The Aculeate Wasps of New Caledonia, with Natural History Notes

By FRANCIS X. WILLIAMS
Experiment Station, H.S.P.A.

(Presented at the meeting of December 11, 1944)

IN May 1940 the Experiment Station of the Hawaiian Sugar Planters' Association sent the writer to New Caledonia to collect and study the insect pests of that large island. The data thus secured would enable Hawaii to safeguard itself more effectively against the accidental introduction of any such pests. Incidental to this work on economic entomology, opportunity was afforded to study the biota—with special reference to the stinging wasps—of that most interesting region.*

I spent from July 3 to November 12—roughly from the very mild midwinter to the commencement of summer—in New Caledonia, paying particular attention to the area about Noumea, the capital city near the southern extremity of the island, but visiting farther south to the Isle of Pines and proceeding northward to the Nepoui valley on the west coast, and to Hienghene well beyond the middle length of the island, on the east. Mrs. Williams who accompanied me took all the photographs in New Caledonia and otherwise helped me in my work.

During our stay in New Caledonia we were assisted in many ways. Referring particularly to travel and to stops in out-of-the-way places, thanks are due to Mr. and Mrs. L. Want for a delightful stay at their ranch at Oua Tom on the west coast, and to Mr. T. Mulhern at whose lumber camp well up the Nepoui valley we spent a week. A trip to the Isle of Pines and way points was made possible through the courtesy of Mr. N. Hagen. Finally, Albert Rogér, manager of Garage Rogér, proved indispensable in his knowledge of people and places, and in arranging trips and in his reassuring operation of the automobile. Above all, the various government officials were always gracious in granting travel and stopover permits.

Mr. Robert Virot, trained botanist, determined many plants for me and in our several field trips in his congenial company gave me a better understanding of the botany. Mr. Virot's "Esquisse Phytogeographique Neo-Caledonienne" (Etudes Melanesiennes, 1(2): 25-29, 1939) is a useful contribution to the botany of the island.

*The types of the species described in this paper are in the collection of the Experiment Station, H.S.P.A., Honolulu.

Mr. E. C. Zimmerman, entomologist of the Bernice P. Bishop Museum, Honolulu, furnished the Experiment Station, H.S.P.A. a catalogue of the insects known to occur in New Caledonia, which has helped a great deal.

The island of New Caledonia was discovered by Captain James Cook in 1774, and is a dependency of France. It lies just within the Tropic of Capricorn and is about 750 miles northeastward of

Fig. 1. Vegetation on the summit of Mount Mou, elevation about 4,000 feet. In the foggy background may be seen the dim forms of native *Araucaria* pines.

Brisbane, Australia, and somewhat less that distance southwestward of Fiji. It is 220 miles long with an average breadth of 25-30 miles and has a total area, including off-lying islands, of 7,200 square miles (Pacific Islands Pilot, 1 [Western Groups] 3rd. ed.: 43, 1928). It is thus more than half as large again as Viti Levu or Hawaii, largest islands in the Fijian and Hawaiian groups, respectively. Less than 30 miles beyond its southern extremity is the Isle of Pines (58 sq. m.), while 50 miles or more off the east coast are the small Loyalty Islands, both under the jurisdiction

of New Caledonia. The more fertile New Hebrides lie some 200 miles north and east.

New Caledonia is nearly enclosed by a barrier reef. It is an ancient island without volcanic activity. It is ruggedly mountainous, the highest points being Mount Panie in the north and Mount Humboldt in the south. Both are approximately 5,400 feet high. Some 20 miles northwest of Noumea and easily accessible from

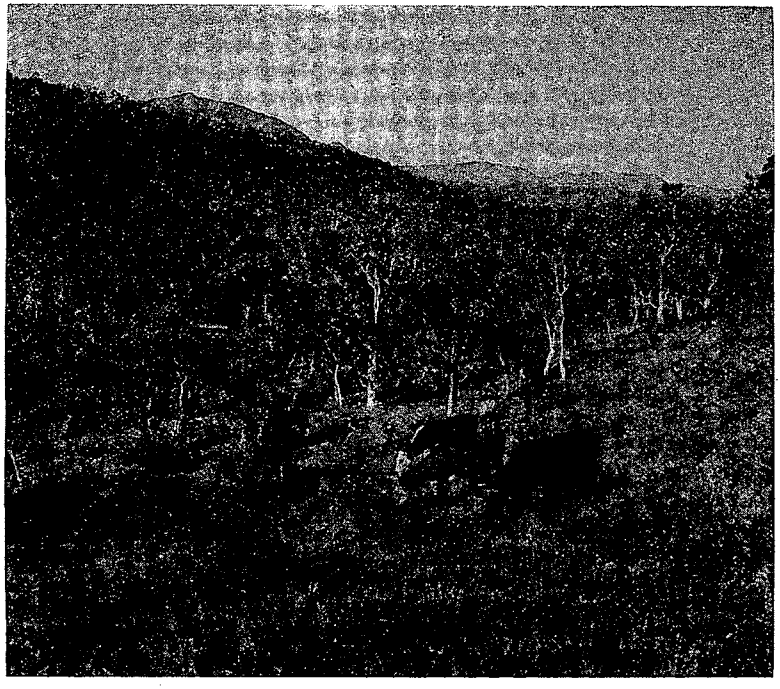


Fig. 2. Hills behind Noumea, showing a forest of "niaouli" (*Melaleuca leucadendron* var. *viridiflora*). Towards the upper right is the nippled summit of Mount d'Or.

that city is the square-topped Mount Mou, elevation about 4,000 feet and a familiar landmark. It is a good collecting place, from base to summit, on which there is a small mossy forest (text figure 1). The east coast is more rugged and generally wetter than the west, which appears to have more mangrove swamps and more extensive open forests of the shaggy-barked "niaouli" (*Melaleuca leucadendron* Linn., var. *viridiflora* Gaernt., Myrtaceae), (text figure 2). Forest consisting of many kinds of trees, ferns, other undergrowth and some palms occur in pockets in valleys and

on the slopes of higher mountains. They have suffered much from the inroads of man.

From a standpoint of zoögeography New Caledonia is generally placed in the Australian region. As a subdivision of this region it has been variously classified. Forel, for example, regards New Caledonia as a sub-fauna of the Australian fauna (The Social World of Ants, **1**: 149, 156, 1930). A classification perhaps more

Fig. 3. Kauri pine (*Agathis* sp.) in the Marmite forest, New Caledonia. The writer's white helmet on the left side of the trunk at the base.

generally accepted, is to consider Fiji together with New Caledonia and probably the New Hebrides, as belonging to the Melanesian subregion, as has been done by Mann (The Ants of the Fiji Islands, Bull. Mus. Comp. Zool. **64**: 405, 1921). Tillyard, in subdividing the Australian region, places New Caledonia in the Papuan province, which he considers as embracing all the islands lying east of Wallace's Line. Chief among these islands are Celebes (at least its highlands), Timor, New Guinea, the Solomons, the New Hebrides, New Caledonia and Fiji. (The Biology of Dragonflies: 292, Cambridge, 1917).

At the time of our visit, Noumea and its environs hardly presented a tropical picture. None of the trees along the streets and in the parks appeared to be in blossom, while the grassy hills rising immediately behind the city and culminating in Mt. Montravel,

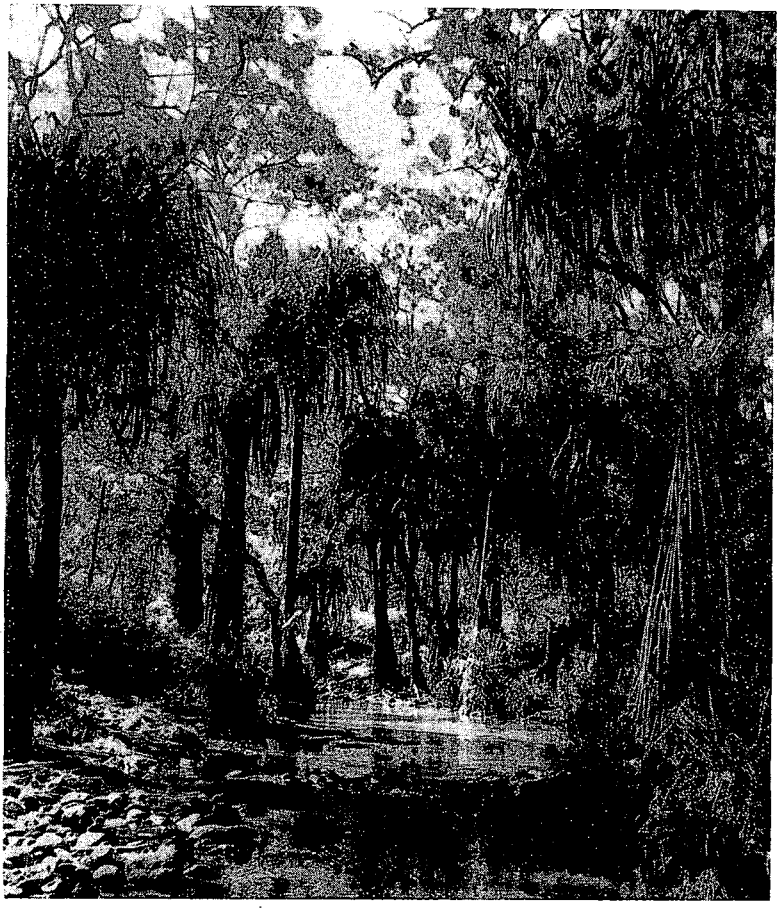


Fig. 4. A grove of *Pandanus* in the Nepoui Valley.

about 548 feet high, were generally quite brown. Later on in these hills small colonies of dwarf ground orchids thrust their pretty white or bluish flowers upwards among the dry grass stems, and certain other plants came into flower. Tiny ponds, nestled in the small valleys, support a fair representation of water-loving insects and other invertebrates. Here one could find several species of

dytiscid and hydrophilid beetles and one or two gyrinid beetles, saldid, notonectid, and hydrometrid and other surface bugs, some of the commoner dragonflies, the sluggish larva of a stratiomyid fly, mosquitoes, etc. A small shrimp was not uncommon.

Butterflies are probably the most obvious insects about the city and in the little forest remnants that still persist in the small valleys

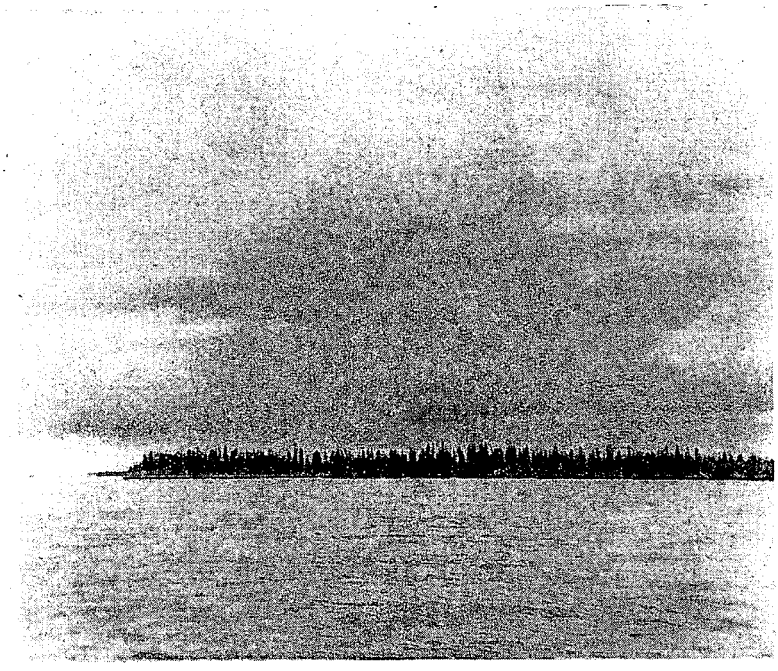


Fig. 5. Coral islet off the southern shore of New Caledonia. To show growth of *Araucaria cookii.*

nearby. In this area at least 15 species may be taken. Conspicuous among these is the glossy blue *Papilio montrouzieri* Boisd., with the more slowly flying, blackish, yellowish white and brown *Papilio amyntor* Boisd. also well known. The skipper butterfly, *Badamia exclamationis* (Fabr.)—or a variety of it—though not often seen in the adult stage, feeds as a caterpillar banded zebra-like, on the foliage of the tropical almond, *Terminalia catappa* Linn., to young trees of which it may cause some damage. One or more kinds of dark velvety *Euploea* butterflies flit about shady places. The widespread *Hypolimnas bolina* (Linn.) with the sexes so differently colored, is common. Long ago, J. J. Walker (Ent. Mo. Mag. **12**: 192, 1901) noted the resemblance between the female

of this butterfly and *Papilio amyntor* in New Caledonia. Other common butterflies are *Precis villida* (Fabr.), *Danaus plexippus* (Linn.), *Cosmolyce boetica* (Linn.) and two migratory pierids, *Anaphaeis java* (Fabr.), race *peristhene* (Boisd.) and *Appias paulina* (Boisd.), var.

I took seven species of sphingid moths. Probably at least double that number occur in New Caledonia. *Hippotion celerio* (Linn.) the taro sphinx, sometimes nearly defoliates taro and *Caladium* plants. A large pale gray species evidently closely related to, if not the same as the Australian Casuarina sphinx (*Psilogramma menephron casuarinae* Walk.), was sometimes attracted to light. *Herse convolvuli* (Linn.) was rarely seen. A single forewing of a sphingid found in a forest near Noumea was identified as belonging to a species of *Macroglossa.* Two specimens of *Cephanodes janus* Miskin, one of the so-called bee or clear-wing hawk moths, were captured at or about the flowers of *Lantana camara* Linn.

Large noctuid moths are well represented in New Caledonia. The larva of one species feeds on the foliage of the "niaouli" tree and hides during the day under the shaggy bark, the quantities of frass at the base of the tree or wedged between the loose bark often revealing its presence. The moths themselves were often found impaled on the thorns of *Acacia farnesiana* Willd.—evidently the work of shrikes.

The use of a beating net on the scrubby growth will often yield a good catch of insects: small weevils, a tiny buprestid beetle that seems to breed in the wood of the dwarf *Casuarina,* small geometrid moth larvae on the same shrub, thrips and other insects. Conspicuous on the thorny *Acacia farnesiana* shrubs are the egg cases of a mantid, probably *Tenodera australasiae* Leach, that often show emergence holes of *Podagrion* sp., one of the chalcid wasps. Large acridiid grasshoppers, most conspicuous of which was *Austracris guttulosa illepida* (Walk.) rise up before you to fly swiftly downwind. The shrill, almost ear-piercing stridulation of a cicadid suddenly ceases at your approach. And as we wend our way along the goat trails on these brown hills at sunset, the mellow, almost continuous note of *Oecanthus rufescens* Serv., a pale brown cricket, arises from among the weeds and tall grass.

