

ON INDO-AUSTRALIAN *BEMBEVINUS*, WITH SPECIAL REFERENCE
TO THE SPECIES OCCURRING IN JAVA (Hym., Sphec.)

by

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The Indo-Australian representatives of the Sphecoid genus *Bembecinus* are very imperfectly known. Several species have been described, but most of the existing descriptions are so incomplete, that they do not permit of a certain identification. Sometimes the two sexes of one species have been separated as different species, and it has also happened that the opposite sexes of two species were combined under one name. In one case F. SMITH even lumped together two different females as the sexes of one species!

The first author who established some *Bembecinus*-species from this part of the world (under the generic name *Larra*!) was F. SMITH. His descriptions are brief and based on colour characters only. HANDLIRSCH (1892) treated the *Bembecinus*-species, known at that time, as part of the genus *Stizus* in his "Monographie der mit *Nysson* und *Bembex* verwandten Grabwespen" (Sitzb. kais. Akad. der Wissensch. Wien, Math. Naturw. Classe, 101, Abth. I). This author paid more attention to structural characters, but unfortunately his Indo-Australian material was very limited. This made it impossible to associate correctly the sexes of the various species. Moreover, HANDLIRSCH was unable to identify the species, formerly described from this region by SMITH. BINGHAM (Fauna of Br. India, Hym. I, 1897) discussed two of SMITH's species and probably misidentified these; he also described one new species from Bengal and gave short summaries of some of HANDLIRSCH's descriptions. In later years a few isolated descriptions have been published by CAMERON, SONAN and by PARKER, but the previously established species were never adequately revised.

During the years 1928-1933 I brought together seven *Bembecinus* species by collecting in various localities in Java. A comparison of this material with the types of SMITH and CAMERON in London and Oxford, in 1934, enabled me to identify three of the Javan species with certainty, viz. *prismaticus* SM., *reversus* SM. and *borneanus* CAM. An other species could be reliably determined as *B. insularis* (HANDL.), ♂ = *B. socius* (HANDL.), ♀. Unfortunately, however, *Stizus javanus* HANDL., the only species which has been described from Java, remained a puzzle to me,

none of the species in my collection agreeing with the original description. A request for information on the type, which should be in the "Lübeker Museum", remained unanswered.

As I expected that further collecting would help to solve this problem, publication of my preliminary results was postponed until more material should become available.

The examination of many hundreds of specimens, subsequently collected in Java, however, has not revealed the occurrence in this island of any other *Bembecinus* species other than the seven already available for study in 1934. Recently, a renewed comparison of the extensive Javanese material at my disposal with the description of *Stizus javanus* resulted in the unexpected and probably somewhat daring conclusion, that *S. javanus* is a "non-existent" species! There appear to be very good reasons to suspect that the type and only specimen of this "species" will prove to be composed of the head and thorax of one, and the abdomen of another species (see p. 305). A study of HANDLIRSCH's type, if still in existence, must be awaited before a final conclusion regarding the status of this species can be drawn. For the present it seems advisable not to use the name *javanus* for any of the Javanese species.

A few remarks may be made regarding the generic status of *Bembecinus*. In the present paper I have followed the American authors PARKER¹⁾ and PATE²⁾, who regard this group as a separate genus. Some other hymenopterists, however, continue to use the name *Stizus* for these insects, and this may perhaps be more correct.

PARKER¹⁾ (p. 8) recorded *Vespa tridens* FABR. as the type of *Bembecinus*, but PATE²⁾ (p. 13) has shown that this is not correct and that the type is *B. meridionalis* COSTA. This species belongs to a group in which the second or third sternite of the ♂ bear a dentiform tubercle (group of *S. peregrinus*, ARNOLD³⁾, p. 285). All Indo-Australian species known to me at present, however, belong to the group of *S. tridens* (FABR.), in which the sternites are unarmed in both sexes. If this group is regarded as a subgenus of *Bembecinus*⁴⁾, it may be called *Stizomorphus*, *Vespa tridens* F. 1781 being the type of *Stizomorphus* COSTA.

The genus *Bembecinus*, as defined by PARKER, is mainly characterized by the concave declivity of the propodeum. Some characters, common to all species occurring in Java, are as follows: Eyes distinctly converging towards the base of the clypeus, in the males more strongly so than in the females. Anterior margin of clypeus straight, or slightly emarginate over its entire width. Antennae in the ♀ feebly clavate, in the ♂ more cylindrical; the eleventh segment in the ♂ produced into a spine at the

¹⁾ Proc. U. S. Nat. Mus. Wash. 75, art. 5, no. 2776, 1929.

²⁾ Mem. Am. Ent. Soc. Philad. 9, 1937.

³⁾ Ann. Transvaal Mus. 12, 1929.

⁴⁾ Lack of material from other parts of the world prevents me from expressing an opinion upon this question.

apex, the twelfth more or less excised below, the apical segment curved and hamate. Propodeum compressed at the sides, so that the concave declivity has its lateral margins prominent and more or less secant. Second submarginal cell strongly narrowed anteriorly, often triangular, the cubital vein not produced beyond the third submarginal cell; in the hind wing the medial cell emits only one vein at its apex. Eighth (ninth, if the propodeum is counted as the first abdominal segment) deeply trifurcate.

The structural characters used by HANDLIRSCH to separate the species mainly refer to the degree of convergence of the eyes and the shape of the propodeum. Some further characters which may serve to distinguish the species are as follows: (1) the presence or absence of a shallow longitudinal groove behind the anterior ocellus; (2) the puncturation of the triangular groove area on the dorsum of the propodeum; (3) the presence, and eventually the width, of a median impunctate line on the sixth tergite (♀); (4) the presence of a longitudinal carina on the seventh sternite (♂); (5) the shape of the genitalia (♂).

The structural differences between the various species are often very slight, and a key, which is based only on these characters, is difficult to use. For this reason I have also tabulated the colour characters in a key. I want to stipulate, however, that this key should be used with a certain amount of care. Although it has become evident that each species has a characteristic colour pattern, there is a certain amount of variation in the extent of the yellow markings. As regards the species occurring in Java, I believe we have a fairly correct idea of the limits of the colour variation. But when material from other localities is studied, one must expect to find colour variations not described in the present paper.

In the following keys and descriptions the term "ocular index" is used for the distance between the eyes, measured along a line through the posterior ocelli, divided by the distance between the eyes at the base of the clypeus. The propodeum is not counted as the first abdominal segment. Tarsi III means: tarsi of hind legs.

Unless otherwise stated, the specimens recorded below are in my collection. Sets of duplicates, however, have been sent to the U.S. Nat. Museum, Washington, D.C., and to the Br. Museum, London.

