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RELATIONSHIPS BETWEEN *XYSTROCERA* AND *CALLICHRMATINI*, WITH REMARKS ON AUSTRALIAN AND ORIENTAL SPECIES (COLEOPTERA, CERAMBYCIDAE)

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ABSTRACT

The relationships between Xystrocera Audinet-Serville, 1834, included in the Methiini since Lacordaire (1869), and Callichromatini are discussed; from a comparison of the adult morphology and larvae, it was concluded that Xystrocera is not closely related to Callichromatini. A key is provided and corrections, additions and remarks on Australian and Oriental Xystrocera are added. "Varieties" proposed by Breuning (1957), Ohbayashi (1963) and Heyrovsky (1967) are synonymized.

Since Thomson (1860, 1864), affinities between *Xystrocera* and *Callichromatini* have been suggested. The genus, established by Audinet-Serville in 1834, was previously included (Audinet-Serville, 1833: 540) in the vicinity of *Mallosoma* and *Elaphidion*, both genera widely separated from *Xystrocera*.

Thomson (1860: 131) established two supra-generic taxa to congregate *Xystrocera* and other genera, the "10.^e Groupe, Xystroceritae" "and the "23.^e Division, Xystroceritae verae" (1.c.: 137). In his key to the genera of "Xystroceritae verae" (1.c.: 233), *Xystrocera* appeared along with *Oeme*, *Oednoderus*, *Unxia*, *Compsomera* and *Orthoschema*. The relation between *Xystrocera* and *Oeme* was pointed out for the first time, but Thomson also observed that: "Le fascies de ces insectes rapelle généralement celui des *Callichromites*".

In 1864, Thomson placed *Xystrocera* near the genera nowadays included in the Methiini (= Oemini); two divisions were established in his "7.^e Groupe, Cerasphoritae": "Xystroceritae" (with *Xystrocera* and *Oplatocera*) and "Cerasphoritae verae" (with *Oeme*, *Malacopterus*, *Temnopsis*, etc., genera of Methiini). Again (1864: 453) he placed *Xystrocera* near the Methiini genera, with the observation "Fascies *Callichromae*".

From Lacordaire's classification (1869a) up to now *Xystrocera* has been maintained in the Methiini, but Lacordaire advanced that:

"Ce genre s'éloigne à quelques égards de tous ceux qui précèdent... ", that is it was not closely related with other Methiini genera.

The systematic position of *Xystrocera* was never challenged, since Lacordaire, not even in Breuning's 1957 revision.

I am using the present opportunity to express my opinion on the relations between *Xystrocera* and Callichromatini. The first problem was to define what is a Callichromatini, for if on one hand the American forms are very homogeneous, the African Callichromatini are widely heterogenous. Lacordaire (1869: 3, note 1) felt the same problem when he remarked that among the Callichromatini there is "un assez grand nombre de formes exotiques ambiguës et qui ne rentrent bien dans aucun des genres".

Some more recent revisions of Callichromatini (*v.g.* Podany, 1968, 1971), besides failing to discuss the relations of the tribe, basically repeated Lacordaire's classification. So, I shall discuss the relations between *Xystrocera* and the American Callichromatini, where the type-genus, *Callichroma*, abundantly represented, is closely related to *Diotecnon*, *Xenochroma*, *Schwarzerion*, *Cnemidochroma*, etc.

Although having the male abdomen (fig. 4) with visible "6th sternite" (according to Lacordaire 1869b: 2, a character of Callichromatini), *Xystrocera* is distant from true Callichromatini (especially American forms) for the following reasons:

Xystrocera has a tubercle on the intermediate coxae (fig. 7), a very constant character never mentioned before and absent in American Callichromatini. The prothorax in *Xystrocera* is unarmed laterally, with sexual punctuation. The anterior coxal cavities are open behind and largely angulated at the sides, characters which are different in American Callichromatini. There are odoriferous pores in the American Callichromatini indicating, very probably, a peculiar behaviour (see Duffy, 1960: 165); these pores are absent in the examined *Xystrocera*.

Other relevant differences are in mouth parts. As shown by Demets (1973, 1974, 1976), the maxillary palpi of *Diotecnon*, *Cnemidochroma*, *Xenochroma* and *Schwarzerion* are highly modified and completely different from those of *Xystrocera* (fig. 6). The galea is elongated both in *Xystrocera* and Callichromatini but the pubescence is different; the lacinia is quite reduced in *Xystrocera* and the labium (fig. 5) very simple.