The native forest with its well-wooded stream offers far more incentive to the entomologist. Here the endemism is higher, and the glimpse of some desirable insect or the capture of single specimens of apparently new species spurs one to more and more visits to his favorite stream and wood.

A number of species and even some families of insects were not in season during my stay in New Caledonia. For example, except for one or two elytra wrapped up with other insect remains in an orb web of a common epeirid spider, I saw no evidence of any of

the fine endemic cicindellid beetles. Although a number of larvae of elaterids were found, chiefly under the bark of a fallen tree in the forest, only two or three adult beetles were taken. An elaterid larva of formidable size occurred rarely under bark where it may have preyed upon the grub of large cerambycid beetles. Collecting under the bark of dead trees was often good, yielding many species of beetles and such other good things as large collembolous insects and a species of *Zorotypus* (Zoraptera).

Aquatic beetles are rather well represented in New Caledonia, particularly where streams are sluggish or have broken up into isolated pools, thus concentrating the fauna. A new experience for the writer were the habits of a species of *Macrogyrus,* a whirligig beetle (Gyrinidae) with much the appearance of *Dineutes,* also represented in New Caledonia. In the more pool-like portions of a clear stream deep in the forest, and at a depth of some seven inches beneath the surface of the water, groups of these beetles, head end inclined slightly downwards, maintained their position with an occasional stroke of the legs. Now and then a *Macrogyrus* would come up for air, but would soon dive to rejoin its group.

The dragonflies (Odonata) of New Caledonia are of considerable interest, both the Zygoptera and the Anisoptera being in good proportion. Campion in his "Odonata collected in New Caledonia by the late Paul Montague" (Ann. Mag. Nat. Hist. [9] **8**: 33-67, 11 text figures and 2 plates, 1921) lists 26 species as definitely known to inhabit New Caledonia and the Loyalty group. To this list must be added *Anax gibbosulus* Rambur and *Macrodiplax cora* (Brauer), the former recorded from New Caledonia prior to 1928 (see Cheesman, Trans. Ent. Soc. London, **75**: 153, 1927), the second taken by the writer in 1940. Both of these dragonflies are Old World tropical species. Among the Libellulidae, pretty little *Diplacodes,* represented by two species of which I took but one, were common about little pools. The male has the body bright red. The larger *Orthetrum caledonicum* Brauer, also common but difficult to catch, has a pale glaucous or brown abdomen. Less often seen were a species of *Tramea, Macrodiplax cora* and the worldwide *Pantala flavescens.* In the subfamily Corduliinae, I took only *Hemicordulia fidelis* MacLachlan. Several fine species of the genus *Synthemis* occur. The Zygoptera or damselflies are represented by ten species, of which seven are endemic. The non-endemic ones are *Ischnura delicata* (Hagen) (= *Ischnura aurora* [Brauer]) and *Ischnura heterosticta* Burm. and *Agriocnemis exsudans* Selys. Along forest streams the relatively large *Argiolestes ochraceus* (Montr.) was occasionally taken; the males when in mature coloration, are heavily marked with bright ochraceous that gives them a striking appearance. A moderately large, very slender *Isosticta* was also found in the same localities, its exuviae were not uncommon on boulders in the Thi River, the nymphs themselves, provided with

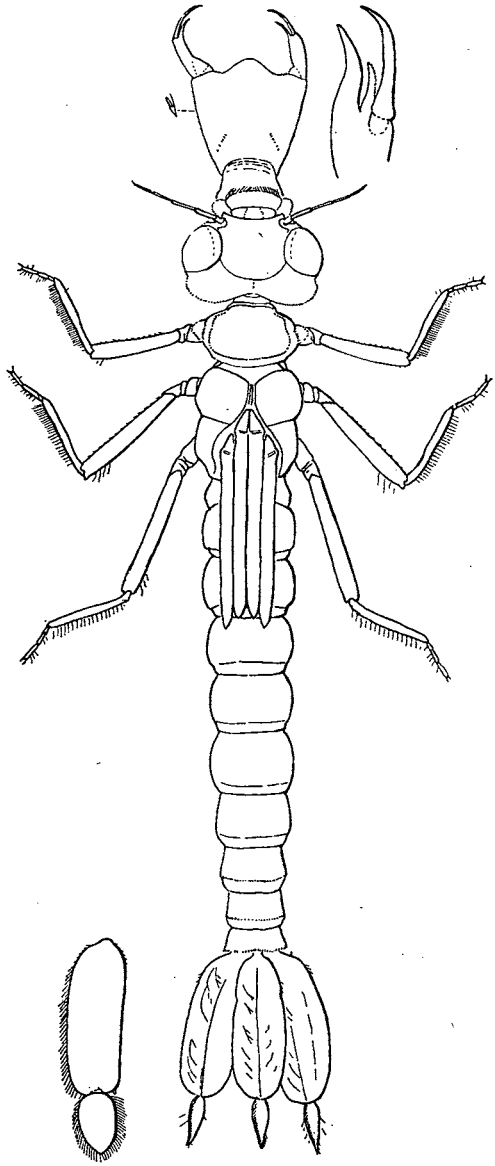


Fig. 6. Nymph of a damselfly (*Isosticta robustior* [?]). Drawn from an over-turgid specimen that was preserved in alcohol. There are no raptorial setae on the labium, and the anal gills are saccate. Thi River near St. Louis, New Caledonia.

saccate gills (text figure 6) were taken under stones in the same stream. Large water-running spiders, and also a species, that when disturbed, crawled even to the bottom of pools carrying its flat eggcase beneath its cephalothorax, are probable enemies of these and other Odonata.

An important paper that includes some of the New Caledonian Zygoptera is "New Genera of Megapodagrioninae, with Notes on the Subfamily" by C. H. Kennedy (Bull. Mus. Comp. Zool. **67**: 289-312, one plate, 1925).

Aculeate Wasps

Thirty-seven species of aculeate wasps now appear to be definitely recorded from New Caledonia. Six or seven of these were not taken by the writer. Fourteen new records are here included. The Pompilidae with about 12 species are best represented. A number of additional species of aculeate wasps are to be expected from this island.

Mutillidae

Ephutomorpha caledonica (André) (pl. 18, figs. A and C)

André Ann. Mus. Civ. Stor. Nat. Genova, (2) **17**: 96, 1896, ♀ (*Mutilla* [*Sphaerophthalma*] *caledonica*). (I have not seen this description).

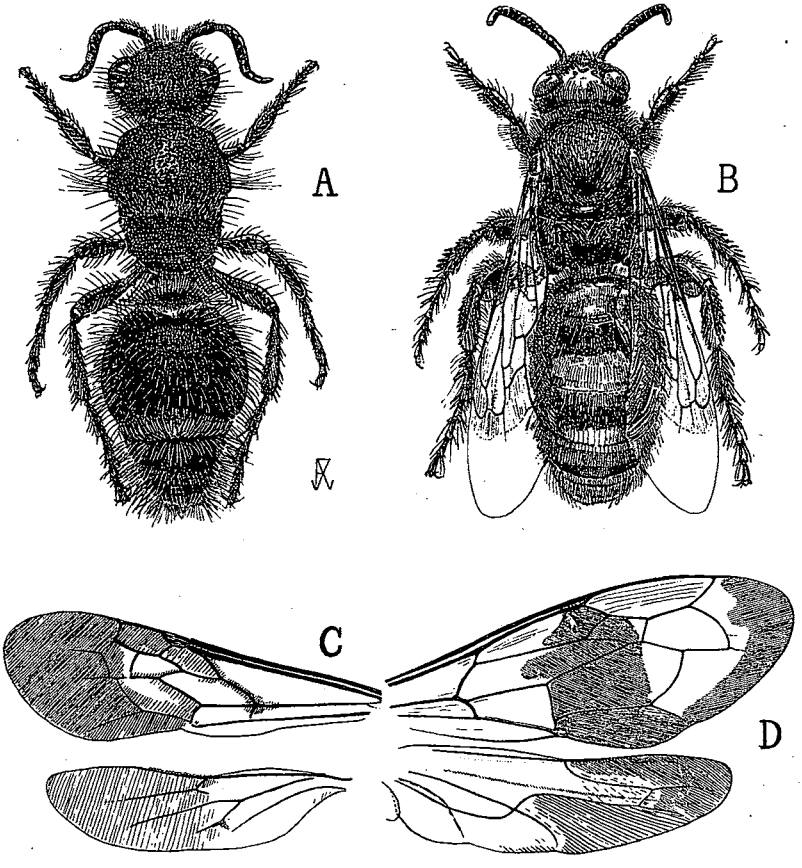
André, Gen. Insect., 11: 49, 1903, ♀. (*Ephutomorpha caledonica* ♀).

Mickel, The Mutillid Wasps of the Islands of the Pacific Ocean (Hymenoptera; Mutillidae). Trans. Roy. Ent. Soc. London, **83** (2): 177-312 (296, etc.), 1935.

New Caledonia: Noumea, 1 ♀, August 10, 1940; Isle of Pines, 5 ♂♂ and 6 ♀♀ (F. X. Williams). The specimens from the Isle of Pines were taken near the seashore where such aculeate hymenoptera as *Pompilus, Tachysphex fanuiensis* and small native bees were also to be found.

A rather small mutillid, with white abdominal hair bands, the male shining purplish blue and the wings fuscous for about their apical half, the female blackish with head and thorax subopaque.

Mutillidae are parasitic chiefly on bees and wasps. The female is always wingless. No species are known to occur on oceanic islands. New Caledonia is the most eastern Pacific island on which these insects are found. The genus *Ephutomorpha* is predominantly Australian. (See Mickel, 1935; and Zimmerman, E. C., [Distribution and Origin of Some Eastern Oceanic Insects], American Naturalist, **76**: 280-307, 1942).



EXPLANATION OF PLATE XVIII

A.—*Ephutomorpha caledonica,* female. Length 7 mm.
B—*Campsomeris novocaledonica,* female. Length 22 mm.
C—*Ephutomorpha caledonica,* male wings.
D—*Cyphononyx vitiensis,* male wings. From Suva, Fiji.

THYNNIDAE

A. von Schulthess (Sarasin, Nova Caledonia, Zool. 2 [1]: 46, 1915) records *Eirone* sp. ♂, from Canala, New Caledonia.

Turner (Ann. Mag. Nat. Hist., [9] **3**: 236, 1919) described *Eirone obtusidens* from a ♂ specimen taken at Noumea.

Montet (Rev. Suisse zool. Genève, **29**: 184, fig., 1922) described *Spilothynnus thalluse* female from New Caledonia, but the correctness of this locality appears to be in doubt. I have not seen Montet's description.

Cockerell (Psyche, **36**: 239-242, 1929) described *Eirone superstes* from a ♂ taken at Bourail, New Caledonia, and adds "Allied to *E. obtusidens* Turner. . . ."

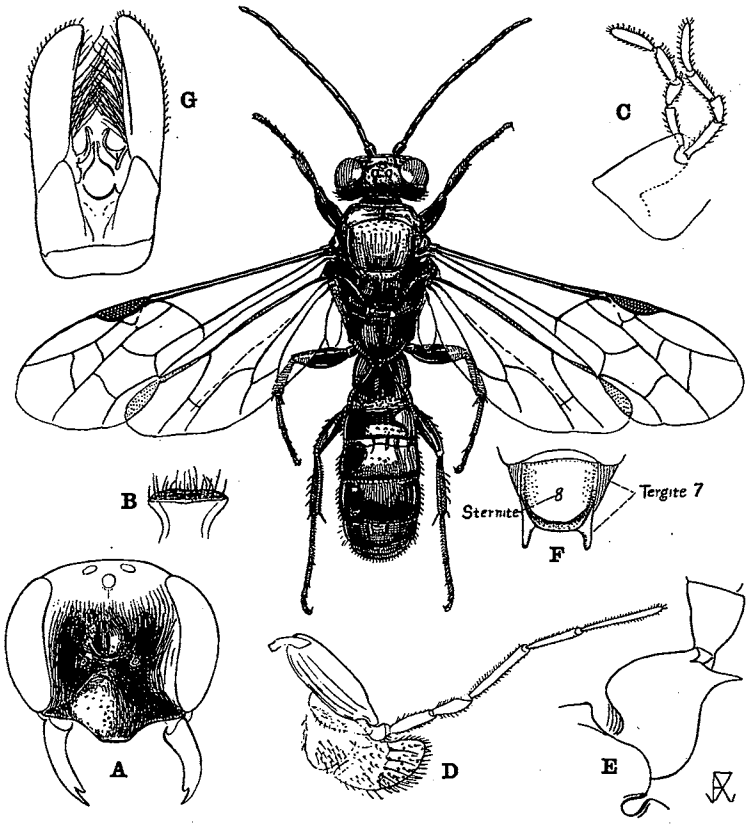
Eirone neocaledonica, n.sp. (pl. 19)

Male, type: Length 10 mm. Shining black, puncturation generally sparse; mandibles rufous apically. Head transverse, slightly wider than pronotum; clypeus produced subtruncate mesad, not carinate, the disc convex and somewhat sunk into the face which has an oval depression mesad above the antennae; mandibles bidentate, of uniform width; antennae slender, rather short, joint 3 shorter than 4, the last 6-7 joints rather arcuate; eyes gently emarginate within, subparallel; ocelli in a low triangle. Pronotum short, the anterior margin raised, the posterior arcuate. Mesonotum with two pairs of parapsidal grooves, the inner enclosing a raised area. Scutellum somewhat elevated anteriorly, posteriorly very little rounded mesad. Postscutellum with a transverse sinuate depression anteriorly, the posterior edge gently emarginate mesad. Propodeum with dorso-lateral tubercles, a triangular depression extending on disc as a median groove with sparse punctures on either side; disc gently rounded into sloping posterior face. Wings lightly infuscate, with a purple iridescence. Midcoxae with an apical thorn ventrad. Abdomen somewhat arcuate and depressed, the intersegmental constrictions moderate; tergite 1 sulcate mesad to beyond middle length, 3 with a basal transverse lamina emarginate mesad; 7 emarginate, the lateral processes thus formed rather blunt; sternite 8 rounded out, simple; claspers with an inner fringe of rather long hairs. Vestiture: sparse pale hair on head, thorax and legs; tergites with a subapical row of dark bristles, bristles more extensive on 7; sternites with bristles more generally distributed.

New Caledonia, Thi River valley, near St. Louis, November 1, 1940. F. X. Williams, one specimen flying low over ground in forest.

Abundantly distinct from the two other species described from New Caledonia. These are marked with yellow, their clypeus triangularly produced, and there are other different structural characters.