I. The *Bembecinus* Species occurring in Java

Key to the species, based on morphological characters

F e m a l e s

1. Posterior lateral angles of propodeum deeply incised. Sixth abdominal tergite without impunctate median line. Ocular index 2.2 - 2.4
..... *B. pallidicinctus* n. sp.

- Posterior lateral angles of propodeum rounded or very narrowly and shallowly emarginate 2
- 2. Sixth abd.-tergite uniformly densely punctate. Face wide, ocular index 1.4 - 1.6. Ocellar area with shallow longitudinal groove behind the anterior ocellus **B. insularis** (HANDL.)
- Median line of sixth tergite more or less distinctly impunctate. Face at top of clypeus relatively narrower 3
- 3. Base of triangular area of propodeum impunctate and polished. No distinct longitudinal groove behind anterior ocellus 4
- Triangular area fairly uniformly punctate, at most with a very narrow impunctate basal margin 5
- 4. Length 10 - 12 mm. Antennae further from the clypeus than from the eyes. Ocular index 2 **B. borneanus** (CAM.)
- Length 8 - 9 mm. Antennae about as far from the clypeus as from the eyes. Ocular index 1.8 - 1.9 **B. alternatus** n. sp.
- 5. Antennae further from the eyes than from the clypeus; ocular index 1.65 - 1.75. Median impunctate line of sixth tergite narrow. No longitudinal groove behind anterior ocellus **B. prismaticus** (SM.)
- Antennae much closer to the eyes than to the clypeus; ocular index at least 2.25. Ocellar area with median longitudinal groove behind anterior ocellus 6
- 6. Impunctate line on sixth tergite narrow. Ocular index 2.25 - 2.35 **B. reversus** (SM.)
- A rather broad band in the middle of the sixth tergite impunctate. Ocular index 2.5 - 2.75 **B. littoralis** n. sp.

Males

- 1. Posterior lateral angles of propodeum deeply incised. Ocular index 2.5 - 2.6 **B. pallidicinctus** n. sp.
- These angles rounded or very narrowly and shallowly emarginate. 2
- 2. Seventh sternite with a more or less shining median carina which does not reach the apex of the sternite. Ocellar area with shallow median longitudinal groove 3
- Seventh sternite not carinate, sometimes with a basal polished area which projects triangularly into the apical punctate part 4
- 3. Ocular index 2.8 - 2.9 **B. reversus** (SM.)
- Ocular index 2.3 - 2.4 **B. insularis** (HANDL.)
- 4. Ocular index 3.1 - 3.2. Ocellar area with shallow median longitudinal groove **B. littoralis** n. sp.
- Ocular index less than 3. Ocellar area without such a groove 5
- 5. Ocular index 2.6 - 2.8. Large species **B. borneanus** (CAM.).
- Ocular index 2.2 - 2.4 6
- 6. Basal half of horizontal part of triangular area of propodeum impunctate **B. alternatus** n. sp.

- Triangular area of propodeum at most with a very narrow impunctate basal margin **B. prismaticus** (SM.)

Key to the species, based on colour characters

F e m a l e s

1. Clypeus black, at most with a transverse yellow line at the base 2
- At least the lateral margins of the clypeus yellow 3
2. Clypeus black; third abdominal tergite with yellow band, which is often abbreviated laterally, rarely reduced to a median transverse spot or entirely absent; fifth tergite black or with a transverse line or a spot in the middle, never with lateral spots. Postscutellum with large yellow mark **B. insularis** (HANDL.)
- Clypeus as a rule with transverse yellow line at the base; third abd. tergite black; fifth tergite with a yellow spot on each side. In the darkest specimens the band on tergite 2 widely, that on tergite 4 narrowly interrupted. Yellow mark on postscutellum small or absent **B. alternatus** n. sp.
3. Clypeus and labrum yellow; also the supra-clypeal area yellow and, contiguous with it, a yellow line along each inner orbit. First abdominal tergite with a transverse band, narrowed or interrupted in the middle; tergites 2 - 4 with narrower bands, tergite 5 with a more or less reduced band, sometimes entirely black, never with large lateral spots. Flagellum of antennae pale brownish yellow below **B. littoralis** n. sp.
- Clypeus with black spot (in *B. borneanus* from Malaya sometimes almost absent); base of labrum often more or less extensively black.
4. Supra-clypeal area with transverse yellow mark, which is contiguous with the yellow lines at the inner orbits 5
- Supra-clypeal area with a median yellow spot, which is distinctly separated from the yellow lines at the inner orbits 6
5. Clypeus with a transverse black spot in the centre, the anterior margin yellow. First tergite with a large yellow spot on each side, tergites 2 - 4 with yellow bands, that on the third tergite rarely somewhat reduced at the sides, fifth tergite with lateral spots. Visible part of labrum yellow, or at most narrowly black at the base. Length 10 - 12 mm **B. borneanus** (CAM.)
- The black spot on the clypeus touches the anterior margin; labrum distinctly black at the base. Abdominal tergites 1 - 5 with pale yellow or yellowish white bands, the first wider than the others and often somewhat narrowed in the middle; the band on the fifth tergite sometimes twice interrupted. Length 7 - 9 mm **B. pallidicinctus** n. sp.

6. Clypeus with transverse black spot in the centre, the anterior margin yellow (sometimes very narrowly). Tergites 1 and 5 with lateral spots, 2 and 4 with bands, 3 with a short transverse line in the middle, rarely entirely black. Postscutellum black or with small yellow mark **B. prismaticus** (SM.).
- Only the base and the sides of the clypeus yellow. Markings of abdomen similar; in specimens from Java the band on the third tergite as a rule only slightly abbreviated at the sides; in specimens from Sumatra this band is sometimes reduced to a small transverse median spot. Brightly coloured specimens have the band on the second tergite strongly dilated in the middle and at the sides. Postscutellum with yellow mark **B. reversus** (SM.)

Males

1. Clypeus yellow. (Tergites 6 and 7 without yellow markings) 2
- Clypeus at least partly black, sometimes with only a small black spot or a transverse blackish line at the anterior margin 4
2. Third tergite black; tergite 1 with lateral spots, 2 with a band or lateral spots, 4 with a band (sometimes narrowly interrupted), 5 with a band or lateral spots. Underside of flagellum of antennae dark brownish or black. Postscutellum black (always?). Propodeum as a rule with a distinct yellow spot on each side. **B. alternatus** n. sp.
- Tergites 2 - 5 with yellow bands 3
3. Underside of flagellum of antennae pale brownish yellow. Propodeum usually black, sometimes with small yellow spots in the posterior lateral angles. Tergite 1 with a transverse band, which is more or less narrowed or narrowly interrupted in the middle. Metatarsus of hind legs black, sometimes fulvous at apex (in a specimen from Malaya dark at base only) **B. littoralis** n. sp.
- Underside of flagellum of antennae fuscous or black. Propodeum with lateral spots. Outer side of hind metatarsus yellow or with yellow spot **B. borneanus** (CAM.).
4. Clypeus black, often with a small yellow spot at the base, rarely also with such a spot near the anterior margin. Underside of flagellum of antennae dark. Mesoscutum with a yellow line on each side along the lateral margin, these lines sometimes interrupted, rarely reduced to a single spot in each posterior lateral angle. Band on first abd. tergite wide, narrowed in the middle, but rarely interrupted. Brightly coloured specimens have six bands on the abdomen and a median spot on the seventh tergite; in dark specimens the band on the first tergite is interrupted, those on 3 and 5 reduced at the sides and the 6th and 7th tergites are black. Disk of mesoscutum black. **B. insularis** (HANDL.)
- As before, brightly coloured specimens with two yellow lines on disk of mesoscutum **B. insularis** (HANDL.), var. **stenaspis** (PARK.).

