Mygimnia anthracina* is a true *Hemipepsis*; it was recognized as such by TURNER (1915, l. c.), but very probably all specimens recorded from other localities than Java by SMITH (1855, 1858), BINGHAM (1897) and BANKS (1934) have been incorrectly identified.

Group 2. (*Hemipepsis* DAHLB.)

♀. — Anterior margin of labrum narrowly incised or emarginate in the middle. Apex of mandibles bluntly rounded. Front above antennae broadly impressed, the sides narrowly and slightly raised, forming a rim along inner orbits.

Mesoscutum and scutellum not carinate. Postscutellum moderately convex. Mesopleura not dentate posteriorly. Dorsum and declivity of propodeum clearly differentiated.

Second abdominal sternite with distinct transverse groove.

Dorsal carina of hind tibiae more or less sinuate or serrate, flanked on inner side by a row of spines and on outer side by two such rows. Claws with two teeth on inner side.

Distal end of marginal cell not broadly rounded; first transverse cubital vein straight or slightly curved, third submarginal cell less high in

relation to its width than in *Moropepsis*. In the hind wing the cubitus is often strongly curved at its base; it originates before or in the end of the submedian cell.

♂. — Anterior margin of labrum rounded or very shallowly emarginate. Antennae usually rather thick, more or less crenulate beyond the seventh segment, sometimes not crenulate.

Postscutellum strongly convex. Dorsum and declivity of propodeum less clearly differentiated than in the female.

Second abdominal sternite only very feebly transversely impressed, in some species not impressed at all. Sixth abdominal sternite without median tooth or lamella, on each side with a carina which ends in a small tooth at hind margin. Third and following abdominal tergites slightly flattened.

Tibial spurs longer and thinner than in the female. Claws of fore legs short and strongly bent, with two teeth on inner side, at least the apical tooth long and sharp; claws of hind legs variable, without distinct teeth in *H. speculifer*, with two or three, rarely four, teeth in other species.

This is not a homogeneous group. The male of *H. speculifer* differs from the other species in the shape of the propodeum and the claws of the hind legs; furthermore the antennae are not crenulate and the carinae on the sixth sternite appear to be longer. *H. speculifer* has dark wings, with a large silvery spot or band on each fore wing; in the other species discussed here the wings are orange or brownish yellow.

In these latter species, except in *H. australasiae* (SMITH), the metatarsi of the mid and hind legs of the male bear on their inner side at the base a fine regular comb of closely set spines, which we have called the "metatarsal comb". It seems that this character has so far been overlooked in the genus *Hemipepsis*. HAUPT (Arkiv Zool. Stockholm 30A, 1938, p. 10) states that *Priocnemis* is the only genus in which a "Putzapparat" is developed on the second pair of legs. There seems to be little doubt, however, that the metatarsal comb in these *Hemipepsis* males also functions as a preening organ.

H. australasiae (SMITH) is in many respects very similar to the other yellow-winged species, but the males do not have a metatarsal comb. Furthermore this species shows a very remarkable character: the antennae of the male are only 12-segmented! After this character had been discovered by the second author, we have carefully examined the antennae of many other *Hemipepsis* species, but 12-segmented antennae were found in the male of only one other species, viz. *H. capensis* DAHLB., the type of the genus; not as a rule, however, but as a not very frequent exception.

There is one male of *H. capensis* with 12-segmented antennae in Coll. VAN DER VECHT; the first author found one among twelve males from South Africa in the British Museum, and in 1949 Dr G. ARNOLD informed us in a letter as follows: "We have here (in the National Museum of Southern Rhodesia) 8 specimens of the male of *H. capensis*, and in one of them the antennae are 12-jointed. In the other species in our collection that abnormality does not occur".

Hemipepsis specularifer (LEP.) (figs. 2 and 6)

1845. *Anoplius specularifer* LEPELETIER, Hist. nat. Ins. Hym. 3, p. 442, ♂ (Java).
 1855. *Pompilus specularifer* SMITH, Cat. Hym. Br. Mus. 3, p. 146.
 1897. *Pompilus specularifer* DALLA TORRE, Cat. Hym. 8, p. 324.
 1911. *Cryptochilus (Mygrimia) specularifer* SCHULZ, Zool. Ann. 4, p. 102.
 1935. *Hemipepsis disclene* (SM.) HAUPT, Revue Suisse Zool. 42, p. 307 (Java).

♀. — Length 38-46 mm; fore wing 34-42 mm. (East-Java specimens may be smaller). Body less slender than in *H. avicula*, notably the thorax relatively shorter and more broadly truncate in front and behind.

Head thick, rounded behind the eyes, seen in front slightly wider than high; inner orbits diverging below, interocular distance on top about 4/5 of that at base of clypeus. Clypeus moderately convex; its anterior margin truncate, narrowly depressed, rounded at the sides; anterior portion of clypeus longer than the basal, interocular, part. Anterior margin of labrum with a narrow median incision. Antennae rather slender, third segment almost 1½ times as long as the fourth and longer than interocular distance on vertex. Front broadly and shallowly impressed between ocelli and antennal sockets, laterally slightly raised along inner orbits. Ocelli small, POL: OOL = 4:6 to 7.

Pronotum less high than in *Moropepsis*, but relatively longer; mesoscutum and scutellum not carinate; scutellum and postscutellum moderately convex transversely, scarcely so lengthwise; the latter slightly flattened in the middle posteriorly and a little longer than the postnotum. Postnotum with deep median groove and 2-3 blunt transverse costae on each side. Dorsum of propodeum wide, as long as scutelli and postnotum united, almost twice as long as the declivity, truncate posteriorly, well separated from the steep declivity, slightly raised along the median line and the lateral margins, stigmal grooves oblique and shallow; infrastigmal tubercles scarcely indicated. Dorsum with 12-14 rather regular and sharp transverse costae, the apical one raised in the middle; declivity with a few interrupted, arcuate ridges in its upper part. Posterior rim of propodeum produced into a rather large blunt tooth on each side.

Dorsal carina of hind tibiae very feebly sinuate, flanked on each side by a row of short spines, about 7 on inner and 12 - 14 on outer side. Inner spur of hind tibiae sharp, almost half as long as the metatarsus; fifth tarsal segment of mid and hind legs as long as the third, almost straight in profile. Claws with two teeth, the basal one blunt, and 4 - 5 bristles (three thick and one or two thin ones) on inner side. Anterior metatarsi with a distinct comb of 6 - 7 spines on outer side, these spines longer than the width of the metatarsus.

Abscissae of radius = 4:13:25:12. First abscissa of cubitus longer than second; first transverse cubital vein moderately oblique, almost straight. Third cubital cell twice as wide as high, it receives the second recurrent at about one third of the base.

Black; wings dark fuscous, with blue and purplish reflections, fore wing with a large subcircular spot of fine silvery white tomentum (fig. 2); base of first discoidal cell brownish hyaline with a dark spot (to see the latter distinctly, the wing must be viewed against the light).

Body covered with fine brownish black pruinosity; clypeus with transverse row of long, fine bristles; back of head, pronotum beneath, and propodeum, with moderately dense erect black hairs; front, mesonotum, coxae and sternites with scattered long hairs; sixth abdominal segment densely covered with fine, dark, appressed pubescence and with numerous black bristles.

♂. — Length 28-35 mm, fore wing 26-32 mm. Incision of anterior margin of labrum almost obsolete. Antennae long and thick, not crenulate, flagellum longer than hind tarsi; relative lengths of third and fourth antennal segments = 10:9. POL:OOL = 9:11.

Lateral tubercles of pronotum more angular than in the female. Postscutellum strongly convex, subconical, seen in profile distinctly raised above the level of the scutellum and much above that of the depressed postnotum; there is a distinct transverse groove between postnotum and propodeum. Mesopleura concave below. Dorsum of propodeum dilated at about two thirds from the base, forming a blunt tubercle on each side; the transverse costae finer than in the female and not continued on the sides; junction of dorsum and declivity slightly angular in some specimens, in others gradually rounded.

Transverse groove of second sternite at most faintly indicated. Sixth sternite shining; it bears two longitudinal carinae which diverge slightly towards the hind margin where they end each in a minute tooth; the space between these carinae concave.