The Thynnidae are distributed chiefly in the southern hemisphere, their headquarters being Australia, where hundreds of species have been described. The family has been monographed by Dr. R. E. Turner (Proc. Linn. Soc. N. S. Wales: **32**, 1907; **33**, 1908; and Family Thynnidae, Gen. Insect.: 105, 1910). Except for the three species of *Eirone* reported from New Caledonia this genus appears to be strictly Australian.



EXPLANATION OF PLATE XIX

Eirone neocaledonica male. Length 10 mm.

A—Head, from in front.
B—Labrum.
C—Labial palpi.
D—Maxillary palpi.
E—Middle coxa, to show apical ventral thorn.
F—Cauda, from ventral side.
G—Terminalia.

The females of the Thynnidae are wingless. Save in the monobasic genus *Diamma* they are smaller than the males and are carried about by them in flight. For this reason they are absent from oceanic islands and rare on, or absent from, ancient continental islands. The fact that they parasitize the grubs of scarabaeid beetles—at least to a great extent—would also limit their insular distribution.

The most eastern outpost for the Thynnidae in the Pacific seems to be Caledonia.*

For the biology of certain Australian Thynnidae, see Burrell, Jl. New York Ent. Soc., **43**: 19-28, 1 pl., 1935.

Scoliidae

Campsomeris novocaledonica Turner (pl. 18, fig. B)

Turner, Ann. Mag. Nat. Hist. (9) **3**: 237, 1919. ♂ ♀.

Betrem, Monogr. Indo-Austral. Scoliiden (Hym. Acul.) Treubia **9**, 388 pp., Suppl. (90-91) 1928, New Caledonia and New Hebrides. Var. *insularum* Betrem, ibid: 91, ♂, described from the Loyalty Islands.

New Caledonia: Thi River valley, 4 ♂ ♂ and 1 ♀, early November 1940; Nepoui, 3 ♂ ♂, early August 1940; Kuebeni islet, near Yate, S. New Caledonia, October 25, 1940 (F. X. Williams). The males were seen flying about an old fallen tree trunk at Thi River. It is probably mainly a forest insect. It is orange and black and up to about 25 mm. long.

Scoliid wasps are parasitic on the grubs of scarabaeid beetles of which a fair number are native to New Caledonia. Insofar as island habitats are concerned both host and wasp are generally restricted to the continental type. The New Caledonian-New Hebrides species is closely related to *C. tasmaniensis* (Sauss.), the only scoliid known from Tasmania, while *C. ovalauensis* (Sauss.) from Fiji, as well as *C. palauensis* (Turner) from Palau, east of the southern Philippines, are more closely related to *C. ferox* (Sauss.) from New Guinea. (See Betrem: 369, 1928.)

Fiji is the most eastern natural outpost for Scoliidae in the Pacific.

Vespidae

Dr. J. S. Bequaert has examined the New Caledonian material and kindly determined the six known species, as follows:

Eumenes germaini Lucas

*The distribution of *Rhagigaster novarae* Saussure (Reise de Nov. Zool. 2: 112, 1867. ♂. "Nova-Zeelandia") seems to be in doubt. Turner (Proc. Linn. Soc. N.S.W., 32: 228, 1907; Genera Insectorum, 105me Fasc. Hymenop., Fam. Thynnidae: 8, 1910) credits it to New Zealand, but Tillyard (The Insects of Australia and New Zealand: 261, 262 and 293, 1926) distinctly indicates that no Thynnidae are known to occur in New Zealand.

Pachymenes quodi (Vachal) (= *Odynerus sarasini* Schulthess)
"Odynerus" caledonicus Saussure
Rygchium haemorrhoidale var. *alecto* Lepeletier
Ropalidia duchaussoyi (Gribodo)
Polistes olivaceus (Degeer) (= *hebraeus* Fabr.)
A few notes are herewith presented on these insects:

Eumenes germaini (text fig. 7)

Lucas, Ann. Ent. Soc. France, (5) **6**: 300-302, pl. 4, figs. 1-6, 1876; describes nest and pupa, ibid: 296-299, figs. 7 and 8.

This inch-long black and orange wasp was one of the first-

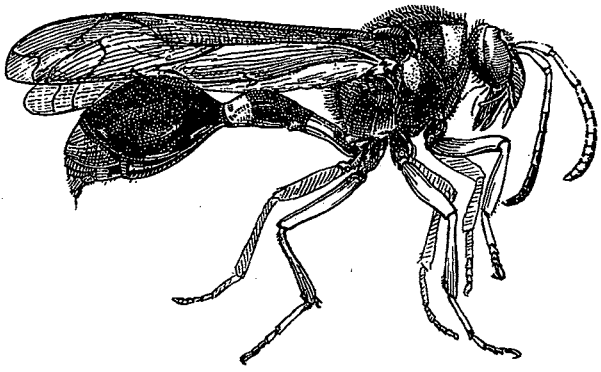


Fig. 7. *Eumenes germaini,* female. Length 25 mm. New Caledonia.

observed insects when we disembarked at Noumea July 3, 1940, and it remained moderately abundant throughout our stay, to November 12. It is widely distributed and endemic in New Caledonia, including the Isle of Pines and the Loyalty Islands. Although a very useful insect, preying as it does upon noxious caterpillars, including both 16-legged and the looping type, the fact that it so frequently plasters its relatively large mud cells on walls and buildings has drawn some complaints. Its cells are also found on banks of clay or rock and attached to the stems of shrubs and trunks of trees. Several cells are built one against the other and each has a jug-shaped mouth later broken down and the group more or less covered with mud. The egg is suspended by a filament from the ceiling of the cell. Few cells containing living larvae or pupae of *Eumenes* were noted. One pupa was found heavily parasitized by a tiny *Melittobia* wasp (Eulophidae), while certain cells were occupied by the larva—in the resting stage—of another large eumenid wasp, probably *Rygchium haemorrhoidale* var. *alecto,* soon to appear in the field. Finally, a bombyliid fly (*Argyramoeba distigma* [Wiedemann] 1828 ?) (text figure 8) was found to be parasitic

in the cells of *Eumenes germaini.* On one occasion the hairy and spiny pupal shell of the bombyliid was observed partly extruded from the mud nest of the wasp, while on another occasion the pupa had produced its fly within the closed mud cell where, of course, it had perished.

Pachymenes quodi (Vachal) (pl. 20, fig. C)

Odynerus quodi Vachal, Rev. d'Ent., **26**: 115, 1907. ♀ (= *Odynerus sarasini* Schulthess).

A shining black wasp, 9-10 mm. long, marked with pale yellowish. It is well distributed in New Caledonia, and later during my stay

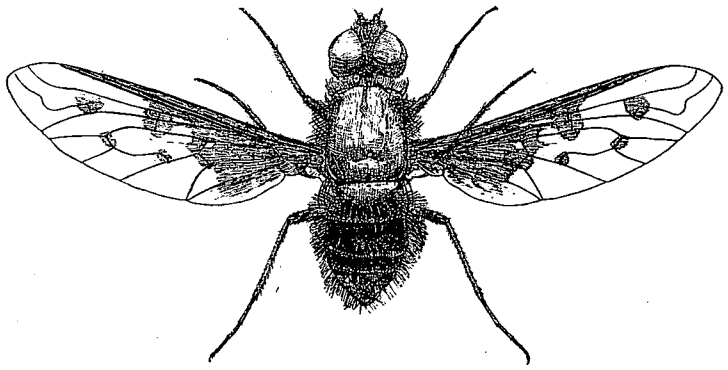
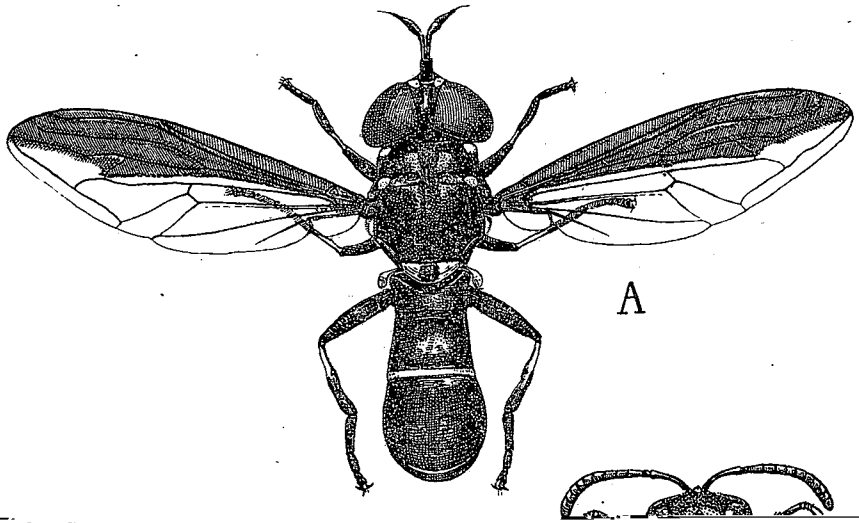


Fig. 8. *Argyramoeba distigma* (?), parasitic in the cells of *Eumenes germaini.*

was not uncommon in gardens in Noumea. Sometimes flying in the same situation as this *Pachymenes* were a handsome syrphid fly of the genus *Cerioides* (plate 20, fig. A) and a large folded-winged parasitic wasp, *Leucospis antigua* Walker (Jl. Ent., **1**: 19-20, 1860; see also Brues, Proc. Haw. Ent. Soc., **11**: 153-154, 1942) (pl. 3, fig. B). These two insects bear so considerable a superficial resemblance to *Pachymenes quodi* as to suggest mimicry. On this point see Tillyard (Insects of Australia and New Zealand: 273, 368, 1926). Maindron (Bul. Soc. Ent. France, [5] **8**: CLXIV-CLXV, 1878) after describing *Leucospis gambeyi* from the Isle of Pines, New Caledonia, makes note of the general resemblance of the female *L. gambeyi* "d'un Euménien", and of the male *Leucospis,* in a vague way appearing like a male mutillid. Maindron's description of *Leucospis gambeyi* fits *Leucospis antigua* well enough.

Species of *Leucospis* are generally recorded as parasitic in the cells of such bees as *Megachile, Osmia* and *Chalicodoma. Megachile* bees are abundant in New Caledonia.

I learned nothing of the biology of *Pachymenes quodi.*


A

"Odynerus" caledonicus Saussure

Saussure, Etud. Fam. Vespidae **1**: 205, 1852. ♂.

A black and orange-red wasp with flavous wings and about 10-15 mm. long. The first abdominal segment is noticeably narrower at its apex than the base of the second, which in turn is narrower there than at the apex.

Chiefly about Noumea, in October and November; but observed also on the east coast.

Rygchium haemorrhoidale (Fabr.) var. **alecto** Lepeletier

Lepeletier, Hist. Nat. Insect., Hymen.: 647, n. 32, 1841, ♀.

A larger and stouter insect than the preceding, and black, brownish and yellow. My first record of this wasp was September 28, when a female was observed at a puddle of water in Noumea. A few specimens taken chiefly at Noumea.

Ropalidia duchaussoyi (Gribodo)

Icaria duchaussoyi Gribodo. Misc. Ent., **4**: 13, 1896.

This small social wasp was found sparingly at La Foa, September 21, Nepoui, early August, and Hienghene, early October. A large tier of deserted cells of this species was found attached to the trunk of a tree at La Foa, and a small occupied group of cells was suspended under the eaves of a building at Hienghene. Hardly in season.

Polistes olivaceus (Degeer)

Degeer, Mem. serv. Hist. Insect., **3**: 582, no. 5; pl. 29, fig. 9, 1773 (*Polistes hebraeus* Fabr.).

Chiefly about Noumea, but uncommon.

For the synonymy concerning this wasp see Bequaert and Yasumatsu (Vespoidea of Micronesia, Tenthredo, **2**: 314-328 [314-315], 4 pls., 1939).

POMPILIDAE

J. Vachal (Rev. d'Ent., **26**: 116-117, 1907) describes *Priocnemis caledonicus* "(an *Pr. tuberculatus* Sm. Cat. p. 166 var. ?)" ♂ ♀, *Priocnemis quodi* ♀ n.sp. ?, *Priocnemis ? corynodes* ♂, n.sp. and *Pompilus inquirendus* ♂ ♀ "(an *P. opulentus,* Sm. ?)".

A. von Schulthess (Sarasin, Nova Caledonia, Zool., **2** [1]: 48, 1915) records *Priocnemis tuberculatus* Sm. from New Caledonia.

R. E. Turner (Trans. Ent. Soc. London: 340, 1919) records *Psammochares elatus,* Sm. (=*Pompilus inquirendus* Vachal) from New Caledonia; and Ann. Mag. Nat. Hist., (9) **3**: 239, 1919, records *Priocnemis caledonicus* Vachal from Noumea and Plaine des Lacs, New Caledonia.

Nathan Banks (Bishop Mus. Occ. Papers, **26**: 232-245, 1941) describes *Cyphononyx parvulus* ♂, and *Aglochares* new genus for

vachali n.sp. *Cyphononyx vitiiensis* Turner is also recorded as occurring in New Caledonia (teste Banks).

In addition to the above list the present writer describes *Priocnemis araucariae* n.sp., *Pr. montrouzieri* n.sp. and *Pr. umbrosicola* n.sp., and records *Homonotus ariadne* (Cam.) ? and a *Pompilus* related to *P. lascivus* Cameron and *P. philippinensis* (Banks), as also occurring in New Caledonia. The above picture is not entirely clear to me but there seem to be 12 species of Pompilidae now known from this island, as follows:

CRYPTOCHEILINAE

Cryptocheilus caledonicus (Vachal)
Monodontonyx parvulus (Banks)
Cyphononyx vitiensis Turner

MACROMERINAE

Priocnemis quodi Vachal
Priocnemis araucariae n.sp.
Priocnemis montrouzieri n.sp.
Priocnemis umbrosicola n.sp.
Priocnemis corynodes Vachal

POMPILINAE

Homonotus ariadne (Cameron) ?
Aglochares vachali Banks
Pompilus elatus Smith
Pompilus sp. near *lascivus* Cameron and *philippinensis* (Banks)

If we study the distribution of the Pompilidae in the tropical Pacific we find that in general, the farther the island is situated from a large land mass the smaller is its pompilid fauna, as follows:

Solomon Islands	14	species	(Banks, 1941)
New Caledonia	12	"	(Williams, 1945)
Fiji	4	"	(Turner, 1917, 1919; Haupt, 1937; an undetermined species in Bishop Museum)
Samoa	1	"	(Perkins and Cheesman, 1928)
Society	0	"	
Marquesas	0	"	
Guam (Marianas)	0	"	
Saipan "	1	"	(I have seen a single specimen of *Pompilinus* ? ♂, from there [D. G. Hall, coll.])
Galapagos	1	"	(Rohwer, 1924)

In the Hawaiian Islands, the pompilid, *Anoplius luctuosus* (Cresson) is a recent immigrant from the mainland of the United States. It was first recorded in Hawaii by O. H. Swezey in 1912, who took one of these wasps in Honolulu in October 1910.