- At least the base and the sides of the clypeus yellow 5
5. Tergite 1 with a broad band, narrowed in the middle; 2-6 with narrower bands, that on 6 often reduced at the sides or absent. Yellow mark on supra-clypeal area contiguous with the yellow lines at the inner orbits. Postscutellum with yellow line. Underside of flagellum of antennae pale brownish yellow **B. pallidicinctus** n. sp.
- Tergite 1 with a transverse oval spot on each side. Yellow mark on supra-clypeal area usually well separated from the lines at the inner orbits, in *B. reversus* rarely contiguous. The band on the third tergite as a rule reduced at the sides or absent. Postscutellum often black 6
6. Clypeus with a dark spot at the anterior margin, base and sides yellow; if the spot is much reduced, there remains a dark line at the anterior margin. Postscutellum with more or less reduced yellow line or black. Underside of flagellum of antennae fuscous. The brightest specimens in my collection (Java) have large spots on tergite 1, and bands on tergites 2-5, that on tergite 3 somewhat reduced at the sides, the others dilated laterally. In most specimens the 5th tergite has only a spot on each side. The darkest specimen (from Banka Island) has only lateral spots on tergites 1 and 2 **B. reversus** (SM.)
- Anterior margin of clypeus yellow; even if the black spot is abnormally large, there remains a fine yellow line at the anterior margin of the clypeus. Postscutellum black in specimens from Java (always?), in specimens from Malaya sometimes with a yellow line. Flagellum of antennae brownish black beneath. Tergite 1 with lateral spots, 2, 4 and 5 with band, 3 with short transverse line in the middle or entirely black **B. prismaticus** (SM.)

Bembecinus insularis (HANDL.).

1858. SMITH, F., Jl. Proc. Linn. Soc. Zool. 2: 104, no. 1, ♂ (nec ♀) (*Larra prismatica*, Borneo).
1892. HANDLIRSCH, A., Sitzber. kais. Akad. d. Wiss., Math. Naturw. Classe, Bd. 101, Abth. I: 47, no. 12, ♂, Taf. III, fig. 4 (head) (*Stizus insularis*, Celebes).
1892. HANDLIRSCH, A., loc. cit.: 44, no. 8, ♀ (*Stizus socius*, Amboina).
1937. PARKER, J. B., Entom. Monthly Mag. 73: 131, ♀ (*B. sarawakensis*, Borneo).
1937. PARKER, J. B., loc. cit.: 132, ♂ (nec ♀) (*B. stenaspis*, Borneo).

The type of *Stizus insularis* HANDL. is a ♂ from Celebes (coll. SCHULTHESS). There is little doubt that *S. socius* HANDL. is the opposite sex of the same species, and if this is confirmed by a study of the type of *socius*, the question arises whether the latter name must be used because it has page precedence. In my opinion this is not desirable. None of these two names has been used to any extent in the existing literature, and as the description of *S. insularis* is accompanied by a figure, whereas that of *S. socius* is not, I have applied the name *insularis* to this species

in accordance with Recommendation (b) to Article 28 of the Rules of Nomenclature.

The description of *S. socius* HANDL. is based on two ♀, one from Amboina (Dr DOLESCHALL) and one, labelled "Stevens 860" (both in Mus. Vienna). The specimen from Amboina should be regarded as the type, the other one as a paratype.

Judging from the description, the type of *B. sarawakensis* PARK. is a rather dark female of *B. insularis* (HANDL.). It has the third abdominal tergite entirely black, a condition which is found in about 20% of my Java specimens. A specimen from S. Borneo, Berangas, agrees well with PARKER's description; a female from East Borneo, Maluwi, has small median spots on tergites 3 and 5. The shape of the second submarginal cell is variable.

The description of *B. stenaspis* PARK. leaves no doubt that the type of this species is a very brightly coloured male of *B. insularis* (HANDL.). In specimens from Java the disk of the mesoscutum is usually black, only a few out of some hundreds of specimens showing traces of a longitudinal yellow line on each side; in specimens from Malaya and Borneo, however, these lines are often well developed. The name *stenaspis* may be retained for such brightly coloured specimens. The allotype and paratype, females, certainly do not belong to this species and will probably prove to be identical with *B. reversus* (SM.).

Malaya: Kedah, Bukit Panchor, several ♀ and ♂, IX.1929, II, VIII. and IX.1930, H. T. PAGDEN and R. P. KELLY, "assembling at nests" (coll. PAGDEN, coll. m.); Selangor, Ampang Reservoir, 1 ♀, 1 ♂, VI.1940, H. T. PAGDEN (coll. PAGDEN).

Sumatra: Deli, Serapoh Estate, 1 ♀, 1 ♂, IV.1939, Rd. AWIBOWO (coll. m.); Lampong Distr., Mt Tanggamus, 600 m, 1 ♀, III.1940, M. A. LIEFTINCK (Mus. Btzg.).

Bangka I.: Petaling, 5 ♂, III.1931, author; Tru, 1 ♂, XI.1935, author.

West Java: Common on sandy soil, particularly on islands in the rivers. Djasinga, 100 m; Buitenzorg, 250 m; do, Tjiampea, 300 m; Mt Salak, 700 m; Tapos on Mt Gedeh, 700 - 800 m; Pelabuan Ratu and Tjisolok on Southcoast, 2 - 20 m; Radjamandala, 350 m; numerous specimens, collected throughout the year by C. J. H. FRANSSEN, EDW. JACOBSON, L. G. E. KALSHOVEN, M. A. LIEFTINCK, J. OLTHOF, Mrs E. v. D. VECHT and author (Mus. Btzg., Mus. Leiden, coll. m.).

Among some hundreds of specimens from Tapos on Mt Gedeh, 4 ♀ and 7 ♂ were found to be *stylopized*.