Legs feebly spinose; hind tibiae with two rows of short spines and a few scattered ones; mid and hind tarsi feebly compressed; inner spur of hind tibia long, almost two thirds of length of hind metatarsus; claws of fore legs short, strongly bent, with two teeth on inner side; claws II with two small teeth, the basal one very blunt, the apical one sometimes obsolete; claws III with only one, very blunt, basal tooth (fig. 6).

Abcissae of radius = 4:12:17:9; third cubital cell narrower than in the female.

Outer ramus of stipes with a row of about 15 denticles on under side; Inner ramus with a tuft of black hairs on outer side just below the tip; incision at inner side narrow and deep, the tooth in front of it blunt.

Coloration as in the female; body more densely pubescent, bristles on clypeus fine and short; fourth, and even more so the fifth, sternites rather densely covered with short, black, recumbent hairs, the pubescence of the basal sternites sparse, long and thin. Legs with very short and dense black pubescence.

West Java: fairly common in forests, up to about 1000 m above sea level; there are several specimens from the mountains near Bogor (Mt Salak, Mt Gedeh, Mt Pantjar) and from Djampang Tengah (Mt Tjimerang, Mt Tjisuru) in Mus. Bogor, Mus. Leiden, Mus. Rotterdam and in the collections of the authors. The British Museum possesses 1 ♀ from Mt Halimun, November 1937, Mrs WALSH, and 2 ♂ from Tjikarang, Djampang mountains, November 1937, Mrs WALSH.

Central Java: Mt Slamet: 1 ♂, Baturraden, July 1929, F. C. DRESCHER (Mus. Bogor).

East Java: Idjen Mts, 2 ♀ 1 ♂ Bajukidul, January 1933, H. LUCHT (coll. Ent. Lab. Wageningen). Mt Semeru: 1 ♀ 1 ♂ Ranu Darungan, 800 m, June 1941, M. A. LIEFTINCK (Mus. Bogor); these specimens are smaller than usual: the female measures only 32 mm, its fore wing is 30 mm long, and the male is only 22 mm (fore wing 23 mm).

The Leiden Museum possesses some old specimens labelled "Java": 2 ♀, MÜLLER leg., and 1 ♀ 2 ♂, KUHL & VAN HASSELT, ± 1825; there is a female labelled "Java, Fruhstorfer" in Mus. Strassbourg.

SCHULZ (1911, l.c.) recorded this species from Amboina, but the specimen seen by him was probably incorrectly labelled.

The yellow-winged species of this group have the following characters in common:

Head and thorax brownish black, with more or less extensive ferruginous markings, the head in some species almost entirely ferruginous.

Antennae ferruginous, in some species fuscous above. Propodeum coloured like the rest of the thoracic complex, except in *H. australasiae* which has the propodeum ferruginous. Legs ferruginous; coxae, trochanters and base of femora more or less fuscous. Wings orange or brownish yellow, their outer margins sometimes narrowly infuscated, but this darker margin generally not sharply defined (at least not in the Javan species). Abdomen black; in the male the posterior margin of the tergites sometimes brownish.

Body covered with fine appressed tomentum; golden on head, pronotum, mesoscutum, scutelli and legs; more brownish on pleura, sternum, coxae, and propodeum; brownish grey on abdomen. Head, prosternum, coxae and femora I with some long bristles, coxae III sometimes bare. Mesoscutum on each side with one bristle; on other parts of thorax and on propodeum some fine erect pubescence; sixth segment of female with dense ferruginous or brown tomentum and many stiff bristles; preceding sternites with some long hairs.

Hemipepsis crassinervis n. spec. (figs 3, 7, 8, and 9b)

Both sexes are easily distinguished from the related species by the wing venation, particularly the shape of the first discoidal cell (fig. 3).

♀. — Length 40-56 mm, fore wing 35-43 mm. Dorsal carina of hind tibiae strongly serrate. Inner spur of hind tibiae equal to one third of length of hind metatarsus. Fifth tarsal segment of hind legs not abnormally curved, as long as the third.

Head and thorax dark brown, with the following parts ferruginous: clypeus, (in most specimens more or less fuscous at base and in centre); a line along inner orbits, dilated inwards towards the ocelli; outer orbits above; mouth parts (apex of mandibles dark) and antennae; posterior margin of pronotum; part of mesoscutum; tegulae, scutelli and postnotum. Coxae, trochanters, and femora (except their tips) fuscous, the remainder of the legs ferruginous. Pubescence of sixth tergite brown, slightly darker than in *H. gigas*.

♂. — Length 25-33 mm, fore wing 24-32 mm. Antennae long and stout, gradually tapering from the seventh segment to the apex, these segments slightly curved. Claws of hind tarsi with two, or three teeth on inner side, in the latter case the middle tooth small.

Clypeus entirely ferruginous. Abdomen deep black. Head and thorax more densely pilose than in the female.

West Java: Mt Gedeh: 1 ♀ North West slope, 1200 m, December 1932, L. G. E. KALSHOVEN (type, coll. v. D. V.); 1 ♀ Tjisarua, October 1938, M. A. LIEFTINCK (Mus. Bogor); 1 ♀ Tapos, 800 m, June 1931, M. A. LIEF-

TINCK (Mus. Bogor) ; 2 ♀ Perbawatee, October 1937, Mrs WALSH (Br. Mus.). Mt Salak: 1 ♂ Tjiapus, April 1937, F. DUPONT (coll. v. D. V.). Sukabumi: 1 ♀ 1 ♂, F. VERBEEK, 1933 (coll. v. D. V.) ; several specimens of both sexes in coll. LINDEMANS (Mus. Rotterdam). Djampang Tengah: Mts Tjisuru and Tjimerang, Mrs WALSH, several specimens in coll. v. D. V. and coll. WILCKE; 1 ♀ Mt Malang, 1 ♂ Mt Gedogan, Mrs WALSH (Br. Mus.). Mt Tangkuban Prah: 1 ♂ 1300 - 1500 m, October 1937, F. C. DRESCHER (coll. v. D. V.).

East Java: Mt Semeru: 1 ♂ Ranu Darungan, 800 m, June 1941, M. A. LIEFTINCK (coll. v. D. V.).

The Leiden Museum possesses 1 ♀ from "Java" (MÜLLER leg.) and 3 ♀ from Sumatra (Matur and Harau, Edw. JACOBSON leg. 1913).

Hemipepsis gigas (TASCH.) (figs. 4 and 9a)

? 1838. *Pompilus aurosericeus* GUÉRIN, in: DUPERREY, Voyage Coquille, Zool. 2, 2, p. 256, ♀ (Java).

• 1869. *Priocnemis gigas* TASCHENBERG, Zeitschr. f. d. ges. Naturwiss. 34, p. 40, ♀ (Java).

♀. — Length 35-50 mm, fore wing 25-35 mm; wings relatively slightly shorter than in *H. crassinervis*.

Hind tibiae weakly serrate; apical spur of hind tibia short, less than one fourth of the length of hind metatarsus; fifth tarsal segment of mid and hind legs long and strongly curved. First discoidal cell in fore wing long, sides of basal half almost parallel (fig. 4); in the hind wing the cubitus originates a little before the end of the submedian cell.

Coloration as in *H. crassinervis*, but the head more extensively ferruginous; in some specimens only basal half of coxae and part of trochanters fuscous.

♂. — Easily distinguished from the males of the related species by the wing venation. Fifth tarsal segment of mid and hind legs less strongly curved than in the female. Claws irregular, the basal tooth more or less divided into two teeth; the claws of one leg often show differences in this respect! Inner spur of hind tibia slender, about half as long as hind metatarsus. — Antennae distinctly crenulate beyond the seventh segment.

• Posterior margins of abdominal tergites more or less brownish; the seventh tergite almost entirely brownish.

West Java: Rather common in the lowlands, and on mountain slopes up to about 1000 m; there are several specimens of both sexes from various localities in Mus. Bogor and in coll. v. D. V. — Further specimens examined: 1 ♀ Mt Gedeh, Tjibodas, 1892/93, R. SEMON (Mus. Amsterdam) ; 1 ♀ Mt Gedeh, Patjet, June 1931, S. LEEFMANS (Mus. Amsterdam) ; a series

of both sexes from Sukabumi, coll. LINDEMANS (Mus. Rotterdam); 6 ♂ from various localities, Mrs WALSH (Br. Mus.).