The presence or absence of these wasps, as above indicated, may also depend upon other factors besides degree of isolation; for example, the type and size of the island, meteorological conditions, abundance and variety of their prey, potential enemies, and the amount and quality of insect collecting that has been done in these places.

Cryptocheilus caledonicus (Vachal)

Priocnemis caledonicus Vachal, Rev. d'Ent., **26**: 116, 1907. ♂ ♀.

I am not familiar with this species. Dr. Turner (1919: 238) says of this species, of which he studied female specimens from New Caledonia: "Closely allied to the Australian species of the group of *P. australis,* Guer."

Save for the presence of a red spot on the mesonotum and the scutellum of *caledonicus,* Vachal's short description would do fairly well for *Monodontonyx parvulus* (Banks), following.

Monodontonyx* parvulus (Banks) (pl. 21, E)

Cyphononyx parvulus Banks, Bishop Mus. Occ. Papers, **16**: 233, 1941. ♂, Houailou (W. H. Ford).

New Caledonia: 2 ♀ ♀, 1940; Noumea, 4 ♀ ♀, July and October, 1940; Prony Bay, 4 ♂ ♂, October 22, 1940; St. Louis, 2 ♀ ♀, August and October, 1940; Thi River valley—in the hills behind St. Louis—2 ♀ ♀ and 5 ♂ ♂, October and November, 1940; Oua Tom, 1 ♂, September 17, 1940; Hienghene, 1 ♀, October 5, 1940, and Isle of Pines, 1 ♂, October 24, 1940 (F. X. Williams).

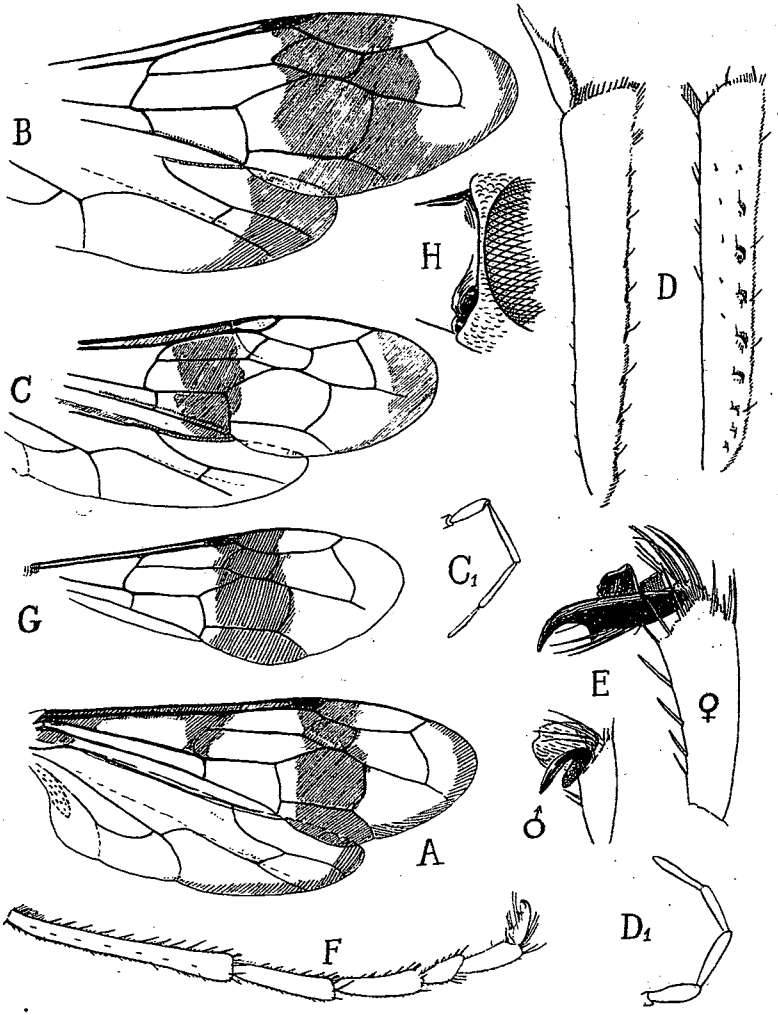
A rather large species, the females measuring up to about 20 mm.; the head, except vertex (♂) and occiput, antennae, legs except coxae, trochanters and base of femora, orange; thorax matt black, with a suggestion of purplish, wings orange, narrowly margined with fuscous and dark also at extreme base; first segment of abdomen, except sometimes a median orange spot above, black, second tergite orange, ringed apically with black, rest of tergites generally orange. The females have all the tarsal claws toothed; the males have the tarsal claws of the first pair of legs cleft—the inner or anterior claw more strongly so—and the claws of the second and third pair of legs toothed.

At the time of my visit this was the most obvious of the New Caledonian pompilids, and it seems strange that it has only recently been described.

Cyphononyx vitiensis Turner (pl. 18, fig. D)

Turner, Trans. Ent. Soc. London: 78-80, 1917. ♂ ♀. Described from Fiji, where it seems not uncommon. See also Turner (1918).

*I am indebted to Mr. Banks for a later determination of the genus of this wasp, as it was previously determined from male specimens.



EXPLANATION OF PLATE XXI

A—*Priocnemis quodi.*
B—*Priocnemis umbrosicola.*
C—*Priocnemis montrouzieri;* C_1 last four joints of maxillary palpus.
D—*Priocnemis quodi,* posterior tibia in two views; D_1, last four joints of maxillary palpus.
E—*Monodontonyx parvulus;* female, tarsal claw of third leg; male, tarsal claw of first leg.
F—*Priocnemis araucariae,* female type; tibia and tarsus of third leg.
G—*Priocnemis araucariae,* type; forewing.
H—*Priocnemis umbrosicola,* female type; malar space.

Banks (1941) records it from Wainoni, Solomons as well as from Fiji, and states that it has been recorded from New Caledonia.

A large beautiful species measuring up to 21 mm. long; the head and thorax in part, orange-red, wings orange with a heavy purplish black blotch beyond the middle, and a dusky outer margin; abdomen shining black with apical third or more orange. The tarsal claws of all the legs are cleft in both sexes.

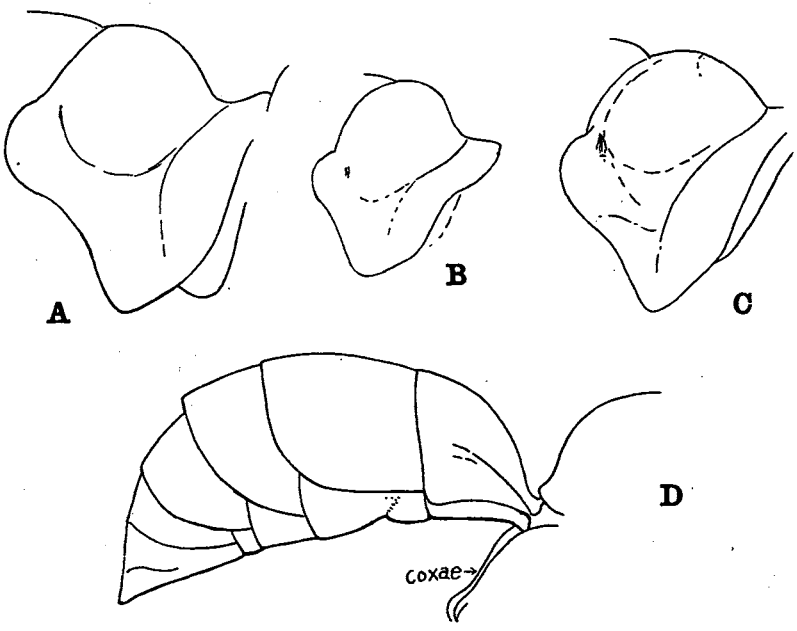
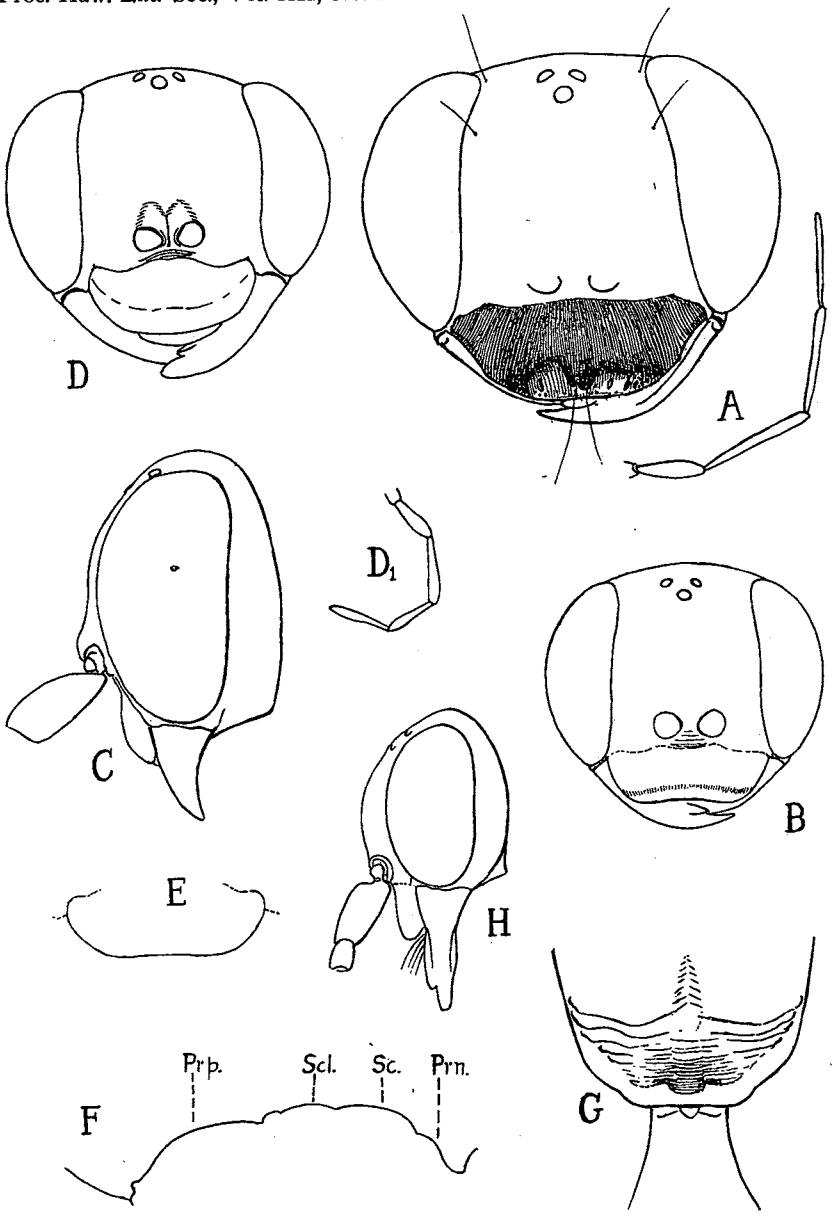


Fig. 9. A, *Priocnemis quodi,* female, pronotum in lateral view; B, *Priocnemis montrouzieri;* C, *Priocnemis umbrosicola;* D, *Priocnemis montrouzieri,* profile of abdomen. All figures to the same scale.

Priocnemis quodi Vachal (pl. 21, figs. A and D; pl. 22, figs. C and E; text fig. 9 A)

Vachal, Rev. d'Ent., **26**: 116, 1907. ♀.

The single specimen, a female, taken by me on a shrub in the Thi River valley, November 1, 1940, agrees fairly well with Vachal's short description. It is 14.5 mm. long, rather stoutly built, head and thorax matt black, abdomen subshining, legs except coxae, trochanters and apical tarsal joints reddish, wings orange with a heavy black band well beyond middle, a dark spot on basal vein extending along costa to base where it widens, outer margin of both wings narrowly blackish. Head in lateral profile showing raised antennal tubercles, clypeus broadly and shallowly excavate and not extending



EXPLANATION OF PLATE XXII

A—*Priocnemis umbrosicola,* head and last four joints of maxillary palpus.
B—*Priocnemis montrouzieri.*
C—*Priocnemis quodi.*
D—*Priocnemis araucariae;* D_1, last four joints of maxillary palpus.
E—*Priocnemis quodi,* clypeus.
F—*Priocnemis umbrosicola,* profile of thoracic dorsum.
G—*Priocnemis umbrosicola,* apex of propodeum and base of abdomen, dorsal view.
H—*Priocnemis montrouzieri.*

beneath eyes; last three joints of maxillary palpi subclavate, only moderately lengthened. The propodeum has a wide shallow median fossa, a few strong transverse rugae and a shallow groove each side from the spiracle to apex, and as seen from above, the recurved propodeal flange each side just before the broad apical portion is simply rounded out. Hind tibiae above rather weakly serrate, hardly carinate; last tarsal joint of legs 2 and 3 beneath with one to several weak bristles each side of the median line before apex. Sericeous white pile locally on head, thorax and anterior portion of abdomen, velvety golden on apical half of tergite 3 and all of 4, 5 and 6, the integument beneath showing rufous. Quite sparse erect hair on head, thorax and coxae, a few short weak hairs on femora.

P. quodi and *P. araucariae* n.sp. may belong to Bank's subgenus *Clistoderes* (Proc. Amer. Acad. Arts & Sciences, **69**: 33, 1934) erected for some Philippine *Priocnemis* that have a furrow on each side of the propodeum from the spiracle back to the end; they have a very large third submarginal cell, the second submarginal very oblique and the clypeus short, not reaching under the eyes.

Priocnemis araucariae n.sp. (pl. 21, figs. F and G; pl. 22, figs. D and D_1)

Female, type: Length 12 mm. Form stout. Black; femora, tibiae and first 2-3 joints of tarsi orange-yellow, the last tarsal joints brownish to black; mandibles with some deep red apically. Head and thorax rather opaque, the abdomen more shining; wings orange, forewings with a wide black band across beyond the middle length; the extreme wing base dusky and the subcostal vein darkened from the base to its junction with the basal cell and again just before the stigma. Clypeus broadly rounded, nearly truncate, last three joints of maxillary palpi moderately long and subclavate—as in *P. quodi;* antennae rather short, arising from tubercles, joint 3 longer than 4; eyes gently converging towards vertex, which is about equal to antennal joints 2 and 3; ocelli forming a low triangle, the posterior ocelli nearer to each other than to the eyes; no malar space. Pronotum emarginate subangularly posteriorly, and slightly depressed mesially there; propodeum rather evenly rounded, the disc with a faint median line from base and a wide shallow fossa gradually increasing in width to posterior face which is thereby very shallowly depressed; some transverse rugae laterally up to the fossa. Hind tibiae rather weakly serrate, the teeth subcrescentric, each tipped with a small spine and about 10-11 in number; tarsal claws with one tooth beneath, the last tarsal joints pilose beneath and with occasional weak longer hair laterally beneath. Abdomen smooth, apical margin of tergites 5, and 6 (pygidium) pale, the 6th with an obscure median carina. Vestiture: general black pile; silver pile on clypeus, sides of face, posterior margin of pronotum and pronotal tubercles, posterior margin of mesonotum, a patch each side of scutellum and postnotum, coxae in part and mesopleurae, some on sides and distal end of propodeum, at base of tergite 1 laterally and weakly across 2, 5 and 6 with fine golden pile and with long brown hairs; a few erect hairs on head, coxae, etc.