In Podany's revisions (1968, 1971) the mouth parts of the Oriental and Palearctic Callichromatini were ignored, so it is impossible for me to compare them with those of American forms.

The larva of *Xystrocera globosa* has a peculiar abdomen, very different from that of *Callichroma velutinum* (Duffy, 1960: 137, 163).

Therefore *Xystrocera* does not seem to be closely related to Callichromatini. In forthcoming papers I intend to discuss the relations of *Xystrocera* and Methiini; however, from my observations, I think *Xystrocera* deserves at least subtribal rank (the "Xystroceritae" of Thomson's) which will be adopted in future studies.

THE TYPE-SPECIES OF *Xystrocera*

I was unable to understand why Breuning (1957: 1224) indicated *Xystrocera nigrita* Audinet-Serville as the type of *Xystrocera*.

Audinet-Serville (1834: 69) established the genus for *Cerambyx globosus* Olivier and *Xystrocera nigrita* Audinet-Serville; a type-species was not indicated. However, Thomson (1864: 247) clearly designated *globosa* as the type-species. Gahan (1906: 105) again correctly referred *globosa* as the type. Evidently, the type-species of *Xystrocera* is *globosa* (Olivier), not *nigrita* Audinet-Serville as cited by Breuning.

KEY TO ORIENTAL AND AUSTRALIAN SPECIES OF *Xystrocera*¹

1. Area of sexual punctuation of male prothorax not clearly separated from remaining surface; mandibles (of both sexes, fig. 11) not strongly angulated externally; (male antennae without sexual pubescence; body brown or reddish brown with or without metallic green reflex; Australia). Group 1. 2
 - Area of sexual punctuation of male prothorax (figs. 1 — 3, 16, 17) clearly separated from remaining surface; mandibles (figs. 12) strongly angulated laterally. 3
- 2(1). Male abdomen densely pubescent; hind femora (fig. 8) pedunculate and clavate, in male not reaching elytral tip; posterior tibiae (fig. 8) expanded and fringed with hairs on hind margin; scape (♂) scarcely produced at apex (fig. 14). *australasiae* Hope
 - Male abdomen glabrous; hind femora (fig. 9) more linear, reaching elytral apex (♂); posterior tibiae (fig. 9) not expanded, without fringe of hairs; scape (♂) projected at apex (fig. 13). *virescens* Newman
- 3(1). Areas of sexual punctuation of male prothorax restricted to side (figs. 1, 2), not reaching pronotum. 4
 - Areas of sexual punctuation of male prothorax reaching pronotum (figs. 3, 16, 17); (male antennae with sexual pubescence). Group 4. 7
- 4(3). Male antennae without sexual pubescence; general color yellowish to reddish with longitudinal dark (or metallic) bands on elytra; elytral punctures at most asperate but the surface never densely and finely rugose. Group 2. 5
 - Male antennae with sexual pubescence; general color metallic blue or green, shining, without bands on elytra; elytra densely and finely rugose. Group 3. Malaysia, Indonesia, (Borneo). *alcyonea* Pascoe
- 5(4). Usually sutural angle of elytra produced or spined; apical spine of segments III and IV of male antennae not longer than spines of ventral surface; area of sexual

1. Characters in parenthesis are not discriminant, but help recognition of groups or species.

- punctuation of male prothorax (fig. 2) pubescent and deeply emarginate at upper side; pronotum with pubescence; posterior femora sublinear. Celebes to Bougainville Island. *apiculata* Pascoe
- Elytral apices rounded; apical spine of segments III and IV of male antennae longer and stronger than those of ventral surface; area of sexual punctuation of male prothorax scarcely emarginated (fig. 1) at upper side; pronotum glabrous; posterior femora pedunculate and clavate. 6
- 6(5). Antennae reddish; usually a dorsal dark band on elytra, the lateral dark band narrow; antenniferous tubercles scarcely projected; ♀ — mesosternal process longitudinally depressed; pronotum granulous. Widely distributed in Oriental Region and elsewhere (see p. 228) *globosa* (Olivier)
- Antennae black; without dorsal dark band on elytra, the lateral one wide; antenniferous tubercles projected; ♀ — mesosternal process not depressed; pronotum sparsely granulous. Northeastern India to Vietnam and Malaysia, Indonesia (Sumatra, Nias Island, Java, Borneo). *festiva* Thomson
- 7(3). Antennae dark brown to black; areas of sexual punctuation of male prothorax (fig. 17) metallic green; elytra reddish with margin widely dark. Phillipines. *sempere* Breuning
- Antennae reddish; prothorax reddish, sometimes with anterior and posterior margins darker; elytra uniformly reddish or brownish (except a narrow longitudinal band at margin or suture). 8
- 8(7). According to Breuning, 1957: 1236, 1237):
 Male antennae 1/3 longer than body; spine of scape moderately long; elytral costae scarcely visible; general color reddish with anterior and posterior margins of prothorax, anterior 2/3 of elytral margins and suture blackish. Malaysia, Indonesia (Sumatra). *brunnea* Aurivillius
- Male antennae twice as long as body; apex of scape projected into a long spine; median costa of elytra conspicuous; prothorax and elytra entirely reddish. Indonesia (Sumatra). *carinipennis* Breuning