Borneo: East Borneo, Ketapan, 1 ♂, VI.1937; Maluwi, 1 ♀, 1 ♂, V.1937; do, Pelawan Besar, 1 ♀, VI.1937, Mrs M. E. WALSH (coll. m.); S. E. Borneo, Berangas, 1 ♀, 3 ♂, XI.1930, author.

Celebes : South Celebes, Bantimurung, 10 ♂, X.1930, author; do, Palopo, 1 ♀, 3 ♂ (Mus. Btzg., coll. m.).

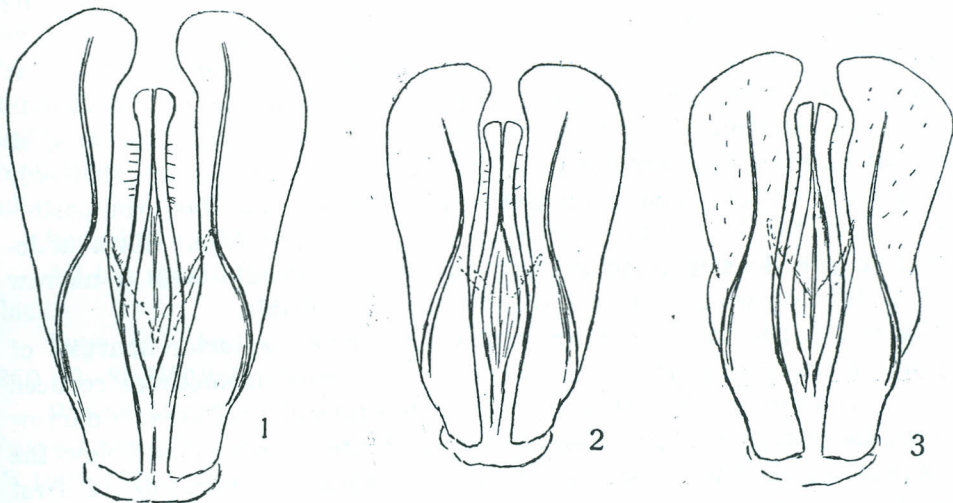
Bembecinus prismaticus (SM.).

1858. SMITH, F., Jl. Proc. Linn. Soc. Zool. 2: 103, no. 1, ♀ (nec ♂) (*Larra prismatica*, Borneo, Sarawak).

1867. SMITH, F., loc. cit., 11: 367, no. 10 (*Larra prismatica*).

1892. HANDLIRSCH, A., loc. cit.: 55, no. 21 (*Stizus prismaticus*, translation of original description).

A female specimen in the SAUNDERS collection, in the Hope Museum at Oxford, labelled "Mal. 53", is supposed to be the type of this species. It agrees in all respects with the original description, which, so far as the coloration is concerned, is fairly complete and accurate. The only locality record, given by SMITH in 1858, however, is Borneo (Sarawak). A male specimen, described by SMITH as *prismaticus* ♂, is indeed from that locality. I suspect that SMITH, when drawing up the description, overlooked the fact that the female was collected in Malaya and not in Borneo. Later, SMITH (1867) has recorded this species also from "Malacca", which appears to support my view. The male from Sarawak, associated by SMITH with the *prismaticus* ♀, belongs to *B. insularis* (HANDL.), var. *stenaspis* (PARK.).



Male genitalia of: 1. *B. insularis* (HANDL.), Tjisolok; 2. *B. prismaticus* (SM.), Tapos; 3. *B. alternatus* v. D. VECHT, Semarang.

It may be noted that in HANDLIRSCH's translation, line 8 from the bottom of the page, one should read "fünften" for "sechsten".

Malaya : Selangor, Bukit Kutu, 3500', 1 ♀, I.1930; Kedah, Bukit Panchor, 1 ♀, VII.1929; do, Kedah Peak, 1 ♂, II.1947; all collected by H. T. PAGDEN (coll. PAGDEN).

S u m a t r a : Lampong Distr., Kedaton Estate, 1 ♀, 1 ♂, Mrs E. v. D. VECHT and author.

W e s t J a v a : Djasinga, 100 m, 2 ♀, VII.1937, author; Depok, 100 m, 1 ♀, XII.1935, M. A. LIEFTINCK (Mus. Btzg.); do, 1 ♂, IX.1936, C. J. H. FRANSSEN (Mus. Btzg.); do, 1 ♂, I.1937, author; Buitenzorg, 1 ♂, XI.1935 (Mus. Btzg.); do, Tjiampea, 1 ♀, IV.1935, author; do, Tjiburial, 1 ♂, IV.1936, author; Mt Gedeh, Tapos, 700 - 800 m, 2 ♀♀, V.1934, C. J. H. FRANSSEN (Mus. Btzg.); do, 12 ♀ (2 *stylopized*!), 21 ♂, throughout the year, author; do, Tjisarua, 1000 m, 1 ♂, IX.1939, M. A. LIEFTINCK (Mus. Btzg.); do, Tjibodas, 1450 m, 1 ♀, 2 ♂, M. A. LIEFTINCK (Mus. Btzg.) and 5 ♀, 14 ♂, V.1935, V.1937 and XI.1938, Mrs E. v. D. VECHT and author; Djampang Tengah, Mt Malang, 3000', 1 ♀, I.1940, Mrs M. E. WALSCH (Mus. Btzg.) and 1 ♂, II.1935, Mrs WALSH; do, Sukanegara, 1 ♂, IX.1935, author and 1 ♂, II.1940 (Mus. Btzg.); Pengalengan, Tjitere, 2 ♀, 3 ♂, VII.1932, author.

E a s t J a v a : Idjen Mts, Blawan, 1 ♀, VI.1939, author; do, Djerukundjur, 2 ♀, 1 ♂, II. and VI.1939 and VII.1940, Mrs A. LUCHT; Mt Semeru, Ranau Darungan, 800 m, 5 ♀, 1 ♂, VI.1941, M. A. LIEFTINCK (Mus. Btzg.).

Bembecinus alternatus n. sp.

F e m a l e. — Clypeus slightly convex, feebly emarginate over its entire width anteriorly, the anterior margin narrowly depressed. Eyes moderately convergent; ocular index 1.8 - 1.9; antennae closer to the clypeus than to the eyes. Ocellar area slightly raised, without a median groove. Propodeum moderately sloping, the posterior lateral angles, as seen in profile, not regularly rounded, but narrowly and shallowly emarginate; base of triangular area impunctate and polished, the posterior half of the horizontal part rather coarsely punctate. Sixth abdominal tergite densely punctate and dull, in the middle with a narrow shining line, on which only a few punctures are visible.