New Caledonia: on an islet adjoining Yate near the southern extremity of the island in a region of *Araucaria cookii* pines, October 25, 1940 (F. X. Williams). Taken on the stem of a small tree. Evidently largely arboreal like its near relative *P. quodi.*

Differs from *P. quodi* Vachal in lacking the infuscation of the outer margin of the wings and the dark blotch found on the costal and basal area in *quodi*. In *araucariae* pale golden pile is present only on segments 5 and 6. The clypeus of the two species differ as figured. *P. quodi* has two or three short dark bristles beneath the last tarsal joints of legs 2 and 3. I suspect this character is variable in these species.

Priocnemis montrouzieri n.sp. (pl. 21, figs. C and C_1; pl. 22, figs. B and H; text figs. 9, B and D)

Female, type: Length 10.2 mm. Moderately stout. Black; femora, tibiae and first one and two joints of tarsi orange-yellow; mandibles with some deep red apically. Head and thorax rather opaque, abdomen shining; wings orange, the forewings broadly infuscate apically and with a second blackish band across the middle. Clypeus not extending under eyes, more arched transversely than convex, broadly truncate and shallowly emarginate, smoothly and rather widely shining along the margin; last three joints of maxillary palpi slender; antennae rather short, arising almost directly from frons, antennal joint 3 considerably longer than 4; eyes slightly converging towards vertex which at posterior ocelli is about equal to antennal joints 2 plus 3; ocelli forming slightly less than a right angle triangle—subequilateral. Pronotum posteriorly subangularly emarginate; propodeum gently rounded, opaque, almost coriaceous, very finely transversely striate reticulate and with only a trace of a wide fossa at apex; as seen from above the lower margin each side before apex slightly emarginate. Coxae and femora with sparse erect hair; anterior tibiae with a few spines along posterior lower side, mid femora with several irregular rows, hind tibiae with 3 rather well-defined rows of short spines the dorsal row of which is situated on a low ridge, each spine following a weak tooth, the whole more or less concealed by short orange pile. Tarsi more slender than in *P. araucariae,* the last joint beneath with pile only. Vestiture: fine appressed golden pile, dense on face, notal parts of thorax and the mesopleura, paler and thinner on propodeum; broad apical bands on tergites 1-5, cuneate mesad on 3-5, 6 with some reddish bristles apically where the integument is slightly reddish.

Type and three ♀ ♀ paratypes, Thi River valley, New Caledonia, November 8, 1940 (F. X. Williams). On ground in cut-over forest. One of the paratypes is 9 mm. long.

Named for Fr. P. Montrouzier who spent many years in New Caledonia where he collected and described many species of insects.

Priocnemis umbrosicola n.sp. (pl. 21, figs. B and H; pl. 22, figs. F and G; text fig. 9, C)

Female, type: Length 15.5 mm. Form slender. Black; femora, tibiae, first two joints of tarsi 1 and 2, first joint of posterior tarsus orange-yellow; mandibles with a little deep reddish apically; wings orange, primaries with broad blackish band beyond middle and joining the narrow apical band on outer margin, secondaries broadly blackish at apex; abdominal segments dull yellowish apically. Insect generally opaque, the tegument more or less concealed by sericeous pile, but the mandibles, margin of clypeus broadly mesad, and the abdomen beneath shining. Clypeus not extending under eyes, transversely arched, subtruncate and slightly bilobed, with a few large preapical and other bristles, some large punctures in the shining marginal area, while

mesad beginning just behind the margin and extending half way to the base of the clypeus is a rather large concavity; malar space very narrow, a mere strip; last three joints of maxillary palpi long and slender; antennae slender, arising from low tubercles, joint 3 considerably longer than 4 and somewhat longer than width of interocular space across posterior ocelli; ocelli forming an equilateral triangle. Pronotum emarginate subangularly posteriorly; scutellum well-elevated, the disc or flat portion narrowing posteriorly and there truncate; propodeum with transverse wrinkles, shallowly and rather widely sulcate mesad, the sulcation deepening apically, also a weak sulcus from spiracles to apex; as seen from above the subapical margin each side slightly emarginate. Legs long, rather weakly spinose, the posterior tibiae slightly carinate with a row of low weak teeth disappearing apically and each tipped by a small spine; in addition there are several rather poorly defined rows of small spines, all of which are somewhat concealed by dense pile; last joint of tarsi beneath with pile only. Abdomen petiolate though not as clearly so as in the Pseudageninae. Vestiture: dense golden pile in the usual places on head and thorax, thinner and more brassy yellow on propodeum, coxae and abdomen above; some golden pile at apex of segments, the abdomen above however, is generally more thinly clothed with very fine appressed pale brassy yellow pile producing a rather dull effect.

New Caledonia: Thi River valley, November 8, 1940 (F. X. Williams). On shady forest floor. One specimen. Apparently freshly issued.

This insect may fall into the American genus *Priophanes* Banks (Psyche, **50**: 82, 1943; Bul. Mus. Comp. Zool., **94**: 173-174, 1944) which contains species formerly placed in *Priocnemis,* but now separated from that genus because of the distinctly petiolate abdomen, no distinct beard under the head, the venation much like *Pseudagenia* and the hind tibiae with rows of spines and more or less distinct teeth which may be quite small. The elongate last three joints of the maxillary palpi and the relatively pointed lower side of the pronotal lobe further affiliate this New Caledonian species with the Pseudageninae.

Priocnemis ? corynodes Vachal

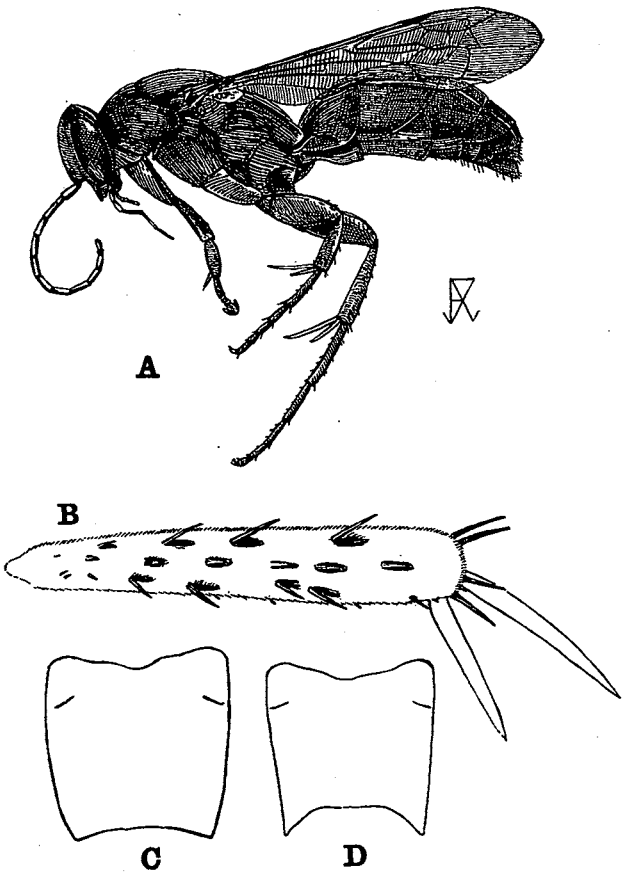
Vachal, Rev. d'Ent., **26**: 116-117, 1907. ♂.

I have not seen this insect which Vachal places with doubt in the genus *Priocnemis*. The type is a male. It is 12-13 mm. long, black with bottle-green reflection, the tibiae and tarsi of the first pair of legs more or less reddish; wings hyaline, the primaries with two brownish bands, the secondaries brownish apically. Abdomen pedunculate as in the genus *Icaria* (Vespidae). The legs appear to be lightly spined.

Homonotus ariadne (Cameron) ? (pl. 23, figs. A, B and C, ♀)

Pompilus (*Ferreola*) *ariadne* Cameron Mem. and Proc. Manchester Soc. (4) **4**: 457, 462, pl. 3, figs. 7, 7 a, 1891.

Pompilus ariadne Cam. Bingham, Fauna of British India, Hymenoptera **1**, Wasps and Bees: 159, 1897. ♀.



EXPLANATION OF PLATE XXIII

A—*Homonotus ariadne* (?), female. Noumea, New Caledonia.

B—*Homonotus ariadne* (?), female; posterior tarsus, dorsal view. Noumea, New Caledonia.

C—*Homonotus ariadne* (?), female; propodeum, from above. Noumea, New Caledonia.

D—*Homonotus tagalicus,* female; propodeum, from above. Los Baños, Philippines.

New Caledonia: Noumea, 7 ♀ ♀ and 1 ♂, July, August and September 1940; St. Louis, 1 ♂, August 26, 2 ♀ ♀ and 1 ♂, October 14, 1940 (F. X. Williams).

I determine this wasp with some doubt as the rather widespread oriental *H. ariadne*. The largest New Caledonia female is 9.5 mm. long. It is black with silvery pile, while the wings are nearly transparent, being faintly clouded apically. From its near relative, *H. tagalicus* Banks of the Philippines (pl. 6, fig. D, ♀) it differs chiefly in having the angles of the propodeum less prolonged behind. The wings are generally more hyaline, and there may or may not be a stub of a vein on the basal side of the base of the first submarginal cell.

My notes on this wasp indicate that it is found on shrubs and weeds.

The genus *Homonotus* is considered by Banks (The Psammocharidae of the Philippines, Proc. Amer. Acad. Arts & Sci., **69**:109, 1934) as the most highly developed of the family Pompilidae, in its flattened head with the very concave occiput, elongate pronotum and the propodeum with the angles prolonged behind.

Aglochares vachali Banks (text fig. 10)

Banks, Bishop Mus. Occ. Papers, **16**:245, fig. 1, a. "Two females from New Caledonia, Houailou, Sept. 25, 1925, Oct. 28, 1925, Ford".

Banks erected the genus *Aglochares* for this single species. Of *Aglochares* he says in part: "Readily separated from *Ctenostegus* by the smooth last tarsal joint".

New Caledonia: Noumea, 1 ♀, September 17, 1 ♀, November 4, 1 ♂, September 29, 1 ♂, November 9; St. Louis, 1 ♀, October 14; Thi River valley, 1 ♀; Oua Tom, 2 ♂ ♂, September 19 and 20; Hienghene, 1 ♂, October 4, 1940 (F. X. Williams).

This wasp attains a length of about 10.5 mm.; it is blackish, banded and otherwise marked with silvery pile, the wings hyaline with two brownish bands, the outer one somewhat double, the apex conspicuously white, secondaries have the apex infuscate. The male has the antennae with a broad strip of very short erect hair on the underside; the posterior margin of the pronotum is very narrowly white though overlaid by silvery pile; the posterior tibiae above at their base have the silvery pile more intense than elsewhere, and the 7th tergite is creamy whitish.

Pompilus sp. (near *P. lascivus* Cameron [1891] and *P. philippinensis* [Banks] [1934])

New Caledonia: Prony Bay, October 22, 1940; 2 ♀ ♀ found dead and slightly digested, among other insects, in the pitcher-like leaf of a species of terrestrial *Nepenthes* plant. In the liquid contained in these pitchers the larvae and pupae of a mosquito (*Trip-*

teroides caledonica [Edwards]) were found, and the adults reared. A specimen of what seemed to be this pompilid was seen but not taken near the shore at the Isle of Pines, October 23 (F. X. Williams).

It is about 10 mm. long; black, the head except clypeus and mandibles in part, pronotum, scutum, scutellum and postscutellum

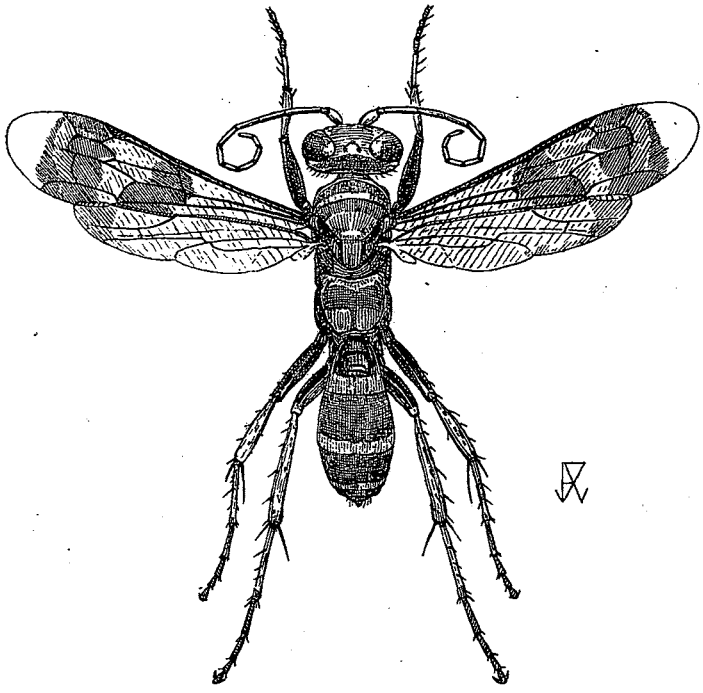


Fig. 10. *Aglochares vachali*, female. Length 7.5 mm.

reddish, wings fuscous; in the forewings the transverse-median and the basal veins are interstitial or nearly; in the hindwings the anal vein ends well before the cubital fork. *Pompilus lascivus* Cameron, Mem. & Proc. Manchester Soc., (4)4: 475, pl. 3, fig. 26, 1891, is an Indian species and is also found in Ceylon. I have not seen the original description of this wasp. *Pompilus philippinensis* (Banks) (The Psammocharidae of the Philippines, Proc. Amer. Acad. Arts & Sci., **69**: 92-93, 1934) is rather widespread in the Philippines.

Pompilus elatus Smith (text fig. 11)

Smith, Jl. Linn. Soc. Zool., **8**: 82, no. 5, ♀, 1864. Asia: Morty Island.

Pompilus inquirendus ♀, ♂ "(an *P. opulentus,* Sm. ?)" Vachal, Rev. d'Ent., **26**: 117, 1907. New Caledonia.

