Etizenia

Occasional Publication of the Biological Laboratory
Fukui University, Japan

No. 20.

STUDIES ON THE FORMOSAN SPHECIDAE (I)
THE SUBFAMILY LARRINAE
(HYMENOPTERA)

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June 10, 1967

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GENERAL INTRODUCTION

The Sphecidae of Formosa have been dealt with either faunistically, biologically or taxonomically by such authors as S. A. Rohwer (1911), S. Matsumura (1912), E. Strand (1913a, b, 15, 22, 23), J. Sonan (1925, 27a, b, 28, 29, 31, 35, 42), F. X. Williams (1928), M. Yano (1932), K. Yasumatsu (1935, 36, 37, 38a, b, 39, 40, 42), K. Iwata (1939, 41), V. S. L. Pate (1943, 44), J. Giner Mari (1943), J. Leclercq (1951, 63) and myself (1954, 59, 60, 65, 66a, b, c, d, 67). Among the investigations done by these authors the important from the taxonomic point of view are those of Strand, Giner Mari, Yasumatsu (1938) and probably of myself (1966).

In the summer of 1966, during two months of July and August, I visited Formosa to investigate wasps and bees in order to obtain the material for my taxonomic basis regarding the Hymenoptera of the Oriental Region.

Recently I have often been charged with the study of the Hymenopterous insects collected by the members of some Scientific Expeditions of our country made to South and Southeast Asia. It is a difficult matter to me, however, to deal with the material without error, because of (1) obscurity of the descriptions of the previous authors, (2) scanty of specimens per species and (3) my own inadequate knowledge on the tropical and subtropical insect fauna.

In order to solve these problems simultaneously, since the first difficulty is presumed to be solved, to a certain extent, by fulfilling the second request, my personal expedition to Formosa was undertaken. This was certainly one of the main reasons. But I had the other reason that directly accelerated my personal travel to Formosa. It was my desire to complete my previous reports based on the Formosan material recently collected by Professor T. Shirôzu of the Kyushu University and some others, because they involved a number of problems that were expected to be solved by observing the related insects of the Island by my own eyes.

It was very regretted, however, that I was given almost no facilities for my investigation by the Govenment of Taiwan. Almost all the mounts and valeys were closed before me except those left open for the common sightseeing travellers. Therefore, I could scarcely touch with the insects living in high altitude, the study of which was one of the objects of my investigation in regard to the faunal connection between Formosa and Japan. The place of my study was, therefore, confined to the lowland and hills. This happened to bring the result that I concentrated my effort to the study of the wasps and bees of the southern origin.

Our investigations were favoured by the weather condition as well as our health and we could go out every day. In order to make the best of our limited time we worked from morning till evening in the field and we pinned and prepared the collected material at night (mandibles, legs and genitalia in good place for study as far as possible) that was preserved in the creosote vapour bottles for two days. The days we took a rest were only those applied for moving from one station to the next. As a result we could collect as many specimens as about 15,000 of aculeate Hymenoptera, together with some biological data.

* *Contribution No. 101 from the Biological Laboratory, Fukui University, Japan*

Acknowledgement

Before proceeding further I must acknowledge my indebtedness to some persons who helped me in various ways. First of all I must thank to Mr. Tadashi Tano, the teatcher of Fujishima High School in Fukui and the assistant of my expedition, who helped me not only in the field work but also in all the troublesome tasks of every day life and who further offered all his personal collection for my study. Next I offer my sincere gratitude to Professor T. Shirôzu, Kyushu University, to Dr. J. Minamikawa, Tokyo, and to Dr. T. Shimizu, Shinshu University, for their kindness in communicating me prior to my start the detailed informations concerning the promising places for investigation as well as the general circumstances of Taiwan. The knowledge afforded by these experienced investigators proved most valuable in carrying out the fruitful collections and observations. My hearty thanks are also due to Professor K. Yasumatsu, Kyushu University, Dr. S. Asahina, the National Institute of Health, Tokyo, and Professor S. T. Yie, Taiwan University, Taipei, for their taking trouble in giving me various facilities to realize the expedition. I further wish to express my cordial thanks to Mr. B. S. Chang (張保信), Kuangyin, Taoyuan Pref., Taiwan, who kindly cooperated with us in some collecting trips and who further sent me a great number of Hymenopterous specimens collected by himself in the places and time different from what we concerned, that were quite valuable in affording me some supplementary material. My thanks must also be extended to Mr. C. C. Yu (余清金), Puli, Taiwan, and to Mr. H. Sasaji of our Laboratory in supplying me some valuable specimens of the Formosan wasps.

Stations for investigation

The stations that were made our bases for the investigation trips (within parentheses) were as follows:

Taipei (Yangmingshan, Wulai, Taoyuan, Yangmei, Yingko) — Puli (Shuili, Lihyuehtan, Liyuku, Penpuchi, Wushe, Chienching, Tsuifeng) — Chiayi (Kuantsuling) — Chuchi — Fenchihu — Alishan — Kao-Hsiuing — Fangliao — Hengchun (Oluanpi, Shatao, Kentin-Kuonyuan, Kentin, Ssuchungchi, Manchou) — Taitung (Chihpen, Chulu, Taoyeh) — Hualien (Liyuchih, Tienhsiang) — Ilan (Tsukeng, Chuantou) — Puli (Penpuchi, Wushe).

Influence of pest control

It seems rather curious that we meet with almost no house fly in the cities, towns and villages of Formosa, especially those situated in the western region of the Island, because the circumstances are not always clean and sanitary. When we searched for the bamboo-nesting insects under the roof of a house, or chasing the flying ruby-tailed-wasps around the house of a village we had alwsys to heed at our feet not tread upon droppings numberlessly scattered of fowl, ducks, geese, turkeys, dogs, buffalos etc. Further, there are always several pigpens and heaped manures near such a house. Thus, the elements attracting flies and the hotbeds for their reproduction appear to be completely provided. Nevertheless, we can scarcely observe the flies of *Musca*, *Sarcophaga*, *Ophyla* etc. in and around the house. This strange phenomenon is utterly due to that the thorough-going control of such insect-pests was carried out and is still going on by the cooperation of the U. S. army through the airplane dusting of the BHC powder. Thanks to such a control the malaria-carrying mosquitoes were almost completely exterminated in Formosa.

But it also exerted a profound influence upon the insect fauna in general. We frequently had the experiences that the environmental conditions of the habitat are considered most favourable to the sand-burrowing or flower-visiting insects, yet we could hardly find not only working wasps and bees, but also even the grasshoppers, flies and ants, excepting a few of the small dragonflies of *Diplacodes trivialis* Ramber, on the ground or on the flowers of

Umbelliferae, Leguminosae and Nitaceae (especially *Ampelopsis heterophylla*). The fact made us suppose that in Formosa the insects in general might have greatly reduced in numbers. But as we did not possess the faunal knowledge before the War we could not give any definite conclusion about the matter. In marked contrast to such a place we encountered an enormous number of wasps and bees under the similar environmental condition in another place, sometimes not far from the first mentioned area. The second place might have escaped the showers of the insect-cide. Such a phenomenon as cited here was often observed in the vicinity of Hengchun, at the southernmost location of the Island.