GROUP 1

***Xystrocera australasiae* Hope, 1842**

(Figs. 8, 14)

Xystrocera australasiae Hope, 1842a: 429; 1842b: 49; McKeown, 1947: 18 (Cat.); Breuning, 1957: 1232.

Except as for Breuning's short and comparative redescription, this species is only known through Hope's 1842 description, according to McKeown, 1947: 18, not 1841 as quoted by Aurivillius, 1912: 37, and Breuning, *l.c.*).

McKeown reported the species for North Australia and Breuning studied specimens from "Svan" River which I presume to be the Swan River, in southwestern Australia.

Being unable to study the holotype of *australasiae*, my identification is questionable. The illustrations (figs. 8, 14) intend to show the differences between the species which I believe to be *australasiae* and *virescens*, and are based on three specimens of the Institut Royal des Sciences Naturelles: 1 ♂ from Australia, Boucard collection, identified by Breuning as *X. virescens* (a wrong interpretation in my opinion) and 2 ♀♀ from Victoria.

Another hypothesis which occurred to me while attempting to identify *australasiae*, is the possibility of *australasiae* and *virescens* being synonymous.

Besides *globosa*, I was able to recognize two *Xystrocera* species in Australia, easy to separate, especially if male specimens can be compared; one of them is certainly *virescens*, the other could be *australasiae*. The study of the types will conclusively decide.

Xystrocera virescens Newman, 1840

(Figs. 9, 11, 13)

Xystrocera virescens Newman, 1840: 19; 1842: 352; Lea, 1917: 617 (Geogr.); McKeown, 1947: 18 (Cat.); Breuning, 1957: 1232.¹

I studied specimens from Australia: Queensland (Cape York, Coen District) through Victoria (Melbourne).

GROUP 2

Xystrocera apiculata Pascoe, 1869

(Figs. 2, 15)

Xystrocera apiculata Pascoe, 1869: 506; Gressitt, 1951b: 4; 1959: 86; Breuning, 1957: 1268.

Xystrocera apiculata var. *fuscipennis* Breuning, 1957: 1269, *n. syn.*

Xystrocera globosa var. *reductevittata* Breuning, 1957: 1241, *n. syn.*

The geographical distribution of *apiculata* (fig. 15) suggests two species. Specimens from Ceram, Amboina, New Guinea and Ferguson Island differ from the eastern New Britain and Bougainville Islands ones in sculpture and color. I did not see specimens from Celebes, an area where *apiculata* also occurs (*cf.* Breuning, 1957: 1269).

1. For references on biology see Duffy, 1963: 56.

The type-locality of the typical form is left undecided pending a lectotype designation. Breuning erroneously quoted "Décrit sur des individus de l'île Amboina" (l.c.). Pascoe (1869: 506) described the species from "Amboina, Kai". (Kai or Kei Islands, SE of Ceram Island and W of Aroe Islands).

Specimens from the western part of the range (typical form), are paler, yellowish or orange yellowish, without dorsal longitudinal band on elytra; the elytral granules are sparse. I think the variety *fuscipennis* was based on a darker specimen from Sepik area (New Guinea), a region enclosed into the range of the typical form, especially because there is on mention of the elytral sculpture: "Comme la forme typique, mais la majeure partie du disque élytrale sauf au cinquième basilaire et au cinquième apical, brun foncé" (Breuning, l.c.).