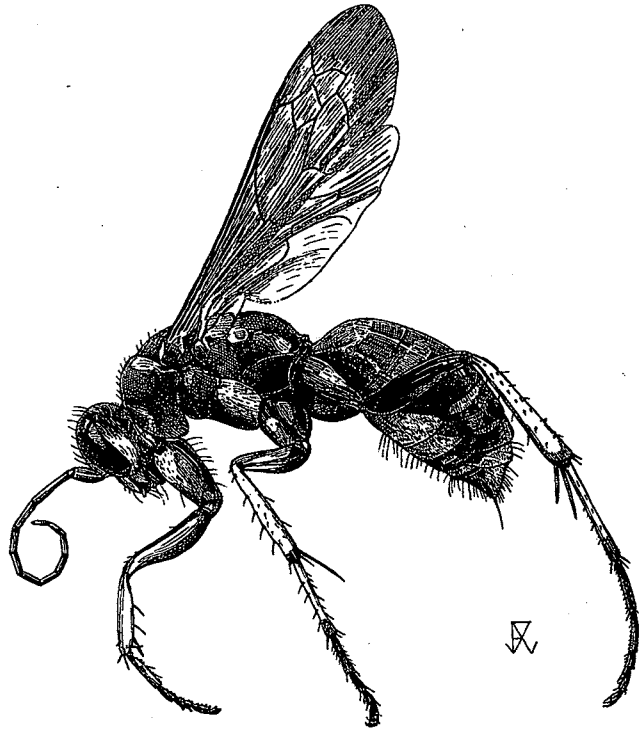


Fig. 11. *Pompilus elatus,* female. Length 11.5 mm.

New Caledonia: 1 ♀, 1940; Noumea, 3 ♀♀, July 6, 1 ♂, August 10; St. Louis, 3 ♀♀, August 17, 1 ♂, October 27; Oua Tom, 2 ♀♀ and 1 ♂, September 19 and 20; Nepoui Valley, 1 ♀ and 3 ♂♂, August 6; Isle of Pines, 1 ♀, October 23, 1940 (F. X. Williams).

I have only seen Vachal's description of the synonym, *Pompilus inquirendus* taken in New Caledonia. My specimens measure from 7.5 mm. in the male to 12 mm. in the female. It is blackish adorned with patches of silvery pile, and the wings are subhyaline except the apex broadly, and a part of the marginal cell, which are in-

fuscate. The fore tarsal comb is not well-developed, and there is an obscure protuberance or short rounded ridge each side at the beginning of the slope of the propodeum.

Turner (Trans. Ent. Soc. London: 73, 1917) gives additional records as Queensland and Moluccas; and (ibid: 340, 1919) also lists Fiji and New Caledonia.

Ampulicidae

Ampulex compressa (Fabr.) (text fig. 12)

Sphex compressa Fabricius, Spec. Insect., 1: 445; n. 19, 1781.

This brilliant blue green wasp, the "canthariade" in New Caledonia, measures up to nearly an inch in length. Its original home is the warmer portions of Asia, but it has spread, probably largely

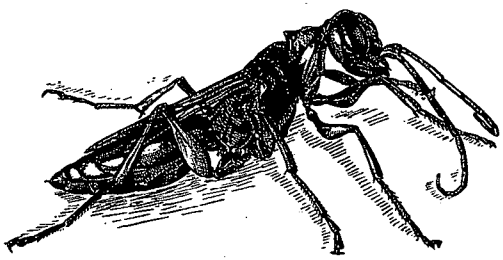


Fig. 12. *Ampulex compressa,* female.

through the agency of shipping, to Mauritius, East Africa and to New Caledonia. Inasmuch as it preys upon cockroaches of the genus *Periplaneta,* themselves inveterate travellers, it is easy to explain the wide distribution of this rather domiciliary wasp. It is very well known in New Caledonia where it is common enough from October to perhaps March or April. Late in 1940 the writer imported it into Hawaii where it is now abundant.

It has been known in New Caledonia since at least 1879, when Lucas refers to the cocoon of *Ampulex* as encased in the remains of *Blatta americana.* It is also mentioned by Turner in 1919, and by others.

Sphecidae

Chlorion (Proterosphex) fumipennis (Smith)

Sphex fumipennis Smith, Cat. Hym. Brit. Mus., 4: 249, 1856, ♂ ♀.

New Caledonia: Noumea, October 16, 2 ♂ ♂; Isle of Pines, October 24, 1940. One specimen seen at Nakety, on the east coast, October 9 (F. X. Williams). At Noumea the specimens were taken

at the edge of a small decrepit forest in the hills behind the town where they were flying about the crown of a flowering bush.

A large black wasp with dusky wings showing purple iridescence.

Widely distributed in Australia and occurring in the New Hebrides (= *Sphex antennata* Sm.).

Sphex rouxi Schulthess (Nova Caledonia, Zool. 2[1]: 47-48, 1915) with dark-margined, yellowish wings, said to be related to *S. formosus* Sm. was described from the New Hebrides and Loyalty Islands. I presume it is a *Chlorion*.

Sceliphron hemipterum (Fabr.)

Sphex hemiptera Fabricius, Entom. System. Suppl.: 244, n. 11-12, 1798.

New Caledonia: St. Louis, October 14, 1940, 3 ♂ ♂; October 29, 1 ♂, 1 ♀ (F. X. Williams). A dusky mud-dauber, 20-25 mm. long; blackish with dull brownish red on the clypeus, base of antennae, mandibles and a blotch on the side of the thorax. The wings are very dilute yellow.

The wasp was coming into season in October, when males were seen flying over bushes evidently searching for females. Old cell masses of this wasp were found in hollow trees, on banks and in very large numbers on the ceiling of an old mill shed at St. Louis.

Recorded also from Madagascar, Mauritius and the Seychelles.

TRYPOXYLONIDAE

Vachal (1907) lists the Australian *Pison punctulatum* Kohl ♂ with doubt, from New Caledonia, and describes *Pison strictifrons* ♀ from that locality.

R. E. Turner (1919: 239) lists *Pison rechingeri* Kohl (1908) described from Samoa, from Noumea, New Caledonia adding: "This is probably the species identified by Vachal with doubt as *P. punctulatum* Kohl." *P. rechingeri* is regarded by Perkins and Cheesman (Insects of Samoa, **5,** Hymenoptera: 26-27, 1928) as a synonym of *Pison tahitense* Saussure (1867).

The present collection contains five species of *Pison,* which I have determined as follows:

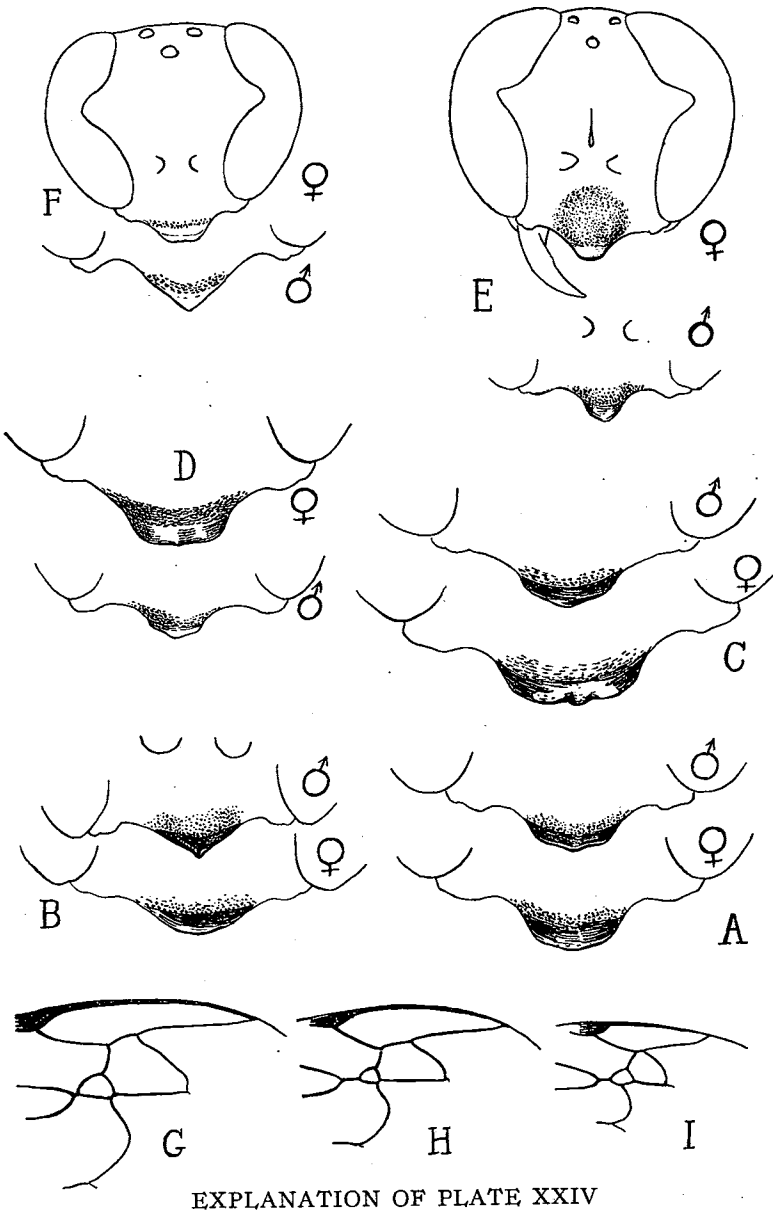
Pison (Pisonitus) rufipes Shuckard (pl. 24, figs. F and I)

Shuckard, Trans. Roy. Ent. Soc. London, **2**: 79, 1837, ♀, Tasmania (Van Diemen's Land).

New Caledonia: Noumea, August 10, 1940. 3 ♂ ♂ and 3 ♀ ♀, by stagnant pool, at sea level (F. X. Williams).

A pair taken by me at Sydney, Australia in March 1919, differ in no way from the New Caledonian specimens.

I refer this wasp doubtfully to *P. rufipes,* as Shuckard's description is very short.



EXPLANATION OF PLATE XXIV

A—*Pison* sp., clypeus.
B—*Pison strictifrons.*
C—*Pison ignavum.*
D—*Pison argentatum.* From Hawaii.
E—*Pison insulare.*
F—*Pison rufipes* (?).
G—*Pison insulare,* female; extremity of forewing.
H—*Pison insulare,* male.
I—*Pison rufipes* (?), male.

It measures up to about 7 mm. long; for the most part it is finely opaque, the mandibles, antennae in part, apex of clypeus, particularly in the ♀, and the legs except the coxae and trochanters are reddish, the apex of the segments of the abdomen are testaceous; the pile is silvery, in part with a pale brassy lustre. The interocular space at the vertex is noticeably wider than at base of the clypeus. The first recurrent nervure is received towards the apex of the first submarginal cell and the second recurrent at about the middle of the second submarginal cell (wing characters also of *P. ignavum* and *P.* sp., following).

Pison strictifrons Vachal (pl. 24, fig. B; pl. 25, figs. B, D and F)

Vachal, Rev. d'Ent., **26**: 114-115, 1907, ♀.

New Caledonia: Noumea, St. Louis, Oua Tom, Touho. August, September, October and November 1940. Eleven males and 8 females (F. X. Williams). One of the males was reared from a free nest of mud cells.

A species of medium size, all black including the spurs; the sculpture is fine, the clypeus of the female gently rounded out, that of the male drawn to a point; posterior ocelli very close to the eyes; disc of propodeum nearly smooth, with a fine median carina from which, and from the base of the disc, proceed fine diverging but abortive striae. There is no transverse impressed line behind the posterior ocelli.

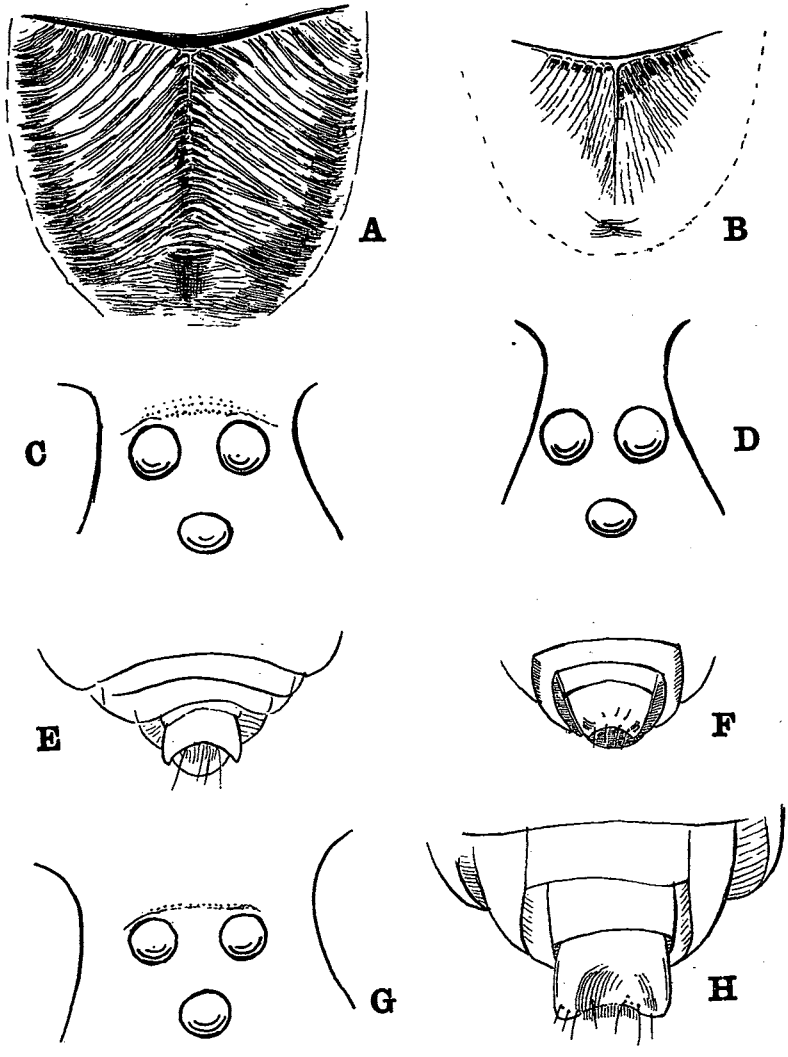
Pison ignavum Turner (pl. 24, fig. C; pl. 25, figs. E and G)

Turner, Proc. Zool. Soc. London: 511-512, 1908 ♂ ♀ Queensland; Melbourne, Australia.

New Caledonia: Noumea; St. Louis; 25 miles NW of Noumea; S. New Caledonia. Twelve ♀ ♀ and 8 ♂ ♂, October 1940.