Central Java: Semarang: 1 ♀ Ungaran, June 1910, Edw. JACOBSON (coll. v. D. V.).

East Java: Djember: 1 ♀, October 1934 (coll. v. D. V.); Idjen Mts: 2 ♀ Bajukidul, December 1932 and July 1933, H. LUCHT (coll. Ent. Lab. Wageningen).

The Leiden Museum possesses some old specimens, labelled "Java": 1 ♀ 1 ♂ REINWART leg., 1 ♀ MULIÉ leg. and 1 ♀ MÜLLER leg.; furthermore there are 2 ♀ from Borneo and 1 ♀ from Bangka Island (VOSMAER leg.). The Museum Strassbourg possesses 1 ♂ labelled "Java, Fruhstorfer".

This species could be identified with certainty as *H. gigas* owing to the kind assistance of Mr P. BLÜTHGEN, Naumburg a. S., Germany, who sent us some notes on TASCHEBERG's type in Halle. Perhaps this species must bear the older name *aurosericea* (GUÉR.), but it is not possible to identify this species with certainty from the incomplete description and it appears therefore advisable to postpone a decision on this matter until it has been possible to study GUÉRIN's type.

Hemipepsis aureomicans HAUPT n. sp. (fig. 5)

Original description: "♀ — Länge 30-35 mm. Kopf hinter den Augen deutlich verschmälert. Schläfen flach gewölbt. Ocellenstellung spitzwinklig. Stirn vor den Ocellen eben. Clypeus trapezisch, sein Vorderrand gerade, länger als ein Seitenrand.

Postscutellum flach gewölbt und mit deutlichem Längskiel. Postnotum grob geripfelt, mindestens die hinteren Rippen seitlich gegen das Grübchen vor dem Stigma gerichtet. Propodeum grob gerunzelt; längs der Mitte zählt man etwa 10 Runzeln; in den Tälchen zwischen den Runzeln liegen eingestochene Punkte, in denen Härchen stehen; unmittelbar hinter der Teilung des Postnotums befindet sich ein rundlich begrenzter matter Fleck (ohne Runzeln und ohne Pubeszenz); die Runzeln ausserhalb des Stigmas verlaufen schräg zu diesem und verlöschen in der Lücke zwischen Stigma und Postnotum; Mitte des Propodeums mit flachem Längskiel, den die Runzeln überschneiden; letzte Runzel vor der Mitte des abschüssigen Teils durchlaufend, mitten flachbogig ausgeschnitten, seitlich der Mitte stärker gehoben, hinter ihr jederseits noch eine oder zwei Querrunzeln, die mitten breit unterbrochen sind; der abschüssige Teil nur mitten mit einigen gebogenen Runzeln.

Im Vorderflügel die M vor der 2. Medialzelle flach S-förmig geschwungen, proximal etwas stärker nach vorn durchgebogen; Makel mit

einem sehr unscheinbaren dichteren Längsfleck, der nur im durchfallenden Lichte zu erkennen ist.

Fühler, desgleichen die Beine von den Hüften an ockerfarben; Flügel goldgelb-hyalin, ohne dunkeln Saum.

Kopf und Thorax dicht dunkel-golden pubeszent; Pubeszenz des Propodeums heller und feiner; Beine vollständig golden pubeszent.

♂ unbekannt. — Java; 1 ♀ vom Kendeng-Gebirge 1200 - 1300 m (Holotype) in Sammlung Dr H. HAUPT. 2 ♀♀ von Pengalengan, 1300 m, und 1 ♀ vom Tengger-Gebirge, 1300 m, im Naturkundemuseum Stettin".

Generally smaller than the two preceding species and easily distinguished from these by the wing venation.

♀. — Length 27-37 mm, fore wing 21-27 mm. Posterior ocelli slightly further from the eyes than from each other. First abscissa of cubitus distinctly curved; proximal half of first discoidal cell with a faint dark streak which runs from the posterior proximal corner in the direction of the middle of the second abscissa of the cubitus. Cubitus in hind wing originates in, or a little before, the end of the submedian cell. Dorsal carina of hind tibiae moderately serrate, with about 16-18 teeth, those at base and at apex almost obsolete. Inner spur of hind tibiae about one third of the length of hind metatarsus. — Postnotum and propodeum rather densely covered with brownish golden tomentum.

♂. — Length 22 mm. Agrees with the female in wing venation and in many other respects. Dorsal area of propodeum more irregularly striate than in the following species; head ferruginous, except the space between and behind the ocelli and around the occiput; the space between antennae and clypeus brownish yellow; posterior margin of pronotum broadly ferruginous; mesoscutum dark, scutellum and postscutellum ferruginous in the middle, dark at the sides.

Disk of second abdominal tergite densely covered with fine, short, dark pubescence, as in *H. velutina* n. sp.

The male of this species appears to be very rare, we have seen only one specimen.

West Java: Females common at altitudes up to about 1500 m above sea-level. We examined many female specimens from various localities (Mus. Bogor, Mus. Rotterdam, coll. v. D. V. and coll. WILCKE), and 1 ♂ from Mt Salak, 1936, F. DUPONT (coll. v. D. V.). In Mus. Amsterdam: 1 ♀, Patjet, June 1931, S. LEEFMANS; in British Mus.: 1 ♀ Salatri, 1938; 1 ♀ Mt Gedeh, Lebak Siu, Sept. 1937; 9 ♀ from various localities in Djampang Tengah, 1937, all collected by Mrs WALSH.

Central Java: Mt Slamet, 2 ♀ Baturraden, October 1929, F. C. DRESCHER (Mus. Bogor). Mt Ungaran, 1 ♀ September 1910, E. JACOBSON (Mus. Leiden).

East Java: Mt Ardjuno, 1 ♀ Djunggo, 1400 m, June 1934, BETREM (coll. BETREM). Mt Tengger: 1 ♀ Kletak, 1500 m, May 1935; 1 ♀ Nongkodjadar, 1200 m, March 1934 (coll. BETREM). Idjen Mts: 1 ♀ Kenteng, 1400 m, March 1924, K. W. DAMMERMAN (Mus. Bogor).

The Leiden Museum possesses three old specimens labelled "Java" (1 ♀, REINWART; 1 ♀, VAN LANSBERGHE; 1 ♀, MÜLLER); furthermore there are 2 ♀ from Sumatra (Dampit, Sumber Pakel, 1916, MAC GILLAVRY), 2 ♀ from Bawean Island (FRUHSTORFER) and 1 ♀ from Borneo (MÜLLER).

Hemipepsis velutina n. sp.

♀. — Length 19-26 mm. First abscissa of cubitus very slightly thickened; the first discoidal cell relatively longer than in *H. aureomicans*; apical margin of wings more distinctly infuscated than in that species.

Dorsum of propodeum more regularly transversely striate than in *H. aureomicans*, sharply delimited from the declivity by a strong transverse carina, which is sometimes entire, sometimes interrupted laterally. Declivity subvertical and smooth, at most with one or two feeble transverse ridges in its upper part.

Dorsal carina of hind tibiae strongly serrate.

♂. — Length 13-18 mm. Wings much paler than in the female. Body very slender. Antennae often dark above. Mesoscutum often pale brownish in the middle. Clypeus yellow or brownish yellow, the space below the antennae and along inner orbits yellow. As in *H. aureomicans* the major part of the second tergite is densely covered with short black pubescence. Inner spur of hind tibiae equal to three fifths of length of hind metatarsus.

West Java: Fairly common up to about 1000 m above sea-level. The type is a female from Bogor, 27 Febr. 1941, J. v. D. VECHT (coll. v. D. V.). We have examined many specimens from various localities (Mus. Bogor, Mus. Leiden, Mus. Rotterdam, coll. v. D. V. and coll. WILCKE). Further specimens seen: 1 ♂ Bogor, 1919, coll. ROEPKE; 1 ♀ Bajah in West Banten, 300', January 1938, Mrs WALSH (Br. Mus.).