Biogeographic problem

On the other hand, in the eastern region of Formosa the insects were apparently more abundant than in the western region, though mosquitoes and flies were also very scarce. Moreover, in this region we could collect and observe some species of wasps that could not be met with in the western region, and at the same time, some species abundant in the western region completely disappeared from before us. The data obtained by us are still insufficient to draw any definite conclusion, but it seems to give us an interesting suggestion about the biogeographic problem of the Island. Further thorough investigation must be performed in future.

Bergmann's rule

It has already come to my notice during the previous study with Shirôzu's collection that in some species which occur commonly in both Formosa and Japan the specimens of Formosa tend to be smaller in the averaged body size than those of Japan. Thanks to the abundant material thus obtained this phenomenon was reconfirmed on the basis of the population study upon, for instance, *Ammophila clavus* F., *Sceliphron inflexum* Sickm., *Larra amplipennis* Sm., *L. carbonaria* Sm., *Liris docilis* Sm., *L. japonica* Kohl etc. Further in the genus *Cerceris*, although there is no common species in both regions it was found that the species living in Japan are generally much larger in body size than those occurring in Formosa. The phenomena above mentioned well agree with the Bergmann's rule. In the studies that will subsequently be published the two populations when the difference is marked and the range of overlapping of the characters is small are dealt with as respectively a subspecies.

Origin of the Japanese insect fauna

As a general result of the study of the Formosan Sphecidae the impression was renewed that the insect fauna of Japan consisted of delivatives of two different sources, one from the Palaearctic Region and the other from the Oriental Region. It seems of interest in connection with this that the ratio of mixing of the two separate derivatives differs with the taxonomic groups of the insects. Among the subfamilies of the Sphecidae those that are mainly of the Palaearctic origin and mixed with a few of the Oriental factors:

Trypoxyloninae, Pemphredoninae, Nyssoninae, Philanthinae and Crabroninae.

While those of the converse relation:

Sphecinae and Larrinae.

As to the Oriental factors mention will be made successively in relation to the respective subfamily.

SUBFAMILY LARRINAE

The Larrinae form one of the difficult groups for taxonomy among those of the family Sphecidae, partly because that the specific differences are sometimes very slight and the variations within a species are sometimes very large. In some cases the difference in the colour pattern of a certain part of the body or the legs alone becomes a key character to separate the species. In such a case, apparently they are mere variations or, at most, local races of one species, yet it was inferred that they are ecologically quite distinct from each other and that there is no gene flow between them, since they are sympatric and there is no sign of intermediate forms between them, or they are sometimes sympatric and sometimes allopatric. Such a fact as mentioned can hardly be presumed by observing an insufficient series of the pinned specimens. On the other hand, difficulty is partly due to that the descriptions of the previous authors are very simple and superficial and in many cases can not conscientiously be applied to the specimens having so delicate a specific distinction. But, this is by no means a matter confined to Larrinae alone. The main reason of the taxonomic difficulty lies in that the thorough-going studies have not as yet been performed regarding most of the groups of the subfamily even within the range of a Zoological Region.

Recently as to the representatives of the western Palaearctic Region detailed studies were made by N. F. de Andrade on the genus *Miscophus* (1952–60), by de Beaumont with respect to the genera *Tachysphex* (1936) and *Liris* s. latr. (1961) and by W. J. Pulawski concerning the genus *Tachytes* (1962).

As to the East-Asiatic forms the work by F. X. Williams (1928) on the Philippine Larrinae is the sole monographic literature on this group given in fair detail. But the specific range covered by it is naturally very restricted and, moreover, his explanation is not always clear cut. Therefore, as to the eastern and southeastern representatives of this subfamily in Asia a number of the taxonomic problems remain unsolved.

As regards the Formosan Larrinae I have published a brief contribution based on the collection made by Professor T. Shirozu in which 15 (really 14) species were enumerated and more or less discussed.

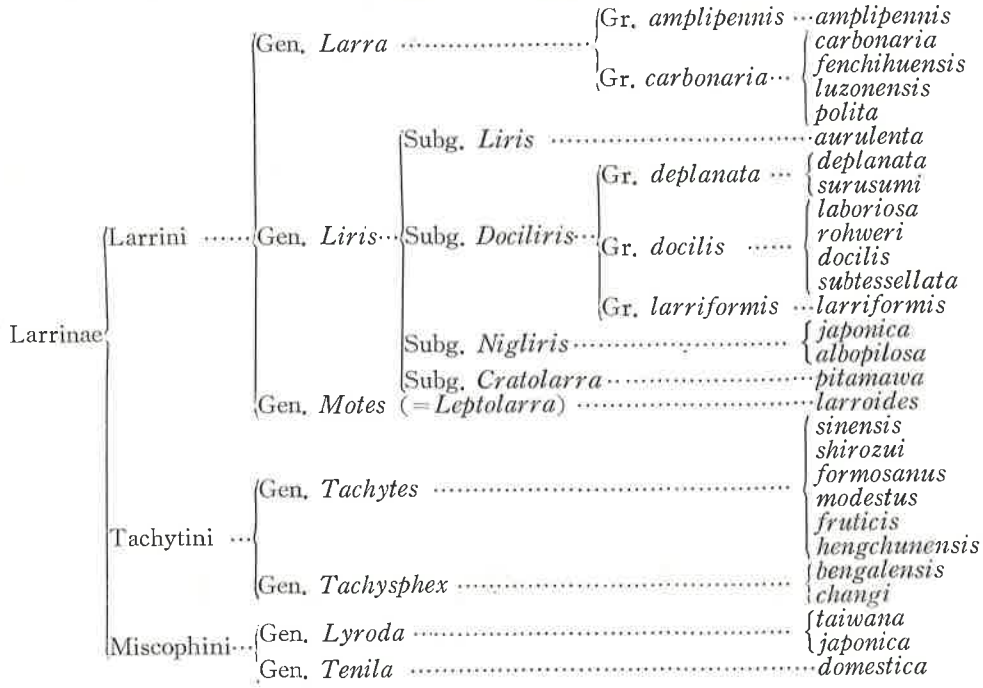
The present paper forms the second report of my study on the Formosan Larrinae in which the number of the species newly added to the Formosan fauna reached 13, including 5 new species and 2 new subspecies. Further, in this paper 3 species (*Tachytes auropilosa*, *Liris shirozui*, *L. vortex*) were transferred to other species and one species (*Tachytes fundatus*) was sunk to a geographic race of a known species. In addition, as the majority of the species collected were fairly sufficient in individual number it enabled me to carry out some variation studies with respect to a certain number of species. This attempt resulted in raising some new questions as to the status of some Philippine and Japanese species and discussions were given upon several species of the respective area.