Black, with the following yellow markings: anterior margin of labrum, a transverse line at the base of the clypeus (sometimes reduced to a few small spots, or entirely absent); the supra-clypeal area; a narrow line at the inner orbits, well separated from the yellow mark below the antennae (often much reduced or entirely absent); underside of first and second antennal segments (the other antennal segments pale brownish yellow beneath); a line on the posterior margin of the pronotum, narrowed or interrupted in the middle, the pronotal tubercles, a spot on the tegulae, a small spot in posterior lateral angles of mesoscutum, a longitudinal spot on each side of scutellum, a short transverse line on the postscutellum (often absent), a large spot (larger than those on scutellum) on each posterior lateral angle of propodeum; a transverse oval spot on each side of the first tergite (the spots usually at least as far from each

other as those on the scutellum); a band on tergite 2, widened at the sides and often reduced in the middle; a similar, but shorter band on tergite 4, often more or less interrupted in the middle, and a spot on each side of tergite 5; in the brightest specimen only the second sternite has a spot on each side at the apex; a line on underside of femora I and II and a small spot at their apex above, anterior side of tibiae I, outer side of tibiae II and a longitudinal spot, on outer side of tibiae III (on basal two thirds), tarsi I (except for a dark line on outer side of the two basal segments) and underside of tarsi II. Upper side of tarsi II, and tarsi III, fuscous, the apical segments more yellowish brown. — Palpi and tibial spurs pale yellow.

Length 7.5 - 9 mm.

Male. — Ocular index 2.2 - 2.4. Posterior margin of sixth sternite emarginate in the middle. Seventh sternite without a median shining carina. Genitalia: fig. 3.

Yellow markings on the head more extensive than in the female: clypeus, labrum, supra-clypeal area and — contiguous with the latter — a line along each inner orbit, yellow. First and second antennal segments, and the base of the third, yellow beneath, the remainder of the flagellum entirely dark. Colour pattern of thorax and abdomen as in the female, but the markings on the thorax very often more reduced, the postscutellum apparently always black, the spots on the propodeum sometimes obsolete; the lateral spots on the fifth tergite often connected by a yellow band, which — like that on the fourth tergite — may be slightly interrupted in the middle; 2nd sternite, often also the 3rd and the 4th, with small lateral spots. Legs as in the female, but the tarsi more extensively yellow, outer side of metatarsus III with yellow spot or line.

Length 6.5 - 8.5 mm.

All the specimens which I have seen, have the third tergite entirely black.

Type (♀) and *allotype* (♂): West Java, Tjiampea near Buitenzorg (250 m), 30.IV.1935, author.

West Java: Tandjong Priok, Antjol, 1 ♂, II.1937, C. J. H. FRANSSEN; do, 2 ♂, I.1931, M. A. LIEFTINCK (Mus. Btzg.); Buitenzorg, 1 ♀, IX.1929, M. A. LIEFTINCK (Mus. Btzg.); do, Tjiburial, 1 ♀, IV.1935, author; do, Tjiampea, 2 ♀, 3 ♂, IV.1935, author; do, 1 ♂, IX.1939, M. A. LIEFTINCK (Mus. Btzg.); Mt Salak, Tjiapus, 700 m, 1 ♀, XII.1936, author; Mt Gedeh, Tapos, 100 - 800 m, 3 ♀, 7 ♂, throughout the year, 1932-1936, C. J. H. FRANSSEN, Mrs E. v. D. VECHT and author; Sukabumi, 1 ♀, III.1933, author; Sukanegara, 1 ♂, II.1940 (Mus. Btzg.); Bandung, 1 ♂, IX.1940, J. OLTHOF (Mus. Btzg.).

Central Java: Semarang, Djatingaleh, 2 ♀, 2 ♂, VII.1939, J. G. BETREM; do, Tjandi, 1 ♀, 1 ♂, VIII.1939, J. G. BETREM.

East Java: Malang, 4 ♀, 9 ♂, III-IV.1933, J. G. BETREM.

Bembecinus borneanus (CAM.).

1903. CAMERON, P., Jl. Straits Br. Roy. As. Soc. 39: 158, ♀ (*Stizus borneanus*, Kuching, Borneo).

This species is easily distinguished by its large size and by the characters mentioned in the keys. The type is a ♀ from Kuching, Sarawak, in the Br. Museum of Nat. History. The ♂ had not previously been described, and I have therefore labelled a ♂ from West Java, Wijnkoops Bay, Tjisolok, V.1932, author, as "neallotype".

M a l a y a : Selangor, Gombak, 16th mile, 1 ♀, VI.1928 (coll. PAGDEN); do, Kuala Sleh, 3 ♀, VI.1947 (coll. PAGDEN, coll. m.); Kedah, Bukit Panchor, 1 ♀, VII.1929 (coll. PAGDEN); Perak, Bukit Merah, 1 ♀, II.1930 (coll. PAGDEN); all collected by H. T. PAGDEN.

W e s t J a v a : Southcoast, Malingping, 3 ♀, 1 ♂, III.1940, author; do, Wijnkoops Bay, Tjisolok, 4 ♀, 3 ♂, V.1932, author; Djasinga, 1 ♀, 1 ♂, XII.1938, M. A. LIEFTINCK (Mus. Btzg.); Bolang, 1 ♀, IV.1940, M. A. LIEFTINCK (Mus. Btzg.); Mt Gedeh, Tapos, 700 - 800 m, 2 ♀, V and VIII. 1933, author; Radjamandala, 350 m, 1 ♀, IX.1936, EDW. JACOBSON, and 2 ♀, X.1936, Mrs M. E. WALSH; Bandung, 700 m, 1 ♀, 1 ♂, I-II.1941, J. OLTHOF (Mus. Btzg.).

B o r n e o : East Borneo, Palawan Besar, 1 ♀, V.1937, Mrs M. E. WALSH.

Bembecinus reversus (SM.).

1856. SMITH, F., Cat. Hym. Ins. Br. Mus. 4: 349, no. 47, ♀ (nec ♂) (*Larra reversa*, Sumatra).

1892. HANDLIRSCH, A., loc. cit.: 56, no. 23 (*Stizus reversus*, translation or original description).

1934. PAGDEN, H. T., Jl. Fed. Mal. States Mus. 17: 461 (*Stizus reversus*, biological notes).

The type of this species is a female from Sumatra in the Brit. Museum of Nat. History. There could be some doubt as to whether this specimen is the true type, because SMITH does not mention the black spot on the clypeus, which is present in this specimen. But as this insect agrees in all other respects with the description, I think we may safely assume that this character has been overlooked by SMITH, whose descriptions often give the impression of being too hurriedly composed. There is another error in this description: in the 15th line from above "fourth" should be read: "fifth".

As HANDLIRSCH suspected, the male associated with the female by SMITH belongs to a different species; it is most probably a male of *B. insularis* (HANDL.).

As the ♂ of *reversus* had not yet been described, I designate a ♂ from South Sumatra, Kedaton Estate, III.1937, author, as neallotype. This male has the third tergite black, which seems to be the rule in Sumatran specimens.