Considered by Turner (1908), and by Perkins and Cheesman (1928) as a subspecies of *P. argentatum* Shuckard. "Distinguished from *argentatum* (Mauritius, Honolulu) by the slightly more rounded clypeal apex in the ♂" (Cheesman, A Contribution towards the Insect Fauna of French Oceania: 177, 1928 [re The Marquesas and Society Islands]); and—"The median segment in *ignavum* is more strongly striated than in the more typical form, but the difference is not sufficient to be of full specific value" (Turner, Proc. Zool. Soc. London: 355, 1910). Further distinctions between the two species were pointed out by me in 1932. Specimens of *P. ignavum* from Samoa as determined by Perkins and Cheesman correspond exactly to my New Caledonian specimens. I have also seen *ignavum* from Queensland. Both species have a more or less well-defined impressed subsinuous line extending behind the posterior ocelli.

As in *P. argentatum, P. ignavum* constructs free cells of mud pellets and sometimes hangs them from rootlets exposed in a bank.



EXPLANATION OF PLATE XXV

A—*Pison* sp., male; propodeum, dorsal view.
B—*Pison strictifrons,* propodeum.
C—*Pison* sp., female; ocelli, from above.
D—*Pison strictifrons,* female.
E—*Pison ignavum,* male; apex of abdomen, from beneath.
F—*Pison strictifrons,* male; apex of abdomen, from beneath.
G—*Pison ignavum,* female; ocelli, from above.
H—*Pison insulare,* male; apex of abdomen, from beneath.

Pison insulare Smith (pl. 24, figs. E, G and H; pl. 25, fig. H)

New Caledonia: Noumea, St. Louis, Thi River valley, Prony Bay, Isle of Pines, Oua Tom, Bonjou district, Nepoui, Nakety and Hienghene; 26 ♂ ♂ and 26 ♀ ♀ 1940 (F. X. Williams). Of these one male was reared from a mud cell of *Eumenes germaini* which the mother *Pison* had partitioned into two cells.

The largest of the New Caledonian *Pison* taken by me, females measuring up to 11 mm. long. The posterior ocelli are much less than half their diameter from the eyes and about half their diameter from each other. The disc of the propodeum is shining, with scattered punctures, a more or less developed median furrow and obsolescent transverse and oblique striae.

Miss E. L. Cheesman (Ann. Mag. Nat. Hist., [10] **20**: 203-204, 1937) who collected *Pison insulare* in the New Hebrides, supplements Smith's brief description of this wasp with useful descriptive notes of her own.

Pison sp. (pl. 24, fig. A; pl. 25, figs. A and C)

A semi-opaque species with fine puncturation but with the disc of the propodeum rather coarsely sculptured, the carina being placed in somewhat of a fossa. The incised line behind the posterior ocelli does not extend across the vertex.

Seven ♂ ♂ and 3 ♀ ♀, (1 ♂ from Nakety, October 10) the rest from Noumea, September, October and November, 1940 (F. X. Williams).

LARRIDAE

Liris clypeata (Smith) (pl. 26, figs. A-D)

Larrada clypeata Smith, Ann. Mag. Nat. Hist., (4) **12**: 294, 1873. ♀. New Caledonia.

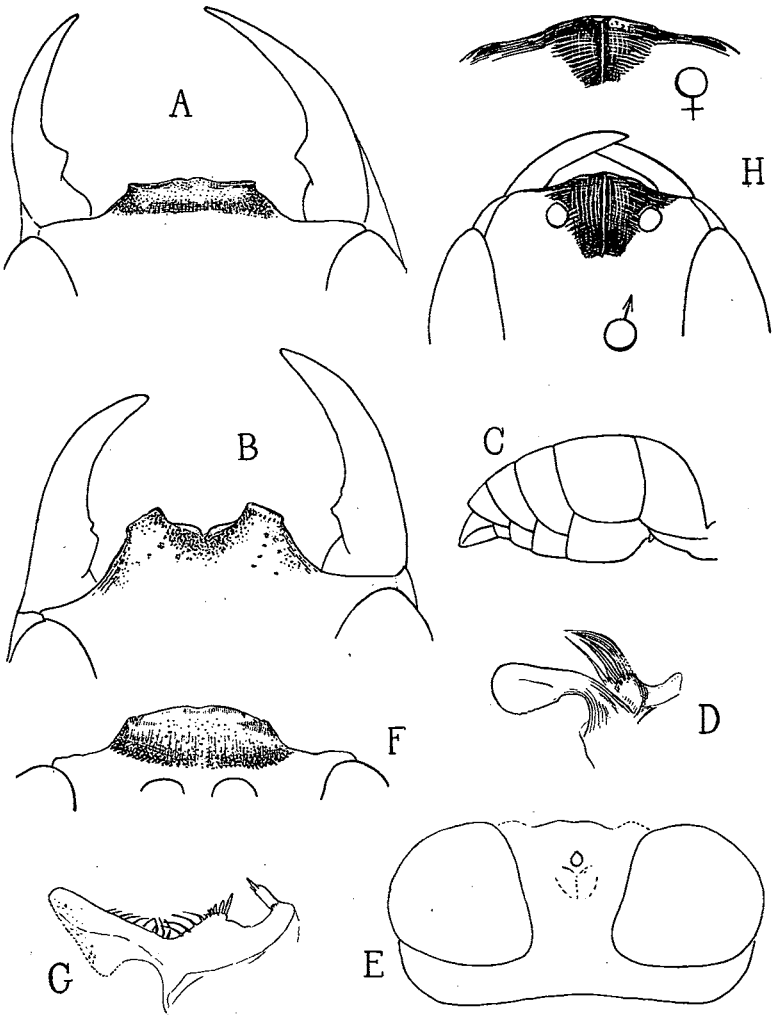
Larra clypeata (Sm.) Kohl, Verh. zool.-bot. Ges. Wien, **34**: 242, 1884.

Notogonia clypeata, Sm. Turner, Ann. Mag. Nat. Hist. (9) **3**: 239, 1919. ♂. Noumea, New Caledonia. "Also from Api, New Hebrides."

Liris (*Larrada*) *clypeata* (Sm.) Cheesman, Ann. Mag. Nat. Hist., (10) **20**: 204-205, 1937. Describes ♂.

5 ♀ ♀ and 3 ♂ ♂, New Caledonia: Noumea, 3 ♀ ♀, July and October, 1940; St. Louis, 1 ♀, August, 1940, Thi River valley, 1 ♀, November, 1940; Prony Bay, 2 ♂ ♂, October, 1940; Hienghene, 1 ♂, October, 1940 (F. X. Williams).

A stout, moderately shining black wasp measuring to about 16 mm. long. The female is easily recognized by the deeply cleft clypeus, an exaggeration of the condition found in such species as *L. melania* Turner from Queensland, *L. mindanaoensis* Williams from



EXPLANATION OF PLATE XXVI

A—*Liris clypeata,* male; clypeus.
B—*Liris clypeata,* female; clypeus.
C—*Liris clypeata,* female; abdomen in lateral profile.
D—*Liris clypeata,* male; sagitta of aedeagus, lateral view.
E—*Liris clypeata,* female; head, from above.
F—*Notogonidea manilae,* female; clypeus.
G—*Notogonidea manilae,* male; sagitta of aedeagus, from above.
H—*Nitela austrocaledonica,* clypeus.

the Southern Philippines, and *L. samoensis*.* It further resembles the above species in the narrow vertex, the absence of spines on the fore tibiae above, and in the rounded propodeum, but possesses a rather ample occipital region, which is characteristic of such species as *L. aurata* (Fabr.) and *L. haemorhoidalis* (Fabr.) of oriental regions.

Liris clypeata is a wary insect, not readily taken.

Notogonidea manilae** (Ashmead) (pl. 26, figs. F and G)

Notogonia manilae Ashmead, Proc. U. S. Nat. Mus., **28**: 130, 1905. ♂, ♀. Manila, Philippines.

Notogonia retiaria Turner, Proc. Zool. Soc. London, **31**: 479-480, 1908. Perth, W. Australia; Kuranda, Queensland, Australia (1916); Fiji (1918).

Notogonidea williamsi Rohwer; Ent. Ser. Bul. **14** (1), Exp. Sta. Hawaiian Sugar Planters' Assn.: 9-10, 1919. Los Banos, Luzon.

Notogonidea manilae (Ashmead). Williams, Ent. Ser. Bul. **19,** Exp. Sta., Hawaiian Sugar Planters' Assn.: 75-76, 100, 1928.

Notogonidea retiaria (Turner). Williams, Insects of Samoa, **5**, Hymenoptera, (1): 33-34, 1928.

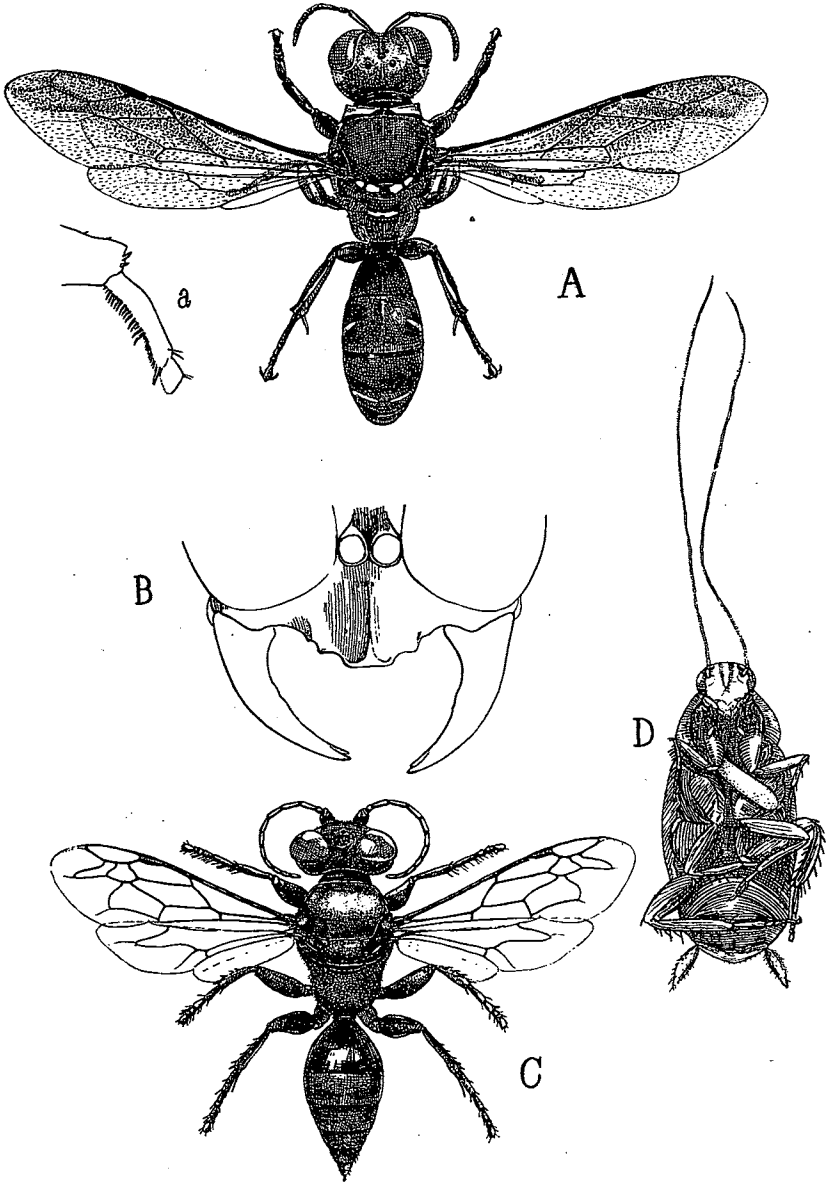
Notogonidea retiaria, Cheesman, Ann. Mag. Nat. Hist. (10) **20**: 206, 1937.

After a critical study of specimens of this wasp from Australia, Fiji, Samoa, New Caledonia, the Solomons, and the Philippines, where it is very abundant, I have come to the conclusion that *N. retiaria* is a synonym of *N. manilae* (Ashmead).

It is a variable species, quite common in New Caledonia and perhaps a recent arrival there, appearing not to have previously been recorded from that island. In the Philippines I found *N. manilae* storing its burrow with *Nemobius histrio* Saussure, a tiny cricket. In the rather decrepit Thi River forest, New Caledonia, it was observed preying likewise upon small crickets. Here on November 8, attentively following prey-laden wasps to their burrows, was a relatively large muscoidean fly of tribe Miltogrammini, family Stephanosomatidae. This fly probably deposits its own young on the

*_Liris corniger_ Williams (Ann. Mag. Nat. Hist. [10] **18**: 126-128, 1936) described from a single female from the British Solomon Islands belongs in the *L. melania* group, its toothed clypeus notwithstanding. The strong median clypeal tooth of *corniger* may possibly be a malformation since the insect, a fresh specimen, was received with the face stove in, and such an injury, did it occur in the pupa or teneral adult, might demand a compensating outpushing elsewhere.

I am using *Notogonidea* Rohwer rather than *Motes* Kohl, as proposed by Pate (The Generic Names of the Sphecoid Wasps and their Type Species. Mem. Am. Ent. Soc., **9: 41, 92-95, 1937) and later used by him (Can. Ent., **75**: 200-202, 1943). I have not seen Arnold's review of the genus *Notogonidea* in his monograph of the South African Sphecidae (Ann. Transvaal Mus., **9**: 228 et seq., 1923) to which Pate refers. These two authors do not consider that *Motes* and *Notogonidea* are generically distinct and Pate uses the older (*Motes*) of the two names. I think that *Motes* and *Notogonidea* should be retained as full genera. They appear readily separable. To unite *Motes* and *Notogonidea* into one genus would, in my opinion, give equal reason to include both of these names as synonyms of *Liris* of Fabricius (1804), or perhaps to go still further, and thus to form a still more unwieldy genus and to add unnecessarily to the ever-growing literature on synonymy.



EXPLANATION OF PLATE XXVII

A—*Crabro novocaledonicus,* male type; a, basal midtarsal joint, from side (paratype).

B—*Crabro novocaledonicus,* male; clypeus.

C—*Tachysphex fanuiensis,* female. Length 9 mm. New Caledonia.

D—Cockroach, mature female, heavily shaded to show egg of *Tachysphex fanuiensis.* Length of cockroach, 6.75 mm.; of wasp egg, about 2 mm. New Caledonia.

wasp's prey. Miss Cheesman (1937) also reports this species (under *N. retiaria*) from the New Hebrides.

Tachysphex fanuiensis Cheesman (pl. 27, figs. C and D)

Tachysphex fanuiensis Cheesman. Ann. Mag. Nat. Hist., (10) 1: 172-175, 1928. fig. 2, A and B. (♂ ♀). Tuamotu Archipelago; Society Islands.

Williams, Bishop Mus.; Pac. Ent. Survey, Bul. **98,** Marquesan Insects—I: 150-151, 1932.

The discovery of this little black wasp in New Caledonia extends its range far to the west. The material consists of 7 ♂ ♂, all from the Isle of Pines, October 24, 1940, and 8 ♀ ♀, of which 2 are from the Isle of Pines, October 24, 1940, 1 from an islet near Yate, October 25, 2 a few miles north of Mount Mou, September 13, 1940, 2 from Noumea, October 30 and November 5, 1940, and 1 from the east coast, October 7, 1940 (F. X. Williams).