As to the classification of the Larrinae I happened to come to almost the same viewpoint as adopted by Williams (1928) except that his *Liris* and *Notogonidea* were sunk to the subgenera of *Liris* s. latr. and the *Notogonidea* was further split into two subgenera, *Dociliris* and *Nigliris*. *Motes* Kohl (s. str.) was treated as a distinct genus and *Cratolarra* Cameron as a subgenus of *Liris* s. latr. The subgeneric name of *Notogonidea* used in my previous reports (1964, 66) was, as given explanation in the first paper, an utterly make-shift one, merely expressing groups other than those named in the papers. However, in the present paper I adopted *Cratolarra* Cameron as a subgenus of *Liris* (s. latr.) and the members of this subgenus is

very close to *Liris nigra* Van der Linden and the latter is the type of *Notogonidea*, so that it becomes impossible to use *Notogonidea* as a subgeneric name, even though it is rather a temporal one. I therefore became compelled to use a new subgeneric name. So, taking this opportunity, it was divided into the subgenera above mentioned.

Thus the system adopted in the present paper becomes as given below, of which group *larriformis* was placed with a query, since the male of this species could not be examined.

Table 1. System of Larrinae adopted in this paper



In classification the characters of the following portions are of use:

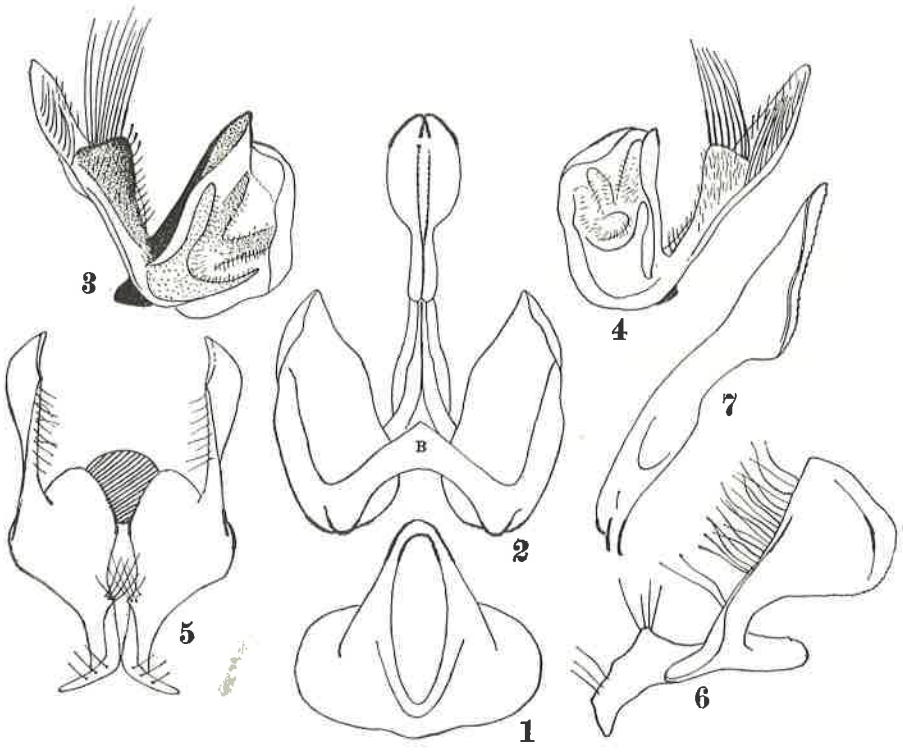
Total body (vestiture, colouring and punctuation); mandible (notch on outer margin, teeth on inner margin, sometimes relative length); clypeus (general form, state of elevation of disc, sometimes punctuation); vertex (relative greatness of interocular distance on vertex as against at base of clypeus or some joint or joints of antennae, sometimes as against the length of vertex, rarely general contour); ocelli (each form, usually generic charcter, sometimes ratio of OOD : POD,); antenna (relative length between joints, length to width of a certain joint, rhinaria, rarely pilosity); pronotum (thickness, form, relative position to mesonotum, nape furrow); scutellum and postscutellum (states of medial furrow or impression); propodeum (relative length to mesonotum, states of medial and lateral carinae, general sculpture, smooth patch on medio-apical area, medial furrow and convergency of posterior aspect); pygidial area (form, surface state, lateral carinae, apical spines); legs (form and pilosity of femora, especially in ♂, surface spines on tibiae, relative length of apical tarsal joints); wings (cloudness, form of radial cell, relative size of cubital cell as measured by relative widths of sections of radial vein); 8th sternite (form); genitalia in ♂ (genral chitinization, hairing, form and structure of paramere, volsella and penis valve).

Notes on the male genitalia.

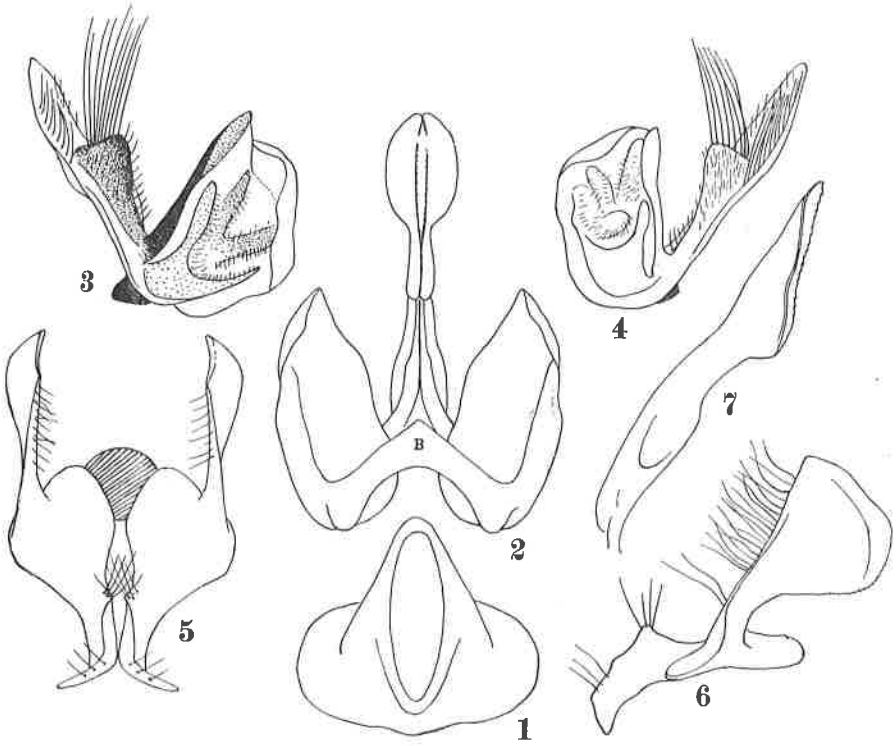
The parts of the male genitalia are given in Figs. 1–7. A pair of parameres are expanded

at basal (interior) portion (basiparamere), connect each other at the medio-ventral area (I call the area *bridge*) and form a basis of the genitalia (Fig. 2). Penis valve occupies the dorso-medial blank between the basiparameres. A pair of volsella located between the bridge of the parameres and the sides of penis valve, sometimes not reaching the penis valve.