East Java: Tengger Mts, 1 ♂ Nongkodjadar, 1200 m, January 1934, BETREM. 1 ♀ Baung in res. Pasuruan, 1200 m, December 1934, Mrs. WALSH (coll. BETREM). Idjen Mts: 1 ♀ Blawan, 850 m, H. LUCHT (coll. v. D. V.); do., 2 ♂, April 1934 and December 1937, H. LUCHT (coll. WILCKE); do. 1 ♂ Bajukidul, December 1932, H. LUCHT (coll. Ent. Lab. Wageningen).

Bawean Island: 1 ♂, FRUHSTORFER (Mus. Leiden).

Bali: 1 ♀ Baturiti, June 1935, (coll. BETREM). 2 ♀ Prapetanggung, 500 m, May 1935 (coll. v. D. V.).

The males of this species are sometimes collected at light.

Hemipepsis australasiae (SMITH)

! 1873. *Mygnumia australasiae* SMITH, Ann. Mag. Nat. Hist. (4) 12, p. 259, ♀ ♂ (Australia).

♀. — Length 25-35 mm, fore wing 22-29 mm. Sides of postnotum distinctly striate. Dorsum of propodeum rather regularly transversely costate, separated from the smooth declivity by a strong carina. Posterior rim of propodeum angular at the sides. Second tergite of abdomen with distinct scattered punctures.

First abscissa of discoides (base of first discoidal cell) about as long as the first recurrent; first abscissa of cubitus almost straight; fenestra in discoidal cell relatively large and not very conspicuous, without central mark, but bordered on the distal side by an oblique dark streak which runs almost parallel to the first recurrent vein; the length of this cell is about four times its height. The nervulus is strongly oblique and makes a greater angle with the transverse discoidal vein than in the other species of this group, in which these veins are almost parallel. Second recurrent vein sinuate. The cubitus in the hind wing originates before the end of the submedian cell.

Dorsal carina of hind tibiae moderately serrate, with 13-14 blunt teeth. Inner spur of hind tibia long and thin, slightly shorter than one third of length of hind metatarsus. Fifth tarsal segment of hind legs normal.

Head ferruginous, tips of mandibles dark; pronotum with transverse dark line on vertical face, widened laterally; mesoscutum ferruginous, darkened anteriorly and often with a broad dark line on each side; the remainder of the thorax (including the propodeum) ferruginous above; the sides dark, disk of mesopleura and tip of metapleura more or less extensively brownish or ferruginous. Legs ferruginous, coxae black at base only. Abdomen black; sixth segment with dark brown pubescence and black bristles. Wings ferruginous yellow, apical margin as a rule slightly infuscated.

♂. — Length 18-30 mm. Distinguished from the other members of the genus by the antennae which consist of only 12 segments, and by the absence of a distinct comb of spines at the base of the mid and hind metatarsi. Ventral side of abdomen with fairly long and dense pubescence.

Coloration as in the female, but the sides of the thorax more extensively ferruginous, and the greater part of the posterior femora dark.

West Java: Not rare, up to about 800 m above sea-level; several specimens in Mus. Bogor, Mus. Leiden, and coll. v. D. V.

Central Java: Semarang, 4 ♀, 1896 and 1905; E. JACOBSON (Mus. Leiden); Semarang, 2 ♀ July 1922 and January 1926, L. G. E. KALSHOVEN (coll. v. D. V.). Mt Muria, 3 ♂, December 1935, Mrs WALSH (coll. BETREM). Gedangan, 1 ♂ March 1933, L. G. E. KALSHOVEN (coll. v. D. V.). Salatiga, 1 ♀ (coll. Ent. Lab. Wageningen).

East Java: Rembang, 1 ♀, PIEPERS (Mus. Leiden). Djember, 1 ♀, December 1937, H. LUCHT (coll. Ent. Lab. Wageningen). Malang, 1 ♀ (Mus. Amsterdam).

Madura: 1 ♀, P. BUITENDIJK (Mus. Leiden).

Bawean: 1 ♀, FRUHSTORFER leg. (Mus. Leiden).

The Leiden Museum possesses the following specimens labelled "Java": 1 ♀, MULLÉ; 1 ♀, VAN LANSBERGHE; 1 ♀ 1 ♂, MÜLLER; 1 ♂, GROEN;

H. australasiae occurs also in Sumatra: Mrs WALSH collected 1 ♂ near Bènkulen, May 1935 (coll. v. D. V.), and the Mus. Strassbourg possesses 1 ♀ which bears a label "Sumatra".

Further investigations on the distribution of this species are very desirable. In the British Museum the senior author compared some Javan specimens with Smith's type, but was unable to find differences of importance. There are several specimens from Australia in the British Museum; the females have the carina on the hind tibiae slightly more serrate than the Javan specimens, and in a female from Cooktown the last abdominal segment is ferruginous. The four males in this collection, one from N. W. coast of Australia and three from Queensland, have 12-segmented antennae.

Group 3.

The following four species all have the dorsum and declivity of the propodeum less distinctly differentiated than the species of the preceding groups, but in other respects the group is not homogeneous, and the species discussed here may eventually prove to represent more than one subgenus. There are differences in the shape of the mandibles (more acute in *H. jacobsoni* than in the others), the hind tibiae (carinate in *H. mellerborgi* and *jacobsoni*, dentate in the two other species), the shape of the second abdominal sternite (♀) (more distinctly grooved in *H. jacobsoni* than in the others), and the claws of the anterior tarsi of the male (with two teeth on inner side in *H. jacobsoni*, with one tooth in *H. mellerborgi* and *aeruginosa*). The male of *H. vulcanica* is yet unknown.

Hemipepsis mellerborgi (DAHLB.)

1845. *Priocnemis mellerborgi* DAHLBOM, Hym. Eur. I, p. 457, no. 4, ♀ (Java)

♀. — Body slender; wings not abnormally wide. Anterior margin of clypeus, roundly truncate; labrum rounded, very shallowly emarginate anteriorly, not distinctly incised; tips of the short mandibles bluntly rounded; supraclypeal area with a minute median convexity just below the antennae; front above antennae slightly flattened, not concave, with a longitudinal fovea in the median line; POL:OOL = 1:2. Clypeus and labrum finely and densely punctate.

Pronotum, as seen from above, very short, with rounded shoulders; scutellum and postscutellum very slightly convex lengthwise; mesopleura normal, not dentate posteriorly; postnotum scarcely shorter than the postscutellum, finely and indistinctly transversely striate. Propodeum fairly long, as seen in profile almost regularly convex; dorsum with an impressed median line, and with weak and rather widely separated transverse ridges; dorsum not distinctly separated from the declivity, the latter finely transversely striate; stigmal furrows shallow; the transition between dorsum and sides slightly prominent; posterior rim of propodeum rounded at the sides.

Transverse furrow of second abdominal sternite very feeble; there is no distinct impressed line.

Dorsal carina of hind tibiae not serrate, but with some shallow incisions near the spines. Claws with two teeth, the basal one blunt, and with three or four bristles.

Basal vein of fore wing strongly curved; nervulus oblique and almost its own length beyond the fork; first discoidal cell almost five times as long as high; first transverse cubital vein slightly curved; marginal cell almost parallel-sided, slightly more than three times the length of the large stigma; abscissae of radius = 4:9:15:9. Basal half of first discoidal cell with subhyaline area; in the distal half of this area is a dark fuscous spot which is truncate on inner side.

Black; the following parts ferruginous: anterior margin of clypeus, mouth parts (except for the dark tips of the mandibles), a line at inner orbits, a short line at top of outer orbits, antennae (the three basal segments slightly fuscous above), a spot on the scutellum (often indistinct), and the sixth abdominal segment. Tegulae brown; postnotum more or less distinctly brownish at base. Wings fuscous, not very dark. Legs ferruginous; coxae, trochanters, and basal half (fore legs) to two thirds (mid and hind legs) of femora black; apices of coxae and trochanters ferruginous.

Dark parts of body with brownish to greyish black tomentum; on the brightly coloured parts it is ferruginous; anterior margin of clypeus, front coxae and abdominal sternites with some long hairs, postscutellum and propodeum with shorter hairs; sixth segment covered with long ferruginous bristles. Head and thorax with a silky shine, abdomen more strongly shining.