Malaya: Selangor, Ulu Gombak, 16th mile, 6 ♀, III and VI.1928 (coll. PAGDEN, coll. m.); do, Sungai Temsom, Ulu Langat, 5 ♀, IX.1928 (coll. PAGDEN, coll. m.); do, Kuala Lumpur, 2 ♀, 1 ♂, III and IX.1928 (coll. PAGDEN); all collected by H. T. PAGDEN.

Sumatra: Deli, Pager Merbau, 1 ♀; do, Timbang, 1 ♂, both I.1919, S. LEEFMANS; Padang, 2 ♀ (one of which is *stylopized*!) and 1 ♂, VIII.-IX.1918, S. LEEFMANS; Fort de Kock, 1 ♂, VIII.1918, S. LEEFMANS; Lampong Districts, Kedaton Estate, 150 m, 5 ♂, III.1937, author.

Banka I.: Batu Rusa, 1 ♂ on flowers of *Embelia ribes*, II.1932, author.

West Java: Pasar Minggu, 2 ♂, IV.1929, author; Buitenzorg, Kretek, 6 ♀, 4 ♂, IV.1935 and IX.1939, author; Tjiapus on Mt Salak, 1 ♀, XI.1937, author; Tapos on Mt Gedeh, 700 - 800 m, 13 ♀, 10 ♂, throughout the year, C. J. H. FRANSSEN, L. G. E. KALSHOVEN and author; Sukabumi, 1 ♀, III.1933, author; Southcoast, Tjisolok, 1 ♀, May 1932, author; Radjamandala, 350 m, 1 ♀, IX.1936, EDW. JACOBSON; Bandung, 4 ♀, 5 ♂, X.1940, J. OLTHOF (Mus. Btzg., coll. m.).

Central Java: Kuarasan, 16 ♀, IV.1940, Dr FERRANTE (Mus. Btzg., coll. m.).

East Java: Malang, 2 ♀, 3 ♂, III and IV.1933, J. G. BETREM; do, Talok, 5 ♂, III.1931, J. G. BETREM.

Borneo: Balikpapan, 1 ♂, IV.1924, S. LEEFMANS.

Bembecinus littoralis n. sp.

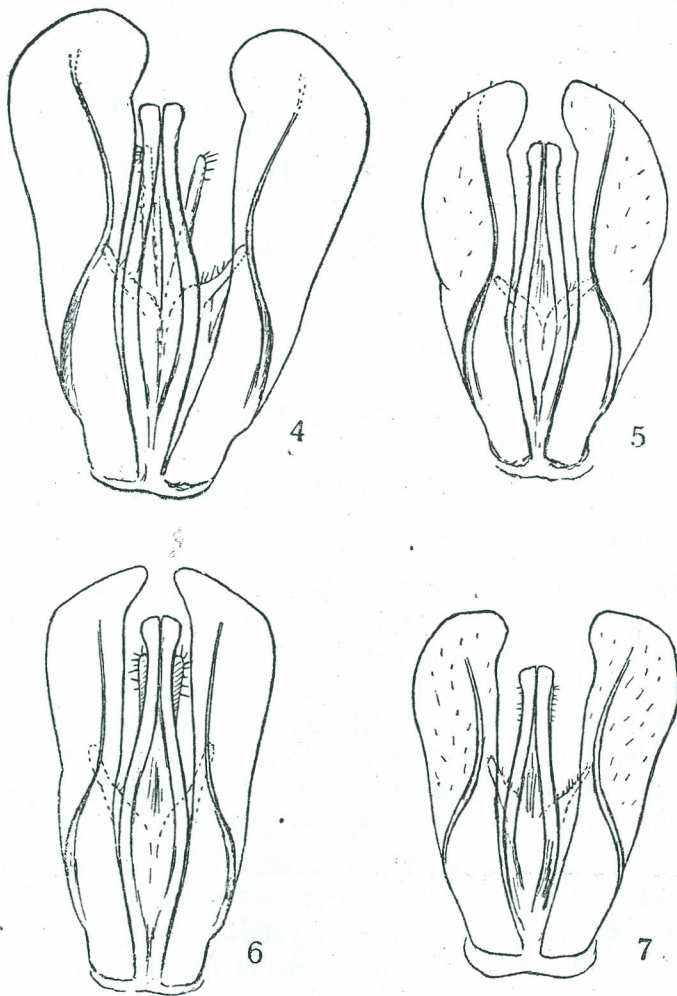
Female. — Anterior margin of clypeus feebly concave. Eyes strongly convergent towards the clypeus, ocular index 2.5 - 2.75. Ocellar area somewhat raised, with a shallow, but distinct, median groove. Propodeum short, rather steeply sloping, the posterior lateral angles, as seen in profile, rounded or somewhat bluntly angular, not incised. Triangular area of propodeum rather uniformly punctate, no conspicuous shining area at the base. Sixth tergite with a wide impunctate median line.

Black; the following parts yellow: labrum, clypeus, supraclipeal area; a line at inner orbits, ending at a level halfway between anterior ocellus and antennae; underside of first and second antennal segments (remainder of flagellum pale brownish yellow beneath); a line on the posterior margin of the pronotum, narrowed or interrupted in the middle; the pronotal tubercles, a spot on the tegulae, a small spot in each posterior lateral angle of the mesoscutum, a longitudinal spot on each side of the scutellum; a transverse line, abbreviated laterally, on the postscutellum, a minute spot on the posterior lateral angles of the propodeum (often absent); a wide transverse band, narrowed or interrupted in the middle, on the first abdominal tergite; narrower apical bands on tergites 2 - 5; apical bands on sternites 2 - 4, widened at the sides and much narrowed in the middle, often reduced to lateral spots; legs as in *B. alternatus*, but

the yellow markings on femora II somewhat less extensive. — Palpi and tibial spurs pale yellow.

The band on the first tergite lies at some distance (smaller than the width of the band) from the apical margin of the tergite; the following bands are wider at the sides than in the middle; the band on the fifth tergite is sometimes reduced to three spots, rarely entirely absent.

Length 7.5 - 9.5 mm.



Male genitalia of: 4. *B. borneanus* (CAM.), Tjisolok; 5. *B. reversus* (SM.), Tapos; 6. *B. littoralis* v. D. VECHT, Isl. Purmerend; 7. *B. pallidicinctus* v. D. VECHT, Tandjong Priok.

Male. — Very similar to the female. Eyes more strongly convergent; ocular index 3.1 - 3.2. Posterior margin of sixth sternite slightly emarginate in the middle. Seventh sternite slightly raised along the median line, but without a shining median carina. Genitalia: fig. 6.