(1) Paramere. External sides of basal portion is called basiparamere, in Larrinae usually fairly well defined from the apical and inner membraneous structure by the difference of chitinization and sometimes easily separable. On ventral side narrowly extended inwards and united with the symmetric extention of the other side, forming the *bridge*. The portion of the bridge sometimes entire, sometimes more or less incised, and sometimes produced into a tooth, usually the area glabrous, but sometimes pilose, and of some use as a specific character. Remaining portions of the paramere varied in form, structure and pilosity with the genus, subgenus, group or species. In *Lyroda* and *Tachyspex* comparatively simple in both structure and hairing; in *Tachytes* simple but variously pubescent inside, sometimes very dense, and partially in a characteristic bundle; in *Larra* apical portion inside densely pubescent, basal portion inside usually with a hollow or excavation, sometimes encircled with elevated lamella; in *Motes*, so far as examined, provided with a lobiform appendage, formed by a deep incision; in *Liris* (s. latr,) different with subgenus, comparatively simple in *Cratolarra* and *Nigliris*, complicate in *Liris* s. str. and much more so in *Dociliris*. In the complicate cases basal portion with specially developed lobiform appendages, sometimes forming together a sort of pouch, including inside particular structures (somewhat resembling the cupping disk of Symphyta), sometimes lengthened



Figs. 1–7. Genitalia of *Liris subtessellata* (Smith).
1, Basal ring. 2, Basiparameres with penis valve (B. Bridge). 3, 4, Remaining parts of parameres. 5, A pair of volsella, seen from apex (hatched portion penis valve). 6, Volsella in lateral view. 7, Penis valve in lateral view.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into a tongue-shaped elongation, somewhat approaching the parapenial lobe of some other families, central area of the paramere, just above the particular structure, with a well chitinized peculiar elevation or platform, different in form, outline and contour with the group or with the species, always carrying series of long stiff hairs or pubescence.

(2) Volsella. In Larrinae, as far as observed, usually the distal (dorsalmost) portion only of this organ well developed. On each side of penis valve it lengthened posteriorly (apically) in parallel with the penis valve and more or less enlarged into a lamelliform expansion (*cuspis*). but the differentiation of *digitus* incomplete or lacking. In some cases, however, basal portion lying between the *cuspis* and the bridge of paramere (*lamina volsellaris*) provided with a short process or tuberculate elevation bearing hairs. Whether this is corresponded with the *digitus* or not is uncertain. Ventral end of the *lemina volsellaris* either simply tapered sidewards along the bridge, or erects into a short appendage, sometimes with apex slightly enlarged and notched. Whether this is the true *digitus* or not is also uncertain. Usually the *cuspis* on ventral side of the stalk sparsely or fairly closely pubescent, but sometimes completely glabrous, the medial elevation, if present, also carries a tuft of pubescence or a few stiff hairs. In *amplipennis* group of *Larra*, cuspis is a well chitinized hairless elongation, digitus unobservable (Fig. 12), in *carbonaria* group of the same genus cuspis is a shorter hairless elongation and the basal part at its ventral end bears a lengthened triangular appendage which is provided with a fringe of hairs (Fig. 16); in *Motes* cuspis somewhat spindle-shaped, with apex broadly rounded, well haired, lamina volsellaris with surface flattened, broad and on its ventro-lateral corner provided with a hair-bearing rounded swelling. In *Liris* s. l. cuspis well developed, apical enlargement lamellate, finely serrate in part, in *Liris* s. str. cuspis at its ventral base with a large, but not long, process carrying hairs (Fig. 39), in *Dociliris* the basal part simple, but chitinized, usually with aparse long pubescence, in most species basal part with a hair-bearing elevation in middle. In *Nigliris* beside the structure similar to *Dociliris* provided further with a somewhat hand-shaped erection at the ventral end (Fig. 106); in *Tachytes* (Fig. 155) cuspis only well developed and mostly densely pubescent, sometimes in part, sometimes wholly, the pubescence usually with irregular paste-like attachments, basal part (lamina volsellaris) gradually changed from cuspis without distinct border, also pubescent dorsally; in *Tachysphex* (Fig. 180) cuspis in a lamellate expansion and provided with a slender appendage at its ventro-apical area, running parallel with the penis valve, basal part in a comparatively highly elevated ridge, carrying a line of sparse long stiff hairs that extended to the ventral side of the appendicular elongation. In *Lyroda* volsella a subround-shaped wad, not highly elevated, with a few stiff hairs upon it, accompanied at the inner dorsal side with a hair-bearing semicircularly raised ridge, both semi-chitinized, brown to pale brown in colour, not reaching the base of penis valve, only connected with there by the less chitinized membraneous tissue (Figs. 207 and 215).

(3) Penis valve. In Formosan Larrinae penis valve can be divided into 5 types: *Larra*-type, *Liris*-type, *Tachytes*-type, *Tachysphex*-type and *Lyroda*-type. In *Larra*-type penis valve is spoon-shaped in ventral view, but its ventral expansion of the apical enlarged area in the lateral view slight, especiall so in *amplipennis* group, nearly flattened. In *Liris*-type, ventral view similar, but the apical expanded area thick, in the lateral view more or less elongate triangle in shape (Fig. 53). In *Tachytes*-type whole the organ laterally compressed and usually with the dorsal surface somewhat expanded sidewards (Figs. 152, 156). In *Tachysphex*-type less expanded in ventral view, but in lateral view well expanded on apical portion (Figs. 175, 181). In *Lyroda*-type the structure markedly different from the types above mentioned, rather

isolated (Fig. 217). In the first two types the inner (medial) margin of the apical expanded area finely serrate, in *Tachytes*-type without dentation, but in *Tachysphex*-type again dentate, but the pattern of the dentation markedly different from that of the first two type.

(4) Basal ring. Less important in taxonomy, since the change with the taxonomic ranks is slight.

Abbreviation:

OOD=Ocellocular distance. POD=Postocellar distance. IOD=Interocular distance. LV=Length of vertex (in *Tachytes* distance between the centre of post-cellar impression and the supposed line connecting posterior margins of compound eyes).