The female examined, from Bougainville Island (Kieta), in the Institut Royal des Sciences Naturelles collection, is evidently darker, with reddish elytra and asperate, dense, elytral sculpture (similar to that of *globosa*); however, the specimen agrees with *apiculata* in other characters, including the pointed sutural angle of elytra.

A pair (National Museum of Natural History) from eastern New Britain (Kokopo), besides the same pattern of asperate elytral sculpture, presents a dark band on each elytron, resembling the common *Xystrocera globosa*.

From central Timor (Soë, 800 m) I received a female (Institut Royal des Sciences Naturelles), identified by Breuning as "*Xystrocera globosa reductevittata* mihi". The specimen belongs to *apiculata* with elytral sculpture a little denser and apical spine absent.

***Xystrocera globosa* (Olivier, 1795)**

(Figs. 1, 4-7, 10)

Cerambyx globosus Olivier, 1795: 27, pl. 12, fig. 81.

Xystrocera globosa; Audinet-Serville, 1834: 70; Dejean, 1835: 328 (Cat.); White, 1853: 120 (Cat.); Thomson, 1860: 251; 1864: 247; Gemminger & Harold, 1872: 2794 (Cat.); Künckel *in* Grandidier, 1890: pl. 47, fig. 5; Gahan, 1894a: 9 (Geogr.); 1894b: 481; 1906: 106, fig. 42; Aurivillius, 1908: 142; 1924: 24 (Geogr.); Schwarzer, 1925: 20; Okamoto, 1927: 65; Matsushita, 1933: 241; Mitono *in* Miwa & Chûjô, 1940: 81 (Cat.); Mitono, 1940: 17; Gressitt, 1940: 3; 1951a: 130; McKeown, 1947: 18 (Cat.); Wolcott, 1948: 334; Lepesme & Breuning, 1953: 301; Breuning, 1956: 230; 1957: 1239 (Synonyms); Villiers & Chûjô *in* Kira & Umesao, 1961: 341; 1964: 244; Breuning & Heyrowsky, 1961: 142; Chiang, 1963: 11 (Geogr.); Kojima & Hayashi, 1969: 45, pl. 15, figs. 1, 4; Gressitt & Rondon, 1970: 51; Pase & Coster, 1973: 1063; Beaver, 1975: 53 (Geogr.).¹

Callidium marginale Goldfuss, 1805: 44, pl. 1, fig. 8.

Xystrocera marginalis; Aurivillius, 1908: 142; 1912: 36; Breuning, 1957: 1239 (Synonymy); Duffy, 1957: 86.²

1. For references on biology see Duffy, 1957, 1960, 1963, 1968.

2. The following papers on *X. marginalis* in my opinion, refer to *X. dispar*, but this name, according to Duffy (1957), is a synonym of *X. vittata* (F.): White, 1853: 120; Distant, 1898: 369; 1904: 106, pl. 9,

- Xystrocera viridipicta* Fairmaire, 1869: 367; Breuning, 1957: 1239 (Synonymy); Ferreira & Veiga-Ferreira, 1959: 119 (Cat.).
Xystrocera globosa diehli Heyrowsky, 1967: 39, n. syn.
Xystrocera globosa var. *invittata* Breuning, 1957: 1241, n. syn.
Xystrocera globosa var. *mediovitticollis* Breuning, 1957: 1241; Gressitt & Rondon, 1970: 51 (Synonymy).
Xystrocera globosa f. *onomichiensis* Ohbayashi, 1963: 10, n. syn.

Callidium marginale Goldfuss, 1805, was considered a synonym of *Xystrocera globosa* by Breuning (1957: 1239) probably influenced by Aurivillius (1908, 1912). This synonymy deserves some remarks.

White (1853: 120) enrolled *X. marginalis* as present in the British Museum collection and occurring in "S. Afr.". I suppose White identified *X. vittata* (F.), a species not mentioned in his catalogue, as *X. marginalis* (Goldf.).

Distant (1898: 369), probably based on the British Museum collection (including White's identifications), cited *marginalis* from Transvaal, on some years later (1904: 106) illustrated both sexes of the species. According to Aurivillius (1912: 36) the species mentioned by Distant as *marginalis* is *X. dispar* Fahraeus.

Aurivillius (1908: 142) suggested that *marginalis* (Goldf.) could be a synonym of *X. globosa*; this synonym appeared (with an interrogation mark) in the "Coleopterorum Catalogus" (Aurivillius, 1912; 36).