The band on the first tergite is very often entire, more or less narrowed in the middle. Sternites 2-4, sometimes 2-5, with lateral spots. The propodeum very often entirely black; if the posterior lateral angles bear a yellow spot, this is small and inconspicuous. Coloration of the legs as in the female, but the 2nd-4th segments of tarsi III often pale yellowish.

Length 7-8.5 mm.

Type (♀) and allotype (♂): South West Java, on beach of Wijnkoops Bay, Karang Hawu near Palabuan Ratu, 30.IV.1932, author.

Malaya: Langkawi I., near Telaga Tujoh, 1 ♀, 1 ♂, IV.1936, H. T. PAGDEN.

Sumatra: Deli, Serapoh Estate, 1 ♂, IV.1939, Rd. AWIBOWO; Benkulen, 1 ♀, V.1935, Mrs M. E. WALSH.

Mentawai Is.: Siberut I., 1 ♂, IX.1924, C. BODEN KLOSS & N. SMEDLEY.

Riouw Arch.: Durian I., 1 ♀, XI.1923, K. W. DAMMERMAN.

Banka I.: Aer Mesu Tjina, 1 ♀, 3 ♂, XI.1929, author; do, 2 ♀, 2 ♂, III.1935, author; Aer Item, 1 ♀, XI.1935, author; Koba, 1 ♀, XII.1935, author.

West Java: Islands in the Bay of Batavia: Purmerend, 4 ♀, 4 ♂, II.1937, author; do, 10 ♀, 2 ♂, III.1937, C. J. H. FRANSSEN; do, 2 ♀, 2 ♂, X.1939, M. A. LIEFTINCK and author (Mus. Btzg., coll. m.); Hoorn, 2 ♀, II.1919; Leiden, 1 ♀, 4 ♂, DOCTERS VAN LEEUWEN (Mus. Btzg.).

Northcoast: Tandjong Priok, Antjol, 1 ♀, I.1931, author; do, 1 ♀, II.1937, C. J. H. FRANSSEN.

Southcoast: Ujung Genteng, 1 ♂, XI.1940, L. J. TOXOPEUS (Mus. Btzg.); Wijnkoops Bay, Karang Hawu, 11 ♀, 1 ♂, IV.1932, author; do, Tjibareno, 2 ♀, XII.1936, F. DUPONT.

Central Java: Mt Muria, Tjolo, 800 m, 1 ♂, 20-24.X.1939, M. A. LIEFTINCK (Mus. Btzg.); Southcoast, Patjitan, 1 ♀, XII.21, 1937, author.

Kangean Is.: Petapan, 1 ♂, II.1936, Mrs M. E. WALSH.

This species is a typical inhabitant of sandy beaches. It is interesting to note that in the only locality, where *B. littoralis* was collected at some distance from the coast, viz. at Tjolo on Mt Muria, Mr LIEFTINCK discovered several species of insects which normally occur on or close to the beach. *B. littoralis* was found here on a sandy path near the resthouse, at approximately thirty km from the nearest (western) sea-shore.

***Bembecinus pallidicinctus* n. sp.**

Female. — Clypeus shallowly emarginate anteriorly over almost its entire width. Eyes rather strongly convergent, ocular index 2.2-2.4. Ocellar area without median groove. Propodeum moderately long, the posterior lateral angles deeply incised; the triangular area punctate, the punctures somewhat sparser at the base than near the top of the declivity,

but there is no distinct polished area at the base as in *alternatus*. Sixth tergite uniformly densely punctate, without a shining median line.

Black, with pale yellow markings as follows: anterior margin of labrum, the sides (and in most West Java specimens also the base) of the clypeus, supra-clypeal area, a line along each inner orbit, ending at a level about halfway between anterior ocellus and antennae; underside of first and second antennal segments (the other segments pale brownish yellow beneath); markings on thorax as in *B. littoralis*, the line on the pronotum narrowed in the middle, rarely interrupted, the postscutellum always with yellow line and the spots on the propodeum distinct; a wide band, narrowed in the middle, on tergite 1; narrower bands, widened in the middle and at the sides, on tergites 2-5, the band on the fifth tergite often more or less reduced; lateral spots on sternites 2-4, coloration of legs as in *B. littoralis*. Palpi, and apical spurs of tibiae, pale yellow.

Length 6.5-7.5 mm.

Male. — Eyes more strongly convergent, ocular index 2.5-2.6. Sixth sternite shallowly emarginate posteriorly. Seventh sternite with a shining median carina, which does not reach the apex. Genitalia: fig. 7.

Clypeus (except a small dark spot at or near the anterior margin) and labrum yellow, coloration of head otherwise as in the female. Colour pattern of thorax as in the female, but the markings more extensive; the band on the pronotum united with the spots on the tubercles, lateral margin of mesoscutum with yellow line from near anterior edge of tegula to scutellum, lateral margins of propodeum almost entirely yellow. Abdominal bands as in the female, moreover the sixth tergite with a band and the seventh with a central spot; sternites 2-6 with triangular lateral spots. In some specimens the band on tergite 6 is reduced and the spot on tergite 7 absent; also the fifth and sixth sternites are sometimes entirely black. Femora I and II with yellow markings above and below, tibiae and tarsi I and II yellow with dark line on inner side of tibiae I and II and metatarsus II; tibiae III black, with yellow line on basal two thirds of outer side; tarsi III dark, segments 2-4 pale brownish, darker on inner side.

Length 6-8 mm.

Type (♀) and allotype (♂): West Java, Southcoast, on beach of Wijnkoops Bay, Karang Hawu near Palabuan Ratu, 30.IV.1932, author.

This species appears to be allied to *B. papuanus* (CAM.) from New Guinea, but by comparison with a series of that species in the collection of the Zoological Museum at Buitenzorg, I have convinced myself that the two are specifically different. *B. papuanus* is larger than *B. pallidicinctus* and the male genitalia are more densely covered with fine hairs.

Sumatra: Padang, 5 ♀, 7 ♂, VIII-IX.1918, S. LEEFMANS; Benkulen, 1 ♂, V.1935, Mrs M. E. WALSH; Oosthaven, 1 ♀, III.1937, author.

West Java: Westcoast: Pasauran, 1 ♀, V.1931, M. A. LIEFTINCK (Mus. Btzg.); Northcoast: Tandjong Priok, Antjol, 1 ♀, 7 ♂, I.1931, M. A. LIEFTINCK and author (Mus. Btzg., coll. m.); do, 1 ♀, 35 ♂, II.1937, C. J. H. FRANSSEN (Mus. Btzg., coll. m.); Southcoast: Wijnkoops Bay, Karang Hawu, 11 ♀, 12 ♂, V.1932, author; do, Palabuan Ratu, 1 ♀, 1 ♂, V.1931, M. A. LIEFTINCK (Mus. Btzg.) and 2 ♂, XII.1935, F. DUPONT (Mus. Btzg.); do, Penandjung, 1 ♀, 1 ♂, VII.1936, Mrs M. E. WALSH.