KEY TO THE SPECIES

1 Postocelli reduced, not round, more or less distorted 2

– Postocelli complete and round 27

2 Upper frons along inner orbits raised into obtuse ridges, ocellar region and upper frons uneven, having swellings, furrows and impressions 3

– Upper frons and vertex gently regularly inclined, ocellar region alone gently roundly raised, without inner orbital ridges 19

3 Mandible without notch on outer margin (pile on head and thorax golden, antennal joints 1 and 2, legs except basal portions ferruginous red, wings purplish dark brown), length 15–22 mm. Africa, India, Sumatra, Java, Amboina, Malay peninsula, Guam, Mariana, Micronesia, Philippines, Formosa, China and Ryukyus

***Liris* (*Liris*) *aurulenta* (Fabricius, 1787)**

– Mandible with a distinct notch on outer margin 4

4 Pronotum, at least in middle, raised high, reaching near level of mesonotum, (radial cell of fore wing with apex obliquely truncate or obliquely rounded) 5

– Pronotum depressed much below level of mesonotum 13

5 Pronotum nearly transverse, evenly high (mandible without teeth on inner margin, pygidial area polished, with sparse punctures, without apical bristle, tarsal claws unarmed, radial cell of fore wing with apex obliquely rounded, at least on antero-apical corner rounded) ..... **genus *Larra* Fabricius, 1793** ... 6

– Pronotum medianly raised and inclined towards sides, with middle more or less wedged into mesonotum (radial cell with apex obliquely truncate) 10

6 Basal half of abdomen red (IOD on vertex greater in length than antennal joints 2+3, joint 2 pilose, 4 about 2/3 the length of 3, front tibia strongly spined, mandible mostly red, sometimes reddish black), length 13–18 mm. Japan (Honshu, Shikoku, Kyushu, Ryukyus), Formosa, Philippines and Thailand

***Larra amplipennis* (Smith, 1873)**

– Abdomen wholly black (IOD less than as long as antennal joints 2+3, joints 2 glabrous, polished, front tibia without spines on outer margin) 7

7 Legs wholly black, at most front tibia somewhat brownish 8

– At least hind femur red 9

8 Disc of propodeum transversely more or less sinuate in cross section (Fig 14), with medial carina, pygidial area sparsely punctured (antennal joint 3 slightly longer than 2, joint 10 about 1.5 times as long as wide at apex) length 10–18 mm. Japan wholly, Korea,

Formosa, Philippines, Singapore, Sumatra and India

***Larra carbonaria* (Smith, 1858)**

– Disc of propodeum transversely rounded (Fig. 17), without medial carina, pygidial area closely punctured, sometimes partly confluent (antennal joint 3 distinctly longer than 2, joint 10 about twice as long as wide at abex), length 12–16 mm. Formosa

***Larra fenchihuensis* sp. nov.**

9 Mid and hind femora and tibiae red (front femur and tibia partly reddish, mandible partly red), length 13–16 mm. Borneo and Formosa

***Larra polita* (Smith, 1858)**

– Mid and hind legs except hind femora black (front leg almost wholly black, mandible mostly red), length 13–16 mm. Ryukyus, Formosa, Philippines, Borneo, artificially in Hawaii ***Larra luzonensis* Rohwer, 1919**

10 Pygidial area bare, polished, pronotum comparativly thick, not transversely carinate on top, with middle roundly produced into mesonotum (pygidial area with apical bristles, mandible with two teeth on inner mergin toward middle, IOD on vertex slightly longer than antennal joint 3, clypeus broadly rounded out anteriorly, with wide polished bevel (Fig. 30), head and thorax very minutely coriaceous, body wholly black, mandible broadly reddish), length 10–12 mm. Formosa and Philippines

***Liris* (*Cratolarra*) *pitamawa* (Rohwer, 1919)**

– Pygidial area not bare, nor polished, pronotum transversely carinate on top 11

11 Tarsal claws armed with a tooth near base, mandible without teeth on inner margin (pygidial area dull, finely closely punctured, with hairs short and fine, apparently glabrous, IOD on vertex subequal to antnnal joint 4, slightly longer than 3, 3 incrassate on apical portion, about 2.3 times as long as wide at apex, rhinaria on antennal joints 6–10, punctures on mesonotum very fine and very close, disc of propodeum transversely, rather coarsely rugoso-striate, wholly black), length 12–13 mm. Formosa (and Philippines)

***Motes larroides taiwanus* subsp. nov.**

– Tarsal claws unarmed, mandible with two teeth on inner margin (pygidial area covered with short stiff hairs. rhinaria on antennal joints 6–12, punctures on mesonotum comparatively coarse, deep, well outlined, subreticulate, disc of propodeum mostly rugoso-reticulate) 12

12 Abdomen with 4 silvery pile bands, head and thorex densely covered with silvery or whitish pubescence (hairs on lower frons and clypeus thick, completely concealing ground surface, punctures on mesopleuron finer, weaker and sparser than on mesonotum, rhinaria much larger than in following species), length 7.0–8.5 mm. Formosa

***Liris* (*Nigliris*) *albopilosa* sp. nov.**

– Abdomen with 3 silvery pile bands, head and thorax not so densely covered with comparatively long pubescence (hairs on the said portions much finer, with ground surface well visible, punctures on mesopleuron as strong and as large as on mesonotum, rhinaria smaller, on any joint not occupying whole the length), length 6–12 mm. Japan (except Hokkaido), Korea, China, Formosa, Philippines, widely Pacific Islands, Australia, Souteast Asia, North Africa and South Europe.

***Liris* (*Nigliris*) *japonica* (Kohl, 1883)**

13 Head and thorax closely covered with golden or brassy pudescence, punctures on clypeal bevel extended almost to the anterior margin, fairly close, wings strongly yellowish 14

– Head and thorax with appressed silvery pile 15

14 Large species, 16–21 mm, pubescence on head and thorax dense, deep golden, hairs on pygidial area dark brown (IOD on vertex slightly shorter than antennal joint 3, disc of propodeum transversely coarsely rugoso-striate and reticulate, rhinaria on antennal joints 6–11, on 6 very small, clypeus broadly rounded out anteriorly with a small incision in midde, body and legs black, tegulae semitransparent brown), India, Formosa and Ryukyus

***Liris* (*Dociliris*) *deplanata binghami* Tsuneki, 1967**

– Madium-sized species, 11–16 mm, pubescence on head and thorax not so dense, rather pale yellow, on propodeum much longer and tends to recumbent laterally, hairs on pygidial area golden (IOD on vertex longer than antennal joint 3, disc of propodeum transversely closely, rather weakly and irregularly striate, mixed with granulae, sides almost smooth, with very weak oblique striae, abscissae of radial vein: $4 > 1 > 3 > 2 > 5$), India, Burma, China, Philippines, Formosa

***Liris* (*Dociliris*) *laboriosa* (Smith, 1856)**

15 All tibiae and tarsi red (hind femur wholly, mandible largely red, antennal joint 3 shorter than IOD on vertex, rhinaria on joints 6–11, propodeum transversely coarsely rogoso-striate, with distinct medial carina, radial cell of fore wing very slightly obliquely truncate at abex, abdomen with 3 silvery pile bands), length about 12 mm. Formosa and Philippines