♂.—Length 11-13 mm, fore wing about 12 mm. Body very slender. Flagellum of antennae longer than head and thorax together, the apical segments very feebly curved; tips of mandibles slightly sharper than in the female; supra-clypeal area slightly convex in the middle; postscutellum in profile strongly convex, almost hump-like; postnotum slightly shorter than postscutellum; propodeum finely rugose without distinct transverse striae, in profile feebly convex, the dorsum not separated from the declivity; stigmal furrows absent.

Abdomen very slender, the first tergite much longer than its width at apex; second sternite without transverse furrow; sixth sternite on each side with a longitudinal carina which ends in a minute curved spine.

Inner spur of hind tibia very long, more than two thirds of the length of the hind metatarsus. Claws with only one tooth, at about two thirds of their length from the base.

Head, including antennae, ferruginous yellow; the following parts brownish black: tips of mandibles, front (except inner orbits), vertex and upper part of occiput. Thorax black, the following parts yellow: posterior margin and lower part of sides of pronotum, a small spot near posterior margin of mesoscutum, a triangular spot on scutellum, a small spot on postscutellum (sometimes brownish or obsolete), a spot on each side of postnotum, and apex of propodeum. Abdomen pale yellowish brown, base of first tergite fuscous, posterior margin of all tergites broadly fuscous. Legs ferruginous yellow, posterior face of coxae I brownish; fuscous are: coxae and trochanters II and III, extreme base of femora II and basal two thirds of femora III; coxae II brownish yellow at base and apex, sometimes their under side entirely yellowish. — Wings much less dark than in the female, somewhat irregularly infuscated; marginal cell and second and third submarginal cells darker, first discoidal cell paler than the other cells. There is an inconspicuous cloud near the basal vein, but for the rest the first discoidal cell is almost uniformly subhyaline. Hind wings slightly paler than fore wings.

The type of this species is a female, labelled: "*Calicurgus mellerborgi*, Java, Mellerborg" (Naturh. Riksmuseum, Stockholm).

West Java: not rare in mountain forests. Mt Gedeh: Tjihodas (1450-1600 m), 6 ♀ 5 ♂, collected by H. H. KARNY, M. A. LIEFTINCK, Mrs E. VAN DER VECHT-BOURGUIGNON and J. v. D. VECHT (coll. Mus. Bogor, coll. v. D. V. and coll. WILCKE); Telaga Warna, 1 ♀ June 1941, M. A. LIEFTINCK (coll. WILCKE); do., 1 ♀, September 1939, M. A. LIEFTINCK (Mus. Bogor); do., 1 ♀, 1949, on flowers of *Polygonum chinense*, J. v. D. VECHT (coll. v. D. V.). Mt Tangkuban Pahu: 1 ♀ March 1941, J. OLTHOF (coll. v. D. V.). Mt Burangrang, 1600 m, 1 ♀ November 1936, F. C. DRESCHER (Mus. Bogor). Mt Patuha, 2 ♂ Rantjabali, 1700 m, September 1941, Mrs E. VAN DER VECHT (coll. v. D. V.). Mt Malabar, 1 ♀ Tjinjiruan, May 1910, H. W. VAN DE WEELE (coll. v. D. V.).

The British Museum possesses a female labelled "South coast, Salatri, Mrs Walsh", but since all other specimens have been collected at altitudes well above 1000 m, the occurrence of *H. mellerborgi* at sea-level needs confirmation.

H. mellerborgi betremi n. subsp.

Differs from *H. mellerborgi mellerborgi* as follows:

♀. — Slightly smaller; length 14-16 mm, fore wing 13-14 mm. Clypeus almost entirely ferruginous; the lines at inner orbits wider; the lines at outer orbits run from vertex to base of mandibles. Antennae ferruginous, basal segments not infuscated. Pronotum with broad ferruginous band at posterior margin, also the tip of the sides pale ferruginous. Tegulae, a median spot at posterior margin of mesoscutum, a large spot on scutellum, and the median convex part of the postscutellum, ferruginous. Declivity of propodeum with a vague brownish spot on each side. Posterior margin of abdominal segments 2-4 with a brownish tinge, posterior margin of segment 5 ferruginous, the pale band at hind margin produced in the middle, both on tergite and sternite, sixth segment entirely ferruginous.

Wings yellowish hyaline, stigma brownish yellow, basal half of first discoidal cell hyaline, with an opaque, darker yellow spot in its distal part.

Legs as in the typical form, but only the extreme base of the femora fuscous.

Head and thorax with brownish golden tomentum, most conspicuous on the face, the pronotum, mesoscutum and the scutelli; abdomen with a greyish yellow pruinosity.

The only difference in morphological characters that we have been able to find concerns the propodeum: in the subsp. *betremi* there is no distinct impressed median line on the dorsum, and the transverse rugae are slightly sharper than in the typical form.

♂. — The male differs less from the corresponding sex of the West-Java form than the female. The most striking difference is found in the wings, which are even paler than in the female, hyaline with a yellow tinge. The yellow spots on the mesoscutum (near posterior margin), scutellum and postscutellum are somewhat larger, but on the other hand the postnotum lacks the conspicuous yellow spots of the male of the typical form. The femora are only slightly infuscated at the base, and the transverse yellowish band on the first abdominal tergite is wide. The propodeum has a fine transverse striation which is absent in the typical form.

EAST JAVA: Tengger Mts, 1 ♀, Kletak, 1500 m, October 1934, BETREM (type, coll. v. D. V.); do., Nongkodjadjar, 1 ♂, August 1934, BETREM (coll. v. D. V.) and 3 ♀ 5 ♂, May 1938, Mrs WALSH (Br. Mus.). Mt Ardjuno, 2000 m, February 1936, Mrs WALSH (1 ♀ coll. WILCKE, 1 ♀ coll. BETREM, 2 ♂ coll. v. D. V.).

Hemipepsis aeruginosa (SMITH)

! 1835. *Mygymia aeruginosa* SMITH, Cat. Hym. Br. Mus. 3, p. 184, ♀ (Sumatra).

! 1902. *Salix khasianus* CAMERON, Ann. Mag. Nat. Hist. (7) 10: 78, ♀ (Khasia Hills, Assam).

♀. — Length 17-18 mm, fore wing 14-15 mm. Body slightly more robust than in *H. mellerborgi*. Anterior margin of clypeus very slightly arcuate in the middle, lateral angles of median portion bluntly rounded. Anterior margin of labrum shallowly and rather narrowly emarginate in the middle. Supraclypeal area with minute median tubercle. Front above antennae slightly flattened; POL: OOL = 1:2.

Thorax as in *H. mellerborgi*, but the postnotum distinctly transversely costate, and posteriorly more deeply impressed in the middle; propodeum without median impression, the lateral ridges faintly indicated, transverse costae on dorsum slightly sharper than in *H. mellerborgi*; there are about 10 distinct costae on the dorsum; on the declivity the costae are finer and closer together, distinct in the middle, but disappearing on the sides which are finely transversely striate. Posterior rim of propodeum rounded at the sides. Second abdominal sternite without transverse groove.

Dorsal carina of hind tibiae strongly serrate, with 12-13 sharp teeth; under high magnification the carina is visible between the teeth. Claws moderately curved, with two teeth (basal one very blunt) and four bristles.

Wings hardly different from those of *H. mellerborgi*.

• Head, including antennae, ferruginous; the following parts fuscous: tips of mandibles, vertex and occiput (except for wide band along the eyes), the dark area on the vertex enclosing the ocelli and produced anteriorly along the median line but not reaching the antennae. Thorax black, except for wide ferruginous band at posterior margin of pronotum and the ferruginous tegulae. Abdomen black, the posterior two segments rusty red; segments 3 and 4, sometimes also the apex of segment 2, more or less extensively reddish. — Legs: coxae and trochanters black, brownish at apex, the remainder of the legs ferruginous; mid and hind femora slightly fuscous at base posteriorly. Wings slightly darker than in *H. mellerborgi*.

• Pubescence as usual; tomentum on ferruginous parts of body and on ventral side of coxae fulvous or golden, on mesoscutum and tegulae rusty brown, on scutellum darker brown, elsewhere dark greyish. Lateral concavities of scutellum with appressed, fairly long, pale golden pubescence, most conspicuous when seen from behind. Long bristles on head and sixth abdominal segment ferruginous.