I am unable to understand how the species could be erroneously quoted as "*X. marginalis* Goldf." in several posterior publications (Lepesme, 1953; Tordo, 1954 and Lespesme, 1955), since Aurivillius in 1912, corrected the identification of *marginalis sensu* Distant.

Breuning (1957: 1239), who ignored most of the bibliographical references to *globosa*, formalized the synonymy between *marginalis* (Goldf.) and *globosa* (Oliv.): "*marginalis* Goldf. (décrit erronément sur de individus du Cap) et *viridipicta* Fairm. (type perdu) sont des synonymes".

Duffy (1957: 86) considered both, *marginalis* (Goldf.) and *dispar* Fahrs., as synonyms of *vittata* (F.). It is easy to understand why Duffy proposed these synonyms: in the British Museum collection, specimens identified as *marginalis* since White's and Distant's time are actually *dispar*, nowadays a synonym of *vittata*.

It is however incomprehensible why Ferreira & Veiga-Ferreira (1959: 119) mentioned *marginalis* (Goldf.) and *viridipicta* Fairm. as good species and omitted *marginalis* Distant (*nec* Goldfuss), in the synonymy of *dispar* Fahrs.

Tordo (1973: 109, 110), besides citing for Mozambique a *Xystrocera* which he believed to be *globosa*, established differences between "*globosa*" and "*marginalis* Bred." I ignore who could be "Bred."! The pronotum figured as belonging to *globosa* (*l.c.*, fig. 3a) does not agree with the species. The previously published bibliography on *globosa* and *marginalis* certainly was not examined by Tordo and

figs. 13, 14; Lepesme, 1953: 18; 1955: 841. References to *marginalis* probably dealing with other species: Tordo, 1954: 137, pl. 1, fig. 1; 1973: 110, figs. 3b, 4b; Ferreira, 1957: 36.

his observations are worthless because it is impossible to recognize the species involved. The reference quoted by Tordo for *globosa* is J. Linsley (*sic*) Gressitt (1951), who dealt with the true *globosa*. I shall return to the matter in the study of the African species of *Xystrocera*.

Xystrocera globosa has a wide distribution throughout the Oriental Region, exhibiting a high vagility especially as regards colonization of islands. Specimens studied and localities previously recorded are: Egypt, "Arabia" (Breuning, 1957), "île de France" (Olivier, 1795; Audinet-Serville, 1834; Dejean, 1935). Madagascar, Seychelles, Aldabra, Rodriguez, Mauritius and Reunion Inlands. China (Tibet to Liaoning) Korea, Japan, Formosa, Nepal, India (including Andaman and Nicobar Islands), Ceylon, Buthan, Bangladesh, Burma, Vietnam, Laos, Thailand, Cambodia, Malaysia. Philippines, Indonesia (Sumatra, Java, Sumbawa, Borneo, Celebes, Ternate, Amboina, Timor, New Guinea), N. W. Australia, New Caledonia, Tahiti. Hawaii. Puerto Rico.

***Xystrocera festiva* Thomson, 1860**

(Fig. 12)

Xystrocera festiva Thomson, 1860: 251; Pascoe, 1869: 506; Gahan, 1894a: 9 (Geogr.); 1906: 107; Heyne & Taschemberg, 1906: 238, pl. 36, fig. 1; Fisher, 1934: 1; Lepesme & Villiers, 1944: 6; Breuning, 1957: 1241; Gressitt & Rondon, 1970: 51, fig. 10e.¹

The species occurs in eastern India (Bengal, Assam), Burma through Vietnam, to Malaysia, Indonesia (Sumatra, Nias Island, Java, Borneo).

GROUP 3

This group is clearly isolated from the preceding one by the presence of sexual pubescence in male antennae, the entirely metallic (green or blue) upper surface and the peculiar elytral sculpture. The area of sexual punctuation in the male prothorax is similar to that of group 2 (as in figures 1, 2).

***Xystrocera alcyonea* Pascoe, 1866**

Xystrocera alcyonea Pascoe, 1866: 534; 1869: 507; Shelford, 1902: 282, pl. 20, fig. 48; Matsushita, 1933: 241; Breuning, 1957: 1252.

Xystrocera promecoides Pascoe, 1888: 492; Breuning, 1957: 1252 (Synonymy).