Notes on this 6-10 mm. long wasp are in part as follows: September 13, near the native village of Bonjou, some kilometers north of Mount Mou, I netted a heavily burdened little wasp that was flying over a stream. She proved to be a *Tachysphex* and her burden a tiny, though mature cockroach that, save for a slight movement of the palpi, had been stung to immobility. Pursuing my search along the stream side, a second *Tachysphex* was noted filling up her burrow in the coarse sand at the base of a bank. She was throwing in sand with her hind legs, varying this procedure by turning about to work with her head. She was captured and the shallow burrow dug up, bringing to light 13 small cockroaches, all one species, of which but one was immature. They were about 7 mm. long. Most were females, which possessed shorter wings than the males; the majority had an egg capsule more or less extruded from the end of the body. This lot had probably occupied two cells, as two of the victims had a *Tachysphex* egg about 2 mm. long glued at one end to the body behind a fore coxa, the egg extending obliquely posterad. (pl. 10, fig. D). Another *Tachysphex fanuiensis* was captured in a garden in Noumea, where she was provisioning her burrow with an adult of this cockroach.

Miss Cheesman (t. c.: 174-175) first discovered this wasp preying on cockroaches, as follows: "On the coast-hills above Fanui several females were making their burrows on patches of dry soil, and stocking them with a small cockroach, *Blattella notulata* Stål (described from Tahiti by Br. von Wattenwyl under the name of *Phyllodromia hieroglyphica*)"—This cockroach has been more recently determined by Morgan Hebard as *Graptoblatta notulata* (Stål) (Bishop Mus. Bul. **114,** Marquesan Insects—II: 117, 1935). As Miss Cheesman remarked, this blattid has the habit of sitting openly on leaves. The cockroach prey of *Tachysphex fanuiensis* in

New Caledonia except for its smaller size much resembles *Graptoblatta notulata.*

Nitela austrocaledonica n.sp. (pl. 26, fig. H, and text fig. 13)

Female, holotype: Length 4.5 mm. Black; head and thorax rather opaque, abdomen smooth and shining; tip of mandibles red, tegulae and axillary sclerites dark brownish, extreme apex of tibiae, their spurs, and tarsi except apical joints, yellowish brown. Mandibles with a small tooth above near the apex; clypeus somewhat produced and very slightly emarginate mesad, the disc with a sharp carina to margin; base of the antennae farther from each other than from the eyes, joints 2 and 3 subequal and together about equalling the interocular space at the vertex; ocelli forming a nearly equilateral triangle, posterior ocelli very close to the eyes, being distant from them by less than their diameter and clearly more than twice as far from

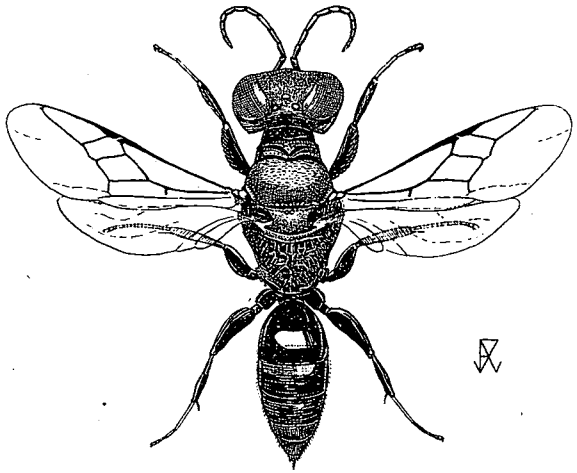


Fig. 13. *Nitela austrocaledonica,* female. Length 4.5 mm. Noumea, New Caledonia.

each other than from the eyes; frons very finely striolate-reticulate. Pronotum rather narrow, the humeral angles not prominent; very finely transversely striate, with a transverse and somewhat reticulate groove more depressed mesad where it is interrupted by a wedge-like projection. Mesonotum finely reticulate, with transverse striolae, a large pit in the shining mesopleural area. Scutellum with about nine basal foveae, the median pair relatively large, the disc somewhat longitudinally striolate-punctate. Propodeum wider than long, as seen from above tapering and rounded-truncate apically, the disc with rather large reticulations formed on more or less longitudinal carinulae, the sides of the propodeum longitudinally, the posterior face transversely striate with a shallow groove. Venation normal for the genus. Vestiture: sparse silvery pile.

Male, allotype: Length 3.75 mm. Like the female, but the median portion of the clypeus is not at all emarginate, the mandibles are simple, and the sides and posterior face of the propodeum are reticulate-striate.

Holotype, allotype and 2 ♀ ♀ and 2 ♂ ♂ paratypes, Noumea, New Caledonia, end of October, 1940 (F. X. Williams). Taken on the sunlit trunk of a palm tree in a garden.

This species seems closest to *Nitela kurandae* Turner (Proc. Zool. Soc. London, 2: 508, 1908), from Cairns, Queensland, which I have not seen. It agrees pretty well with the description of *kurandae* in clypeal and ocellar characters and differs from that Australian species in being nearly all black, whereas *kurandae* has the antennae in part, and all the legs pale ferruginous.

CRABRONIDAE

Crabro novocaledonicus n.sp. (pl. 27, figs. A and B)

Male, type: Length 10 mm. Black; head and thorax opaque, abdomen subopaque above, shining beneath; scape except a line beneath, humeri of pronotum widely, pronotal lobes, paired spot each side on scutum anteriorly, wide spot on scutellum, stripe on fore femora beneath, small spot on fore tibiae above at base, mid femora in part above anteriorly and beneath, stripe on middle and hind tibiae above, and each side on tergite 2, an interrupted band at about middle length on tergite 5, a complete band on 6 and 7, yellow; wings in part infuscate, most pronounced on the anterior half or more of the primaries. Head and thorax generally coriaceous—with fine very close punctures. Head subquadrate; mandibles of about uniform width on exterior face, bidentate but without a distinct tooth on upper inner margin; clypeus doubly truncate, with a strong median carina that widens at the margin; antennae with 13 segments, not modified, antennal fossae contiguous, joint 3 of antennae at least twice as long as 4; eyes converging strongly towards clypeus, face excavate and with a median impressed line; ocelli in a low triangle, the posterior ocelli farther from each other than from the eyes. Pronotum sulcate mesad, the humeral angles acute, the anterior margin thinly raised, the pleura wrinkled, compressed to form with the sharply margined mesopleura an epicnemium or bed for the anterior femora. A vertical carina before the middle coxae. Propodeum short, the disc rather poorly defined, with a narrow median groove, posterior face oblique, sulcate. Femora stout, first four joints of anterior tarsi flattened and about twice the normal width; the fore tibiae and first tarsal joint fringed with pile anteriorly; middle tibiae without definite apical calcar; first joint of middle tarsi somewhat arched, with a fringe of stout little bristles outwardly beneath (Aa). Wings long, the recurrent vein in outer third of submarginal cell. Abdominal tergites finely coriaceous, the first segment long, subpetiolate, its apex considerably narrower than the base of 2; segment 1, and 2 in part, keeled laterally, sternites 2 and 3 mainly flat, those beyond becoming gently concave; pygidium rugulose; apex with a pair of small diverging papillae.

Type and 3 ♂ ♂ paratypes, New Caledonia: hills behind Noumea, October 16 and 19, 1940 (F. X. Williams). Flying about a flowering shrub, evidently searching for females.

This insect best fits Kohl's species-group *Crabro* (Die Crabronen der Paläarktischen Region. Ann. k. k. Naturhist. Hofmus. Wien, 29: 21-23, 1915), or the genus *Ectemnius,* its approximate equivalent (see Pate's Conspectus of the Genera of Pemphilidine Wasps [Hymenoptera: Sphecidae. American Midland Naturalist, 31: 329-384, 1944]). The New Caledonian species is in the same

group as our Hawaiian *Crabro,* which however have the antennae 12-jointed in the male as well as in the female.

Other Insects

The New Caledonian bull-dog ant (*Myrmecia apicalis* Emery [1883] Ponerinae)

This is a large slender finely sculptured black ant (text fig. 14), with the bilobed labrum, the flagellum of antennae in part, mandibles

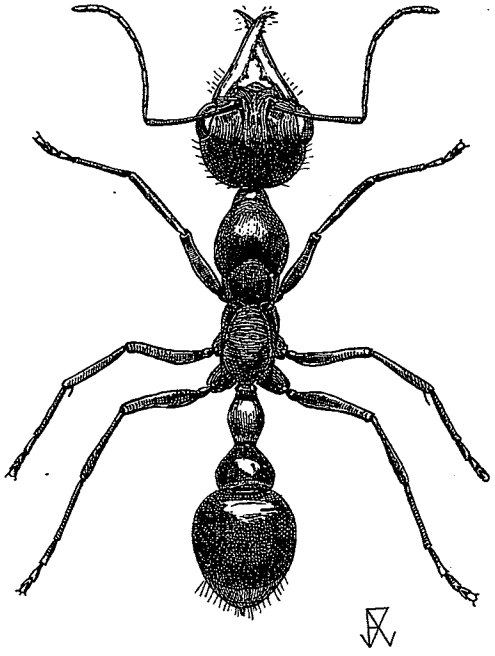


Fig. 14. *Myrmecia apicalis.* Length 11.5 mm. Marmite forest, New Caledonia.

except teeth and apex, yellowish, the labrum and apex of abdomen being submetallic and covered with pale brassy pile and the body in general with fine white pile giving it a pruinose appearance. For the genus it is of rather small size—up to about 12 mm. long—some of its Australian relatives attaining a length of 25 mm. or more. I have not seen Emery's description.

I took a half-dozen specimens of this apparently timid species on shrubs in the cut-over Marmite forest, in the mountains beyond the St. Louis mission, in November 1940.

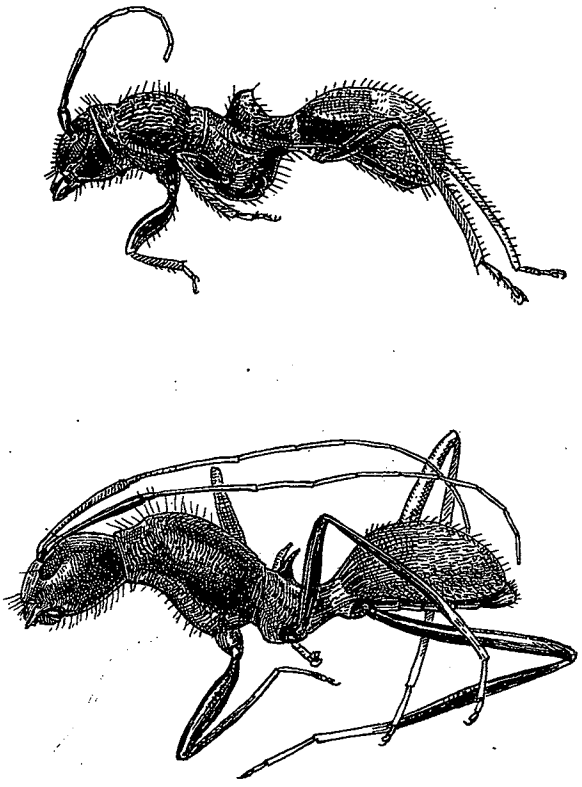


Fig. 15. Cerambycid beetles; the upper one superficially resembles a ponerid ant of the tribe Ectatommini, while the lower one suggests a camponotid ant. Length of upper figure, 5.5 mm.; of lower, 7 mm. New Caledonia.

It is the only species of the primitive genus *Myrmecia* that has been found outside Australia, including Tasmania.

Two species of small, oddly-shaped cerambycid beetles (text fig. 15) were taken on shrubs in the Thi River forest. Both have a pair of thorns on the waist-like base of the elytra that fit so snugly over the abdomen. They are very ant-like; the larger beetle resembles ants of the tribe Camponotini, of which there are plenty in New Caledonia, the second more thickset and smaller has stouter elytral thorns and a coarse sculpture suggesting one of the ponerine

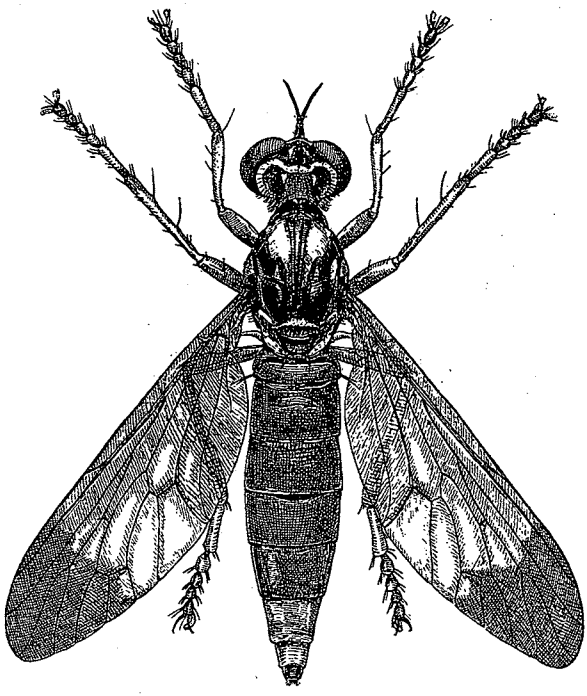


Fig. 16. A handsome asilid fly (*Neosaropogon* [?]) with orange and black wings and the abdomen tipped with red. It suggests a pompilid wasp. Length 14.5 mm. St. Louis, New Caledonia.

ants of the tribe Ectatommini, also well represented. Such resemblances between longicorn beetles and ants have been noted in Australia, and probably elsewhere (see Tillyard: 234, 1926).

Text figure 16 is a strikingly colored asilid fly near to, or of the genus *Neosaropogon*. The thorax is marked with fine yellow pile, the wings orange and black, the legs mostly orange-yellow while the abdomen is black marked with orange. Superficially it much resembles the orange and black winged pompilid wasps that inhabit the same situation. One of these flies was taken with a *Pison* wasp in its grasp.

Neosaropogon belongs to the subfamily Dasypogoninae, of which Tillyard says (362-363, 1926): "A group of wasp-mimicking forms belonging to this subfamily occur in Australia; they belong to the genera *Cabasa, Codula, Chrysopogon* and *Neosaropogon*."

Fig. 17. Endemic land snails of the genus *Placostylus* from the hills behind Noumea. Other species of *Placostylus* may attain a length of five inches. They are considered a table delicacy.

Fig. 18. A giant gecko lizard (*Rhacodactylus leachianus* [Cuv.]) found only in New Caledonia, where it lives on the trunks of trees and in fissures in boulders. It often exceeds a foot in length. Its leathery egg shells may sometimes be found on the floor of the forest.