♂. — Length 12-13 mm, fore wing 12 mm, antennae nearly 9 mm. Body slender, abdomen short and narrow, hardly as long as head and thorax together; seventh and following antennal segments rather strongly curved; postscutellum convex, but less strongly so than in *H. mellerborgi*; propodeum very feebly convex, dull, finely granulately rugose, without transverse striae.

• Abdomen and legs as in *H. mellerborgi*.

• Coloration as in the female, but the antennae fuscous above; dark area on front larger, clypeus with vague dark central spot; transverse band on pronotum paler; abdomen black, somewhat reddish laterally; seventh tergite and sixth and seventh sternites ferruginous.

• Easily distinguished from *H. mellerborgi* ♂ by the partly dark antennae, the black postnotum and the uniformly dark wings; basal half of first discoidal cell slightly paler than the rest of the wings.

• West Java: Mt Gedeh, 1 ♀ 1 ♂, Tapos, 700 m, August 1933, L. G. E. KALSHOVEN (coll. v. D. V.). Djampang Tengah: 1 ♀, 1934, Mrs WALSH (coll. WILCKE); 1 ♂ Mt Tjisuru, March 1935, Mrs WALSH (coll. v. D. V.); 2 ♂ Tjigaaha, January 1938, Mrs WALSH (Br. Mus.). South coast, 1 ♀ Salatri, January 1938, Mrs WALSH (Br. Mus.).

• Sumatra: SMITH's type is a female labelled "Sumatra, 54-76" (Br. Mus.); the reddish colour on the abdomen is more extensive than in the Javan females. — Atchin (Atjeh), 1 ♂ Pendeng, 400 m, Febr.-March 1937, A. HOGERWERF (Mus. Bogor).

As s a m: Khasia Hills, 1 ♀ (type of *Salvus khasianus* Cam.), 1 ♂, P. CAMELON coll. "1902-289" (Br. Mus.).

***Hemipepsis vulcanica* n. spec.**

♀. — Length 28 mm, probably 25-30 mm; length of fore wing 23 mm. Body slender, wings not abnormally wide.

Apex of mandibles bluntly rounded. Clypeus convex, its anterior margin truncate, rounded at the sides, distinctly depressed. Labrum not incised. Front broadly, but very shallowly, impressed, very feebly raised along inner orbits. POL: OOL = 1: 2.

Pronotum short, much higher than long; scutellum and postscutellum hardly convex, mesopleura not projecting; postnotum emarginate posteriorly in the middle, here much shorter than the postscutellum, its transverse costae moderately coarse, curved backwards at the deeply impressed medial line. Dorsum of propodeum with about 10-11 transverse costae which are most distinct in the middle; there is a very shallow median longitudinal impression in the posterior half, a similar impression is visible on each side above the stigma; the stigmal furrows are wide and very shallow; on each side the space between the lateral longitudinal impression and the stigmal furrow is raised and forms a bluntly angular boundary between the dorsum and the sides; declivity oblique, not costate but nevertheless not sharply separated from the dorsum; its surface very finely transversely striate, laterally the striae hardly visible. Posterior rim of propodeum with distinct lateral angles.

Second abdominal sternite without transverse groove, there is only a very feebly indicated transverse impression slightly before the middle.

Dorsal carina of hind tibiae broken up into a row of about 12-13 teeth which are hardly longer than the dense erect pubescence which covers the tibiae; near the base the teeth are very small, on the posterior half the carina is visible between the teeth; the row of teeth is flanked on each side by a row of 7-8 spines; moreover there are several small spines on the outer side of the tibiae. Claws with two teeth (the basal one small) and 4-5 bristles.

Wings similar to those of *H. mellerborgi*; as in that species the basal vein in the fore wing strongly curved and the nervulus far behind the fork; abscissae of radius = 4: 9: 12: 7; stigma small, less than one fourth of length of marginal cell; second discoidal cell with distinct pocket at lower inner corner; fenestra in basal half of first discoidal cell very distinct, the basal half subhyaline, the outer half dark brown with lighter margin.

Black; the following parts ferruginous to brownish red: palpi, apical half of mandibles (tips dark), antennae (basal three segments slightly infuscated) tips of femora, and all tibiae and tarsi. Anterior margin of clypeus, inner and outer orbits, a line at posterior margin of pronotum, and some vague marks on abdominal segments 5 and 6 obscurely reddish.

Tomentum on dark parts of head and thorax black, on propodeum and abdomen dark greyish brown; long hairs as in *H. mellesbergi*, but those on the sixth segment black.

West Java: Rare, in mountain forests. Mt Gedeh: Tjiboda forest reservation, 1450-1600 m, 1 ♀ 21 April 1940 (type, coll. v. d. V.), 1 ♀ November 1938 (coll. WILCKE); do., 1 ♀ May 1937, M. A. LIEFTINCK (Mus. Bogor); Mt Gedeh, Tjisarua, 1050 m, 1 ♀ July 1930, M. A. LIEFTINCK (Mus. Bogor). Mt Tangkuban Prah, 1200-1500 m, 2 ♀ December 1928 and February 1929, F. C. DRESCHER (Mus. Bogor; coll. v. d. V.); Djampang Wetan, Mt. Malang, 1 ♀ February 1938, Mrs WALSH (Mus. Leiden).

The Leiden Museum possesses an old specimen labelled "Java, MÜLLER".

Hemipepsis jacobsoni n. sp.

♀.—Length 15-16 mm, fore wing 11.5 mm. Anterior margin of clypeus very shallowly emarginate in the middle; labrum very slightly emarginate; tips of mandibles distinctly sharper than in the preceding species; supraclypeal area without median tubercle or convexity; front convex, slightly flattened above antennae, with impressed median line between ocelli and antennae; inner orbits almost parallel below, in upper half converging towards vertex. POL: OOL = 10: 11. Interocular distance at vertex slightly longer than third antennal segment.

Pronotum short; scutellum slightly convex; postscutellum more convex than in the three preceding species; mesopleura distinctly projecting posteriorly as the thorax is seen from above; postnotum short, less than half as long as the postscutellum, sloping towards the base of the propodeum with which it forms a distinct angle as the thorax is seen in profile; it is deeply impressed in the middle and finely transversely striate. Propodeum relatively short, rather regularly convex, dorsum and declivity not distinctly separated, lateral impressions and stigmal furrows hardly indicated; there are about 10 transverse costae on the dorsum; declivity finely transversely striate, with a few transverse costae in its upper part. Posterior rim of propodeum slightly raised on each side, the lateral angles bluntly rounded, not very prominent.

Second abdominal sternite with a distinct, though shallow, transverse groove.

Dorsal carina of hind tibiae not serrate, with only a few shallow and indistinct incisions near the spines; there are about 5 spines very close to the carina on the inner side, whereas the outer side bears a row of 7 spines at some distance from the carina. Claws with three bristles and two teeth, the basal tooth inconspicuous, small and blunt. Inner spur of hind tibia slightly shorter than half the metatarsus; the basal brush does not reach the middle.

Basal vein in fore wing rather strongly curved, first recurrent vein slightly curved inwards; stigma long, nearly half as long as the marginal cell which is only four times as long as wide; abscissae of radius = 5:8:15:9. First discoidal cell with distinct fenestra, on outer half with dark kidney-shaped spot, which is darkest posteriorly. In the hind wing the cubitus originatus before the end of the submedian cell.

Head, including antennae, ferruginous; apex of mandibles dark. Thorax brownish black, the following parts ferruginous: larger part of pronotum (a band at anterior margin, a line in lateral groove, vague spots at sides, and a median line near posterior margin, dark), mesonotum, tegulae and scutellum; postscutellum, postnotum and a vague mark at base of propodeum reddish brown. Abdominal segments 1-3 brownish black, the following segments ferruginous. Legs ferruginous, coxae partly fuscous. Wings fuscous, moderately dark, with violaceous lustre.

♂. — Length 11-12 mm, fore wing 10-11 mm, antennae about 8 mm. Clypeus slightly convex, anterior margin truncate; labrum rounded. Antennae rather thick and not very long, hardly crenulate, seventh and following segments slightly curved. Front above antennae very slightly convex, median line distinctly impressed; ocelli far apart, PCI: OOL = 11:10.