The type-locality quoted by Breuning (1957: 1253) for *alcyonea*, "décrit sur des individus de la presq'île de Malacca: Penang", is wrong. The type-locality should be left undecided pending a lectotype election. Pascoe certainly had specimens (or only one specimen,

1. For references on biology see Duffy, 1968.

because but one measurement is cited), from Penang, a locality described by himself (Pascoe, 1866: 222), but to conclude the original species description he said (*l.c.*: 535): "This species seems to be a variable species...; but I have a small specimen, with much less rugose antennae,... of the femora. The example described above is from Sarawak, where, as well as in Singapore, the species was taken by Mr. Wallace." As Pascoe had specimens from Penang, Sarawak and Singapore, all them are syntypes.

I studied specimens from Malaysia (Perak, Malacca, Sarawak), Singapore and Indonesia (Borneo). It was very interesting to note that the species has never been found in Sumatra (*ca.* 50 Km from the Malay Peninsula).

GROUP 4

***Xystrocera semperi* Breuning, 1957**

(Figs. 3, 17)

Xystrocera semperi Breuning, 1957: 1253.

In the male studied the metallic green area of sexual punctuation of the prothorax presents very characteristic crateriform punctures (fig. 17); the median area, free from sexual punctuation, is an orange lozenge.

The species remains recorded only for the Philippines; 1 ♂ from Mindanao (illegible locality; Humboldt-Universität) was examined.

***Xystrocera brunnea* Aurivillius, 1924**

Xystrocera brunnea Aurivillius, 1924: 25; Breuning, 1957: 1236.

This species was not represented in the collections studied. Differences presented in the above key to separate *brunnea* and *carinipennis* follow Breuning (1957: 1236, 1237). The species was originally described from Sumatra: Tanangtalo; Breuning records Malaysia: Selangor (Kuala Lumpur).

***Xystrocera carinipennis* Breuning, 1957**

(Fig. 16)

Xystrocera carinipennis Breuning, 1957: 1237.

Sides of antennal segments III-V (♂) with relatively coarse granulations; underside of segments III-VII (♂) abundantly covered with sexual pubescence; elytral median costa not projected (♀); segment I of posterior tarsi (♂) a little longer than the sum of the following. General color reddish orange with slightly darker, brownish, elytral suture.

Originally described from "Indes néerlandaises". Both specimens studied (National Museum of Natural History) are from Indonesia, Sumatra: 1 ♂ (no other data); 1 ♀ from Beokit Gabah (erroneously identified as *Xystrocera devittata* Kolbe, an Afrikan species).

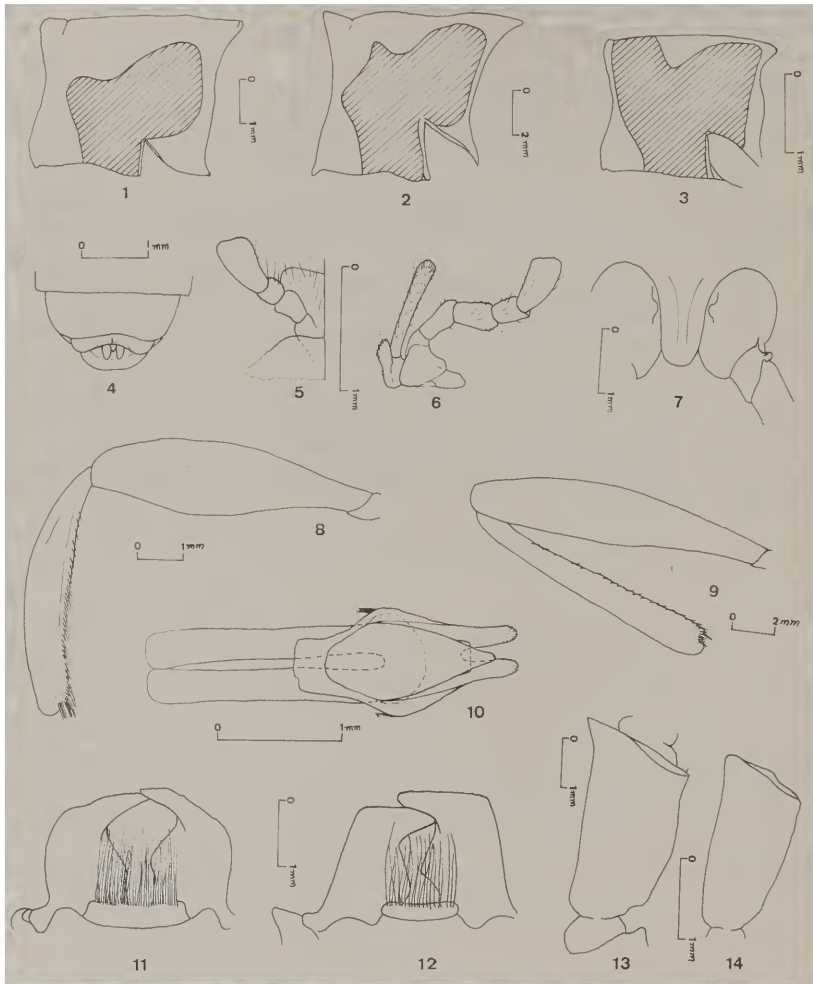
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Xystrocera globosa: 1, male prothorax, lateral view; 4, last abdominal sternites, ♂; 5, labium; 6, maxilla; 7, intermediate coxae; 10, male genitalia. *X. apiculata*: 2, male prothorax, lateral view. *X. semperi*: 3, idem. *X. australasiae*: 8, posterior leg, ♂; 14, scape, ♂. *X. virescens*: 9, posterior leg, ♂; 11, mandibles; 13, scape, ♂. *X. festiva*: 12, mandibles.