***Liris* (*Dociliris*) *larriformis* (Wil.iams. 1928)**

– All tibiae and tarsi black 16

16 IDO on vertex less than as long as antennal joint 3, lateral carinae on posterior aspect of propodeum complete, extending further forwards, wings more or less darkened, pile on body fine and sparse, less conspicuous, especially with abdominal band 17

– IOD on vertex as long as antennal joint 3, lateral carinae on posterior aspect of propodeum usually lacking, at most intermittently defined, wings much less darkened, silvery appressed pile on body distinct and marked (bevel of clypeus broad, polished, with no or very sparse punctures) 18

17 Large deep-black species, 17–20 mm, wings strongly clouded, with purplish shimmer, (3 bands of sparse brownish pile on abdomen very narrow, very inconspicuous, apparently lacking, pygidial hairs chestnut brown, bevel of clypeus broad, polished, very sparsely punctured, disc of propodeum transversely rugoso-striate, in some light irregularly, not strongly reticulate, posterior aspact dull, transversely coarsely rugoso-striate, rhinaria of antennal joints usually on 7–11, locating before middle. Formosa and Ryukyus

***Liris* (*Dociliris*) *surusumi* Tsuneki, 1966**

– Medium-sized species, 11–15 mm, less black due to more marked pile, wings not so strongly clouded (3 bands on abdomen in some light fairly well-defined, pygidial hairs brownish black, seen obliquely from above pale yellow or brassy, bevel of clypeus broadly sparsely punctured except apical margin, disc of propodeum weakly transversely, somewhat arcuately rugoso-striate, intervals more weakly finely wrinkled, posterior aspect more glossy, sometimes even shining, with coarse transverse striae on lateral areas, rhinaria of antennal joints usually on 7–11, a small elliptic flattened impression towards middle of each joint). Ryukyus, Formosa and Philippines

***Liris* (*Dociliris*) *rohweri* (Williams, 1928)**

18 Hind femora red (medio-anterior region of mosonotum distinctly impressed, wings usually faintly yellowish, with apical margin clouded, pygidial area at base transversely bare, rest covered with short brassy bristles, with 6–7 apical spines), length 12–15 mm.

India, Ceylon, Sumatra, Thailand, Malay Prom., Borneo, Hongkong, Philippines, Formosa, Ryukyus up to Okinawa

***Liris* (*Dociliris*) *subtessellata* (Smith, 1856)**

– Hind femora black (medio-anterior impression on mesonotum very weak, wings usually more markedly yellowish, pygidial area similar, soulpture on disc of propodeum quite variable), length 12–16 mm. The Philippines, Formosa and Japan (excluding Hokkaido) (Hawaii, introduced)

***Liris* (*Dociliris*) *docilis* (Smith, 1873)**

19 Postocelli hooked at upper end and lengthened below along inner orbit, pygidial area covered with pile and bristles ..... **genus *Tachytes* Panzer, 1806** 20

– Postocelli obliquely slightly elongated and flattened, with a trace of hooked structure, pygidial area bare ..... **genus *Tachysphex* Kohl, 1883** 26

20 IOD on vertex distinctly shorter than antennal joint 3 (about 4 : 5), (pile on frons and clypeus suffused golden, abdomen with 4 pile bands, LV ≒ IOD, antennal joint 3 about 2.5 times as long as wide at apex), length 16–19 mm. Formosa

***Tachytes formosanus* Tsuneki, 1966**

– IOD on vertex subequal to, or longer than, antennal joint 3 21

21 IOD on vertex nearly equal to antennal joint 3 (abdomen usually with 2 silvery pile bands, LV≒IOD, wings strongly yellowish) 22

– IOD on vertex more or less longer than antennal joint 3 (abdomen usually with 4 pile bands defined, IOD > LV) 23

22 All legs black, covered with golden hairs (antennal joint 3 about 2.7 times as long as wide at apex, impressed area on disc of propodeum smooth, without striae, but without lustre), length 16–25 mm. India, China, Korea and Japan (except Hokkaido)

〔*Tachytes sinensis sinensis* Smith, 1856〕

– All legs with apex of femora, whole tibiae and tarsi ferruginous (other characters agree with those of *sinensis* s. str.), length 16–19 mm. India, Formosa and Ryukyus

***Tachytes sinensis fundatus* Rohwer, 1911** (conj. nov.)

23 IOD on vertex only slightly greater in length than antennal joint 3 (pile on body silvery, abdominal pile bands pale brassy, pygidium with coppery bristles, disc of propodeum slightly shorter than scutellum, medianly with distinct impressed line, apical area smooth and polished, wings hyaline), length 11–13 mm. Japan and Formosa

***Tachytes fruticis* Tsuneki, 1964**

– IOD on vertex distinctly longer than antennal joint 3 24

24 Hairs on body silvery with a faint brassy lustre (antennal joint 3 approximately 3/5 the length of IOD and only twice as long as wide at apex, impressed area on propodeum transversely striate), length about 12 mm. Formosa

***Tachytes hengchunensis* sp. nov.**

– Hairs on body golden 25

25 Legs from apex of femora below ferruginous red (pile on head and thorax more or less brassy, antennal joint 3 approximately 2.5 times as long as wide at apex), length 11–15 mm. India, Burma, China, Formosa, Korea, Japan (excluding Hokkaido and Ryukyus)

***Tachytes modestus* Smith, 1856**

– Legs wholly black (hairs on head and thorax deep golden, antennal joint 3 approximately thrice as long as wide at apex), length 15–18 mm. Formosa

***Tachytes shirozui* Tsuneki, 1966**

26 Clypeus: Fig. 157, IOD on vertex longer than antennal joints 2+3, sometimes subequal and more than 1/3 as long as IOD at base of mandibles, inner orbits roundly convergent upwards, pygidial area elongate triangular, about 1.5 times as long as wide at base, surface transversely rounded (abdomen with 3 slivery pile bands, mesonotum subreticulate, with intervals shining), length 7–9 mm. Japan (incl. Hokkaido and Ryukyus), Formosa, Philippines, Palaus, Marianas, Hawaii, Thailand and India

***Tachysphex bengalensis* Cameron, 1889**

– Clypeus: Fig. 190, IOD on vertex nearly as long as antennal joints 2+3 and approximately 1/3 as long as that at base of mandibles, inner orbits on lower portion parallel, then roundly convergent upwards, pygidial area in broader triangle, at base gently roundly raised and on apical portion gently roundly impressed, with sparse large punctures scattered (pile on frons and clypeus silvery, abdmen with 3 pile bands less remarkable, mesonotum with punctures somewhat sparser, intervals minutely coriaceous), length about 9 mm. Formosa

***Tachysphex changi* sp. nov.**

27 With one cubital cell (frons and clypeus modified into a beak-like process), length about 3 mm. Philippines and Formosa

***Tenila domestica* (Williams, 1928)**

– With 3 cubital cells (frons and clyeus normal) 28

28 Abdomen with basal two segment red (other characters as in *L. taiwana*, see below), length 9–11 mm. India, Celebes, Philippines [*Lyroda formosa* (Smith, 1858)]