Posterior margin of pronotum distinctly angular. Postnotum very finely transversely striate, with median triangular impression in posterior half. Dorsum of propodeum much longer than declivity, very finely sculptured, without distinct transverse striation, longitudinal impressions very faint; declivity bluntly carinate in the middle, the carina slightly prominent at the junction with the dorsum; upper part of declivity finely transversely striate.

Second abdominal sternite without transverse groove or furrow; carinae on sixth sternite converging towards posterior margin.

Claws of fore legs short, with two sharp teeth on inner side; claws of mid and hind legs longer, also with two teeth, but the basal one blunt.

Inner spur of hind tibiae about equal to three fifths of length of metatarsus.

Stigma of fore wing large, half as long as the marginal cell; abscissae of radius = 4:9:13:8.

Coloration mainly as in the female; lower half of face yellowish; mesoscutum and scutellum partly fuscous; postscutellum, postnotum and propodeum blackish; abdomen ferruginous brown, first segment and posterior margins of following tergites more or less infuscated. Legs pale ferruginous; coxae fuscous; anterior face of coxae I, a line at ventral side of coxae II and some vague marks on coxae III yellowish. Wings as in the female.

The type is a female collected by AURIVILLIUS on the island "Noordwacht", in a group of islands north of West Java (Mus. Leiden); E. JACOBSON collected two males at Muara Antjol near Djakarta, December, 1907 (Mus. Leiden).

Group 4. *Rhodopepsis* n. subgenus.

Mandibles long and thin with acute tip, on inner side with small tooth. Supraclypeal area without median tubercle. Posterior angles of mesopleuron raised and distinctly projecting as the thorax is seen from above. Hind tibiae of female without sharp longitudinal carina or separate teeth, at most with faint indication of blunt carina near apex; with a few rows of short spines. Claws of tarsi with two teeth; in the male the claws of the fore legs short, with two relatively long and acute teeth. Tarsal comb of fore legs (♀) weakly developed.

Second abdominal sternite (♀) with faint transverse impression, in one species with a rather distinct groove (*H. kangeanensis* n. sp.); sixth sternite of male with a small spine on each side at hind margin, without median tooth or tubercle.

Wings relatively wide, especially in the male; length of fore wing of male less than three times its greatest width (8:3). In fore wing distal end of marginal cell subacute; first transverse cubital vein moderately oblique and slightly curved, the second bent outwards close to its base; basal vein irregularly curved, first abscissa of cubitus (base of first submarginal cell) thickened at proximal end; first discoidal cell with distinct fenestra and kidney-shaped dark spot. In the hind wing the cubitus originates slightly before the end of the submedian cell.

Type: *Mygymia fervida* SMITH 1861 = *Hemipepsis fervida* (SM.); besides the species discussed below the subgenus contains: *H. indica* (CAM.) 1891 (nec *Salix indicus* BINGH.), *H. matangensis* (CAM.) 1905, and *H.*

thion (SM.) 1861. Very probably *H. negritos* BANKS, from the Philippine Islands, also belongs here.

The species of this subgenus appear to be rather uniformly coloured; head and thorax are black; the abdomen is red, with the first segment partly or entirely blackish (in *H. negritos* the abdomen is black); wings fuscous with violaceous lustre; antennae and legs more or less extensively ferruginous, the former sometimes entirely black.

***Hemipepsis fervida* (SMITH) (fig. 10b)**

! 1861. *Mygnimia fervida* SMITH, Jl. Proc. Linn. Soc. Zool. 5, p. 82, ♀ (Makassar, Celebes).

? 1857. *Salix smithii* BINGHAM (new name), Fauna Br. India, Hym. I, p. 134, ♀ ♂ (Sikhim, Burma, Tenasserim, Borneo, Celebes, New Guinea) (locality records very probably partly incorrect).

1897. *Salix fervidissimus* DALLA TORRE (new name), Cat. Hym 8, p. 223.

1911. *Cryptochilus (Mygnimia) fervidissimus* SCHULZ, Zool. Ann. 4, p. 106.

♀.—Length 19-22 mm. Head strongly narrowed behind the eyes; the temples in profile only one fourth to one third of the width of the eyes. Clypeus slightly convex, the top of the convexity above the middle, anterior part gradually sloping towards anterior margin, which is slightly depressed and distinctly emarginate. Front above antennae flattened, with distinct median furrow, upper margin of flattened part biarcuate. POL: OOL = 2:3.

Pronotum hardly impressed medially, its posterior margin depressed; postnotum transversely striate, with deep median groove which almost reaches the anterior margin; propodeum short, its dorsum wider than long, as seen in profile forming a bluntly rounded angle with the steep declivity, the junction not distinctly defined; there is a slight swelling on each side in front of the stigma; infrastigmal furrows shallow, but distinct; a bluntly rounded keel runs on each side from above the stigma towards the posterior margin of the propodeum, it is most pronounced at the junction of dorsum and declivity, where it is slightly curved outwards; dorsum with about 12 sharp and rather regular transverse costae; costae on declivity coarse laterally, but much finer in the middle.

Head and thorax dull, face with silky shine, abdomen rather strongly shiny; labrum dull, very densely and finely punctate; clypeus, and front above antennae, finely and superficially punctate.

Head and thorax black; mouth parts (including labrum and except apex of mandibles) and antennae bright ferruginous red; legs (except coxae and trochanters) and abdomen bright red, first abdominal segment slightly blackish at base. Wings fuscous, with a violaceous lustre.

♂. — Length 12-14 mm, fore wing 12.5-14.5 mm. Head (including clypeus) distinctly wider than high (7:6). Clypeus slightly convex, its anterior margin hardly depressed and almost truncate. Diameter of anterior ocellus $1\frac{1}{2}$ times that of the posterior ones. POL:OOL = 4.5. Antennae long (about $\frac{5}{6}$ of fore wing), distinctly crenulate, the fifth segment slightly curved, the following segments more strongly curved; third to fifth segments about equal in length, the following segments slightly shorter. Postscutellum slightly convex, postnotum indistinctly transversely striate. Propodeum relatively longer and much less high than in the female, transversely striate; as seen in profile the dorsum forms a flat and unbroken arc with the short declivity; infrastigmal furrow obsolete. Third and following abdominal tergites rather strongly flattened above, somewhat angular laterally.

Legs long and thin, finely spinose; length of inner spur of hind tibiae about $\frac{2}{3}$ of hind metatarsus; claws of fore legs short, rather strongly curved, the two teeth on inner side close together, relatively long and sharp; claws of mid and hind legs longer, their teeth shorter, the basal tooth short and blunt.

Wing slightly paler than in the female.

H. fervida adelpha n. subsp.

Like the Celebes form, but upper side of sixth and following antennal segments fuscous to blackish (♀); in the ♂ the first antennal segment yellowish beneath, the third and following antennal segments dark above. This character has proved to be constant in a long series of specimens.

West Java: Djampang Tengah: Mt Tjimerang, 1 ♀, October 1936. Mrs WALSH (type, coll. v. D. V.); do., 1 ♀, December 1932, Mrs WALSH (Mus. Bogor); do. 1 ♀, April 1935, Mrs WALSH (coll. BETREM); Mt Tjisuru, 5 ♀ 2 ♂, 1935, Mrs WALSH (coll. v. D. V.); do., 1 ♀, March 1933, Mrs WALSH (Mus. Bogor); do. 2 ♀, March 1935, Mrs WALSH (coll. WILCKE); Mt Tjiung, 1 ♀, 1938, and 1 ♀ 1 ♂ Mt Malang, 1937, Mrs WALSH (Br. Mus.). Mt Gedeh: 1 ♀, Tapos, 700 m, July 1933 (Mus. Leiden). Sukabumi: 3 ♀ 1 ♂, coll. LINDEMANS (Mus. Rotterdam); do., 2 ♀ March 1933, J. VAN DER VECHT (Mus. Leiden); Tjibareno, 1 ♀ 7 December 1936, F. DUPONT (coll. WILCKE). Radjamandala: 1 ♀, March 1933 (Mus. Leiden). Bandung: 1 ♀, 16 March 1938, F. C. DRESCHER (Mus. Bogor).