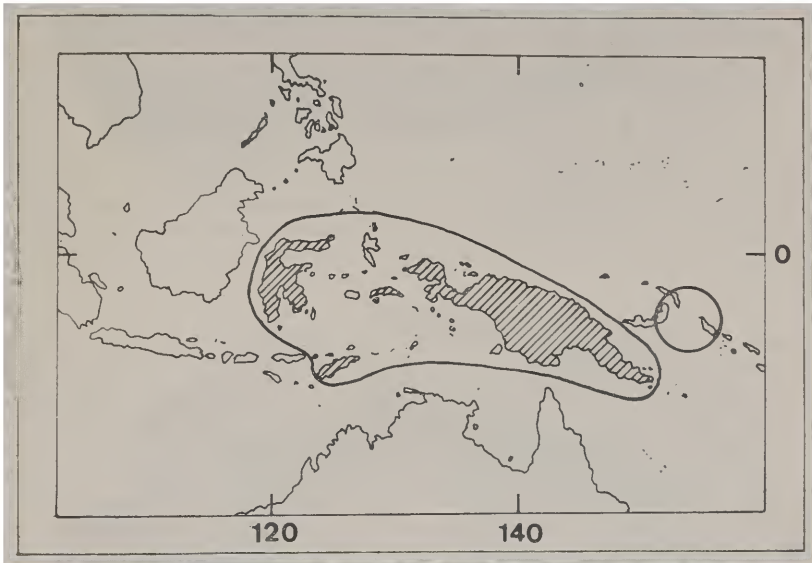
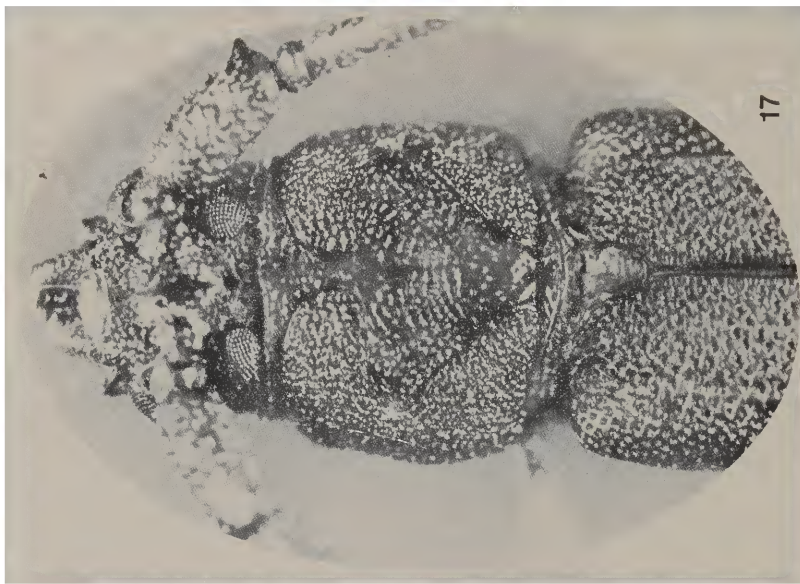


Fig. 15. Geographical distribution of *Xystrocera apiculata*.



Male pronotum: 16, *Xystrocera carinipennis*; 17, *X. semperi*.