– Abdomen wholly black 29

29 Abdominal segments 1–4 with silvehy pile bands (propodeum coarsely reticulate, pile on body silvery), length 7–8 mm. India, ? Philippines

[*Lyroda venusta* Bingham, 1897]

– Abdominal segments 1–3 with silvery pile bands 30

30 Clypeus (Fig. 199) on anterior margin with an intermediate tooth or rounded protuberance between medial and lateral groups of teeth, disc of propodeum without lateral carinae (pilosity silvery, sometimes faintly brassy, mandibles largely reddish,), length 7.5–9.5 mm. Formosa

***Lyroda taiwana* sp. nov.**

– Clypeus (Fig. 210) on anterior margin without intermediate tooth between medial and lateral groups of teeth, disc of propodeum with lateral carinae 31

31 Pilosity on frons and clypeus golden, longer and thicker than in the following subspecies (in radial vein of fore wing abscissa 5 always longer than 2), length 10–12 mm. Japan (Honshu and Kyushu) and Korea [*Lyroda japonica japonica* Iwata, 1933]

– Pilosity on frons and clypeus silvery, shorter and finer (abscissa 5 shorter than, rarely equal to, abscissa 2), length 8.7–11.5 mm. Formosa

***Lyroda japonica takasago*, sp. nov.**

♂ ♂

1 Posterior ocelli reduced, not round, more or less distorted 2

– Posterior ocelli complete and round 27

2 Upper frons along inner orbits raised into obtuse redges, ocellar region and upper frons uneven, having swellings, furrows and imprssions 3

– Upper frons and vertex gently regulariy inclined, ocellar region only more or less raised, without inner orbtal ridges (mandibles with a notch on outer margin) 19

3 Mandible without notch on outer margin (Head and thorax with dense golden pile, antnnal joint 1 and legs except basal portion ferruginous, wings purplish dark brown, IOD nearly as long as antennal joints 2+3, pygidial area covered with coppery golden bristles, 8th sternite deeply roundly emarginate at apex), length 10–20 mm. From the Ryukyus through Formosa, Philippines, China, Indo-China, Java, Snmatra, India as far westwards as Africa

***Liris* (*Liris*) *aurulenta* (Fabricius, 1787)**

– Mandible with a notch on outer margin 4

4 Mandible without teeth on inner margin, at most very weakly incised toward middle ... 5

– Mandible with one or two teeth on inner margin 10

5 Rhinaria on antennal joint 5 only, in an elliptic flattened impression, pronotum seen vertically from above bluntly wedged into mesonotum, carina on top with some thickness (pygidial area only on apical portion weakly bordered on both sides with carinae, surface finely coriaceous and transversely gently rounded, with sparse fine pile, IOD on vertex longer than antennal joints 2+3, clypeus: Fig. 25, propodeum medianly strongly carinate and transversely coarsely striate, mandible largely red, 3 abdominal pile bands), length about 9 mm. Formosa (and Philippines)

***Motes larroides taiwanus* subsp. nov.**

– Rhinaria on antennal joints 4–13, bare impressed areas, occupying 1/3–1/2 of each joint, pronotum seen vertically from above nearly transverse, with carina on top rather acute (punctures on frons sparse, with intervals at least as wide as points, wings fairly strongly darkened in general) ..... **genus *Larra*** 6

6 Basal half of abdomen red (IOD on vertex slightly longer than antennal joint 2+3+4, joint 10 only slightly longer than wide, pygidial area flattened but without bordering carinae, 8th sternite with apex narrow and roundly incised), length 12–16 mm. Japan (except Hokkaido), Formosa, Philippines and Thailand

***Larra amplipennis* (Smith, 1873)**

– Abdomen wholly black 7

7 Whole legs black 8

– At least hind femora red (antennal joint 3 strongly widened toward apex even in dorsal view, less than twice as long as wide at apex, joint 10 apically narrowed) 9

8 Disc of propodeum transversely rounded, without medial carina, sides simply punctured (antennal joint 3 about twice as long as wide at apex, joint 10 also twice so, IOD on vertex less than as long as antennal joints 2+3, clypeus with punctured area reaching near apical margin), length 10–13 mm. Formosa

***Larra fenchihuensis* sp. nov.**

– Disc of propodeum transversely more or less sinuate, with medial carina, sides more or less obliquely striate (Antennal joint 3 subcylindric, slightly widened apically, approximately 1.7 times as long as wide at apex in dorsal view, joint 10 cylindric, about 1.2 times as long as wide, IOD on vertex approximately as long as antennal joints 2+3, disc of propodeum transversely somewhat sinuately, rather coarsely rugoso-striate, with intervals punctured, pygidial area distinctly bordered by carinae, apex truncate), length 7–15 mm. Japan (incl. Hokkaido and Ryukyus), Korea, Formosa, Philippines to India

***Larra carbonaria* (Smith, 1858)**

9 Hind femora only red, rest of mid and hind legs black (IOD on vertex approximately as long as antennal joints 3+4, joint 10 in dorsal view about 1.5 times as long as wide

at base, clypeus: Fig. 20, disc of propodeum with median carina distinct, transversely somewhat sinuately rugoso-striate, pygidial area bordered by carinae, with apex feebly emarginate), length 9–14 mm. Ryukyus, Formosa, Philippines, Borneo, artificially in Hawaii

***Larra luzonensis* Rohwer, 1919**

– Femora and tibiae of mid and hind legs red (front femora and tibiae also broadly reddish, IOD on vertex slightly less than antennal joints 3+4, joint 10 about 1.3 times as long as wide at base, others much the same), length 8–13 mm. Formosa and Borneo

***Larra polita* (Smith, 1858)**

10 Pubescence on frons and clypeus golden, at least with brassy lustre 11

– Pubescence on frons and clypeus silvery 13

11 Four broad silvery pile bands on abdomen, wings yellowish, apically clouded, punctures on vertex very fine and dense, on mesonotum and mesopleuron microscopically coriaceous (clypeus: Fig. 67, IOD on vertex as long as antennal joints 2+3, joint 3 about 1.7 times as long as broad at apex in narrowest view, propodeum with a very weak medial carina on basal half, weakly transversely striate, intervals finely reticulate, disc bordered at apex by a strong transverse carina, latero-posterior corners and sides of posterior aspect transversely strongly coarsely carinate, sides of the segment almost smooth, 8th sternite with apex widely rounded and medianly minutely roundly incised, front femur beneath broadly flattened, slightly hollowed out, with long appressed silvery (somewht brassy) pile; golden (rarely pale brassy) pile on head dense, appressed, on mesonotum as in many *Tachytes* species (e. g. *T. modestus*). on dorsal and posterior aspects of propodeum long and close, abscissae of radial vein: $4 > 1 > 3 > 2 \geqq 5$), length 10–12 mm. Formosa, Philippines, Burma, India and China (not in Japan and doubtful in Ryukyus)