Central Java: Mt Slamet: 1 ♀, Baturraden, February 1937, F. C. DRESCHER (Mus. Bogor). Semarang: 1 ♀ Gedangan, February 1933, L. G. E. KALSHOVEN (Mus. Leiden).

East Java: Bodjonegoro, 2 ♀ in teak forest, Nglirip, March 1936, Mrs. WALSH (coll. BETREM, coll. v. D. V.). Pasuruan residency: 1 ♂, Baung, 360 m, 15 December 1934, J. G. BETREM (coll. v. D. V.).

Hemipepsis nigricornis n. sp. (fig. 10a)

♀. — Length 20-25 mm. Closely allied to *H. fervida* (SM.). Clypeus convex, truncate anteriorly; anterior margin strongly depressed, wider than in the related species; the surface of the convex part dull, finely punctate, more coarsely and somewhat rugosely punctate near the depressed margin; as seen in profile the top of the convexity appears to lie below the middle. POL: OOL = 4:5.

Propodeum mainly as in *H. fervida*, but the transverse costae slightly further apart, and the upper part of the declivity with two or three coarse costae. Posterior lateral angles of dorsum rounded, not projecting.

Apical fourth of hind tibiae with feeble indication of a longitudinal carina.

Head and thorax black; mandibles and under side of antennae brownish; labrum black or slightly reddish; legs, except coxae and trochanters, brownish red; femora I and II, tibiae I and the tarsi more or less fuscous. Abdomen brownish red; basal half of first segment blackish.

West Java: Bogor: 1 ♀ Mt Pantjar, 300 m, February 1937, F. DUPONT (type, coll. v. D. V.). South coast: 1 ♀ Tjisolok at Wijnkoops Bay, September 1936, F. DUPONT (coll. WILCKE). Bandung: 2 ♀ Mt Burangrang, 1300-1600 m, January and February 1929, F. C. DRESCHER (Mus. Bogor).

Central Java: Mt Muria at North coast: 1 ♀ December 1935, Mrs. WALSH (coll. v. D. V.).

The Leiden Museum possesses a female labelled: "Java, 1935, Mrs. WALSH".

Hemipepsis quadridentata n. sp.

♀. — Length 18-22 mm. Head strongly narrowed behind the eyes; width of temples only about one third of that of the eyes. Clypeus wide and short, strongly convex, the top of the convexity in the middle; anterior margin feebly emarginate. Surface of clypeus finely punctate, with a few coarser, but superficial, punctures anteriorly; the depressed anterior margin impunctate. Labrum shining, finely punctate, with distinct interspaces, the anterior margin shallowly emarginate. Front above antennae not flattened, irregularly punctate, on each side slightly raised towards the median line; median groove distinct and rather wide, but

obsolete in front of ocelli and just above interantennal tubercle. POL: OOL = 2:3.

Posterior margin of pronotum distinctly depressed, the depressed margin angularly produced in the middle. Posterior angles of mesopleura strongly projecting; metapleura at posterior margin with a blunt rim which projects as a small and blunt tooth as the thorax is seen from above and behind. Propodeum short, much raised above the level of the deeply depressed and coarsely sculptured postnotum; its dorsum about equal in length to the steep declivity; in the middle convex, towards the end bluntly carinate and slightly projecting; dorsum on each side of the middle feebly impressed lengthwise; posterior lateral angles slightly prominent; infrastigmal tubercles well pronounced, though bluntly rounded; stigma grooves distinct; the dorsum bears about 9-10 transverse, somewhat arcuate, carinae; the declivity is more densely and finely costate than the dorsum.

Hind tibiae without trace of dorsal carina, with a few rows of about 4-6 short spines. Claws with two teeth, the basal one blunt. Pulvillus bluntly triangular, bristles of pulvillar comb longer and fewer in number than in the other species.

Head, pronotum and mesonotum much more shining than in the other *Rhodopepsis* species; body deep black; antennae fuscous below; hind femora, tibiae, sometimes also the metatarsi, and second and following abdominal segments, red. The extension of the black colour on the abdomen is variable, in one specimen the second segment has some blackish spots, in another the first segment is obscurely reddish at apex. Wings with a strong violaceous lustre.

♂.—Length 15 mm, fore wing 16 mm. Antennae short and thick, only half as long as fore wing, the segments beyond the sixth very slightly curved, the antennae not distinctly crenulate. Front more densely punctate than in the female; anterior ocellus transversely oval, distinctly larger than the others; POL: OOL = 5:7. Propodeum almost as in the female, hardly less high; posterior angles even slightly more prominent; declivity with long and thin hairs. Inner spur of hind tibia only about half as long as the metatarsus. Claws as in *H. fervida*.

Coloration as in the female, but hind tibiae and tarsi darker, brownish; wings not paler than in the female.

West Java: Bogor: 1 ♀ Mt Salak, February 1936, C. J. H. FRANSSEN (coll. WILCKE). Djampang Tengah: 2 ♀, 1934 and 1935, Mrs WALSH (coll. v. D. V.); 1 ♂ Mt Malang, December 1937, Mrs WALSH (Br. Mus.); 1 ♂ Mt Ganggang, September 1935, Mrs WALSH (coll. v. D. V.); 1 ♂ Mt Malang;

February 1938, Mrs WALSH (coll. WILCKE). Bandung: 1 ♀ Mt Burangrang, 1600 m, September 1928, F. C. DRESCHER (type, coll. v. D. V.); 2 ♀ Mt Tangkuban Prahu, 1300-1600 m, February 1929, F. C. DRESCHER (Mus. Bogor).

Central Java: 1 ♀ Kopeng, December 1916, W. ROEPKE (coll. Ent. Lab. Wageningen).

The Leiden Museum possesses one female labelled "Java, REINWARDT" and one labelled "Java, MÜLLER".

Hemipepsis kangeanensis n. spec.

♀. — Length 25-30 mm. Head thick, much less narrowed behind the eyes than in the other species of this subgenus; as seen in profile the temples more than half as wide as the eyes. As seen from above, the head is slightly more than twice as wide as thick. Clypeus slightly convex, the anterior margin narrowly depressed and feebly emarginate. Labrum dull, very finely and densely punctate. Front above antennae distinctly flattened, slightly raised along inner orbits, the surface dull, but not distinctly punctate. POL:OOL = 4:5.

Posterior margin of pronotum depressed; in the middle the margin is rather abruptly widened and produced anteriorly into a deep and conspicuous \wedge -shaped impression. Postnotum short, separated from propodeum by a deep transverse groove. Propodeum mainly as in *H. fervida*; interspaces between the transverse costae somewhat rugose; the costae rather coarse, somewhat arcuate at base of dorsum, transverse posteriorly, denser and finer towards apex of declivity. Second abdominal sternite with a distinct transverse groove.

Apical part of hind tibiae with feeble and blunt longitudinal carina. Lateral pits of coxae III very deep; outer side of these coxae concave before apex, as the insect is seen from below.

Second submarginal cell strongly narrowed towards the radius, here less than half as wide as posteriorly.

Body black; labrum, mandibles (except apex), the three basal antennal segments, the under side of the following antennal segments, legs (except coxae and trochanters), and the second and following abdominal segments rather dark red; the abdominal segments suffused with fuscous stains. Wings dark, more strongly violaceous than in *H. fervida* (SM.).

♂. — Length 16 mm, fore wing 16 mm, antenna 12 mm. Clypeus truncate anteriorly; labrum large, rounded, densely and finely punctate; flattened area above antennae truncate at top, obliquely cut off at inner orbits, the upper margin not arcuate. POL:OOL = 3:4. Antennae distinctly crenulate.

Posterior two thirds of postnotum with deep and rather wide median impression. Propodeum more coarsely rugose than in *H. fervida* ♂; upper half of declivity with a few transverse costae; posterior lateral angles of dorsum slightly prominent.

Legs as in *H. fervida* (SM.).

Coloration as in the female; third, fourth and fifth antennal segments brownish above, the terminal antennal segments almost entirely blackish.

K a n g e a n Islands: Petapan, 1 ♀, East coast, in forest, February 1936, Mrs WALSH (type, coll. v. D. V.).

E a s t J a v a: Bodjonegoro, 1 ♂ Nglirip, in teak forest, January 1936, Mrs WALSH (coll. v. D. V.).