Like *B. littoralis*, this species lives in colonies on sandy beaches.

II. Notes on other Indo-Australian Bembecinus-Species

Bembecinus anthracinus (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 54, no. 20 (*Stizus*).

The description is based on a single female. Holotype in Mus. Hamburg. Type locality: New Guinea.

Bembecinus facialis (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 48, no. 13, Pl. III, fig. 3 (*Stizus*).

The type is a ♂ from Aru in the Museum at Budapest. According to the figure the interocular distance on the vertex is about 2.7 times that at the top of the clypeus.

Bembecinus javanus (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 50, no. 15 (*Stizus*).

The type and only specimen is a female from Java ("Lübeker Museum"). Judging from the description, I suspect this specimen to be composed of parts of two species. Head and thorax agree with *B. pallidicinctus* m., but the description of the abdomen fits only to *B. reversus* (SM.) or *B. prismaticus* (SM.).

Bembecinus lateralis (BINGH.)

1897. BINGHAM, C. T., Fauna Br. India, Hym. I: 281, no. 512, ♀ (*Stizus*).

Described from a specimen bearing a MS-name given by CAMERON. The type is probably in the ROTHNEY-collection, Hope Museum, Oxford; the type locality is Barrackpore, Bengal.

Bembecinus magrettii (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 43, no. 7, Pl. III, fig. 18 (*Stizus*).

The type material consists of 2 specimens (one of each sex) in the Museum at Vienna, labelled "Stevens 860" and probably originating from the Eastern part of the Indonesian Archipelago. The female should be regarded as the type, the male as the allotype.

Bembecinus modestus (SM.)

!1861. SMITH, F., Jl. Proc. Linn. Soc. Zool. 5: 124, ♀ (*Larra modesta*, Bachian).

1892. HANDLIRSCH, A., loc. cit.: 57, no. 24 (*Stizus modestus*, translation of original description).

This species was unknown to HANDLIRSCH. The following additions to SMITH's description are based on an examination of the type, a ♀ from Batjan Island, in the Hope Museum, Oxford University.

Interocular distance at vertex 2.4 times that at the top of the clypeus. Antennae almost twice as far from the clypeus as from the eyes (8:4.5). Dorsum of propodeum punctate, also at the base; as seen from above, the sides slightly convex. Sixth tergite with only few punctures in the median line.

Supra-clypeal area with two small yellow spots. Yellow markings on thorax: a transverse line on pronotum, the pronotal tubercles, a spot in the posterior angles of the mesoscutum, a small spot on each side of the scutellum, and the postscutellum. Propodeum entirely black. Tergites 1-4 with narrow yellow bands; fifth tergite with yellow spot in the middle.

B. modestus is probably closely allied to *B. reversus*; the head has approximately the same shape as in that species. It differs from this and most other species by the black clypeus and labrum, from *insularis* (which also has a black clypeus) by the strongly convergent eyes.

Length 9 mm.

***Bembecinus papuanus* (CAM.)**

1906. CAMERON, P., Nova Guinea 5, Zool.: 58, ♂ (*Stizus*).

This species was described from Lake Jamur, W. New Guinea. The type is probably in the Zool. Museum at Amsterdam. It is closely allied to *B. pallidicinctus* from Java.

***Bembecinus proximus* (HANDL.)**

1892. HANDLIRSCH, A., loc. cit.: 45, no. 9 (*Stizus*).

The description is based upon one ♂ and one ♀, received by HANDLIRSCH from CAMERON. The author says this is a "species orientalis" and does not give further particulars. According to HANDLIRSCH, loc. cit. Bd. 104, 1895: 1035, the type locality is in Continental Asia, and I suspect it to be in Assam or Bengal, as most of CAMERON's material came from these countries.

The ♂ should be regarded as the holotype, the ♀ as the allotype.

***Bembecinus pusillus* (HANDL.)**

1892. HANDLIRSCH, A., loc. cit.: 46, no. 10 (*Stizus*).

The type material consists of 1 ♂ from the Andaman Islands, 1 ♀ from Malaya (both in Mus. Vienna), and 1 ♀ from Java (Mus. Budapest).

The male specimen should be regarded as the type. It has the clypeus yellow. As the females are said to have a large black spot on the clypeus, they will perhaps prove to belong to a different species.

Bembecinus semperi (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 46, no. 11 (*Stizus*).

The type is a female from the Philippine Islands, collected by SEMPER (Mus. Hamburg).

Bembecinus simillimus (SM.)

1859. SMITH, F., Jl. Proc. Linn. Soc. Zool. 3: 159, ♀ ♂ (*Larra simillima*, Aru).

1892. HANDLIRSCH, A., loc. cit.: 56, no. 22, ♀ ♂ (*Stizus simillimus*, translation of original description).

The type is not in the Hope Museum at Oxford, but in the British Museum at London. It is a female with a round bluish-white label inscribed "Aru", another label "*L. simillima* Sm." and another "F. Sm. Coll. 1879: 22". In this specimen the posterior lateral angles of the propodeum have a narrow and superficial incision, somewhat alike to *B. alternatus*. Dorsum of propodeum rather coarsely punctate; a narrow transverse line at the base, produced backward in the middle (T-shaped), impunctate. Tergite 6 without impunctate median line. The lateral spots on the first tergite about as wide as the space between them. Band on tergite 2 narrowed in the middle, on 4 narrow; tergites 3, 5 and 6 black. Upon my request, Mr R. B. BENSON kindly measured the interocular distance at the vertex and at top of the clypeus and informed me that the distances in these units are 52:34 (= 1.53, as in *insularis*).

This species has been recorded by BINGHAM from Malaya (Fasc. Mal. 1905, Author's adv. copy p. 46), but I suspect this determination to be erroneous.

As the specimen, described by SMITH as the ♂ of "*L. simillima*", I regard a female (sic!) from Aru in the Hope Museum at Oxford, which agrees entirely with the description. It has the lateral angles of the propodeum distinctly incised and probably represents an unnamed species.

Bembecinus trichionotus (CAM.)

1913. CAMERON, P., Bijdragen tot de Dierkunde 1913: 81, ♂ (*Stizus*).

Type (♂) in Zool. Mus. Amsterdam; the type locality is Waigeu Island. Probably closely allied to or identical with my *B. littoralis* from Java.

Bembecinus versicolor (HANDL.)

1892. HANDLIRSCH, A., loc. cit.: 48, no. 14, Pl. III, fig. 17 (*Stizus*).

The type material consists of three females, one from New Britain (Mus. Hamburg), one from Halmahera (Mus. Budapest) and one from Amboina (Mus.?). The specimen from New Britain should be regarded as the type, the others as paratypes.