***Liris* (*Dociliris*) *laboriosa* (Smith, 1856)**

– Three pile bands on abdomen, wings strongly darkened, punctures on vertex and mesonotum comparatively coarse, distinct and close, at least on subalar epimeral area of mesopleuron coarsely rugoso-reticulate 12

12 Pile on frons and clypeus deep golden, clypeus: Fig. 44, rhinaria on antennal joints with surface smooth (mesopleuron including epimeral area somewhat coarsely rugoso-reticulate, sculpture even throughout, lateral margins of dorsal and posterior aspects of propodeum bordered with zigzag carinae, always more or less intermittent, oblique striae on sides of the segment stronger on dorsal half or on central area, weaker sometimes obsolete on ventral portion; IOD on vertex less than as long as antennal joints 2+3, front femur: Fig. 48, pubescence beneath long, erected and golden), length 9–13 mm. Ryukyus, Formosa and India

***Liris* (*Dociliris*) *deplanata binghami* Tsuneki, 1967**

– Pile on frons and clypeus pale yellow, clypeus: Fig. 58, surface of rhinaria with pointed granules rather sparsely scattered, mesopleuron with epimeral area coarsely irregularly rugoso-reticulate, rest of the area somewhat rugosely punctured, dorsal and posterior aspects of propodeum bordered with zigzag carinae, partly weak but not interrupted, oblique striae on sidis even, fine and moderately close, IOD on vertex as in *deplanata*, front femur: Figs. 60–61, with whitish pubescence), length 11.5 mm. Ryukyus and Formosa

***Liris* (*Dociliris*) *surusumi* Tsuneki, 1966**
(=*Liris* (*Dociliris*) *shirozui* Tsuneki, 1966)

13 Pronotum thick, not transversely carinate on top (pronotum in middle raised near level

of mesonotum, IOD on vertex as long as antennal joints 3+4, 3 less than twice as long as broad at apex, joint 10 slightly less than twice as long as wide at apex, clypeus: Fig. 32, punctuation on head and thorax as in *Liris subtessellata*, minute and close, disc of propodeum medio-anteriorly with irregular longitudinal rugae, remaining portions transversely finely closely and very weakly rugoso-striate, front femur almost normal, very weakly flattened beneath near base, hind femur normal, wholly black), length 7–9 mm. Formosa and Philippines ***Liris* (*Cratolarra*) *pitamawa* (Rohwer, 1919)**

– Pronotum compressed in front, flattened anteriorly, with top transversely ridged 14

14 All tibiae and tarsi red (hind femur and greater part of mandible red, clypeus with bevel polished, nearly truncate at apex, without medial incision, 8th sternite lightly bilobate at apex), length 7–8 mm. Formosa and Philippines

***Liris* (*Dociliris*) *larriformis* (Williams, 1928)**

– All tibiae and tarsi black 15

15 Pronotum in middle raised near level of mesonotum, punctures on mesonotum comparatively coarse, with intervals distinct, radial cell of fore wing with apex more of less obliquely truncate (body and legs black) 16

– Pronotum depressed much below level of mesonotum, punctures on mesonotum very minute and close, radial cell truncate at apex 17

16 Clypeus on anterior margin with medial tooth (Fig. 109), silver hairs on frons, clypeus, temples and thorax thick, dense and long, IOD on vertex nearly as long as antennl joints 3+4, apical vein of radial cell slightly oblique, length 5–7 mm. Formosa

***Liris* (*Nigliris*) *albopilosa* sp, nov.**

– Clypeus on medial lobe roundly produced anteriorly, silver hairs on the said areas not so thick, dense nor long, IOD on vertex distinctly less than as long as antennal joints 3+4, apical vein of radial cell markedly oblique, length 5–10 mm. Japan (except Hokkaido), Korea, China, Formosa, Philippines, widely Pacific Islands, Australia, Southeast Asia, N. Africa and S. Europe ***Liris* (*Nigliris*) *japonica* (Kohl, 1883)**

17 IOD on vertex distinctly less than as long as antennal joints 2+3, pubescence beneath front femur long, erected, wings fairly strongly darkened, latral carinae on dorsal and posterior aspects of propodeum complete and thorough (wholly black, antennal joints 3 and 10 in narrowest view both twice as long as wide at apex, hairs on thorax-complex finer, sparser, thus the surface appearing deep black, mesonotum finely somewhat sparsely punctured, intervals more minutely coriaceous, disc of propodeum medianly longitudinally broadly impressed and in part with medial carina, surface transversely weakly comparatively coarsely striate, not glossy, clypeus: Fig. 76, front femur: Fig. 78), length 8–13 mm. Formosa, Ryukyus and Philippines

***Liris* (*Dociliris*) *rohweri* (Williams, 1928)**

– IOD on vertex as long as antennal joints 2+3, pubescence beneath front femur short, appressed, wings hyaline, slightly darkened or yellowish, apically darker, lateral carinae on propodeum incomplete or lacking (front and hind femora broadly excavated beneath, thorax less blackish due to pile,) 18

18 Hind femora red, 4 silvery pile bands on abdomen (medio-anterior area of mesonotum somewhat impressed, lateral margins of posterior aspect of propodeum more steeply (straightly) convergent apically), length 7–12 mm. From India, through Southeast Asia, China, Philippines, Formosa up to Okinawa

***Liris* (*Dociliris*) *subtessellata* (Smith, 1856)**

– Hind femora black, 3 silvery pile bands on abdomen (medio-anterior area of mesonotum almost unimpressed, lateral margins of posterior aspect of propodeum roundly convergent posteriorly), length 7–12 mm. Japan (except Hokkaido), Formosa, Philippines, Hawaii (introduced)

***Liris* (*Dociliris*) *docilis* (Smith, 1873)**

19 Posterior ocelli hooked at upper end and lengthened below along inner orbits, pygidial area covered with hairs and bristles ..... **genus *Tachytes*** 20

– Posterior ocelli obliquely slightly elongate and flattened, with a trace of hook structure, pygidial area bare ..... **genus *Tachysphex*** 26

20 IOD on vertex distinctly less than as long as antennal joint 3 21

– IOD on vertex equal to or longer than antennal joint 3 23

21 Four complete pile bands on abdomen, mandible reddish near apex, clypeus on anterior margin broadly rounded, antennal joint 12 much less than twice as long as broad at apex (penis valve: Fig. 140, legs all black), length 15–18 mm. Formosa

***Tachytes formosanus* Tsuneki, 1966**

– Two or three incomplete pile bands on abdomen, mandible reddish toward middle, clypeus on anterior margin nearly truncate and with a more or less wide protuberance in middle, antennal joint 12 approximately twice as long as broad at apex (penis valve: Fig. 124) 22

22 All legs from apex of femora below ferruginous (medial protuberance on anterior margin of clypeus nearly lunate, medial impressed line on disc of propodeum rather weak), length 15–17 mm. Formosa, Ryukyus and India

***Tachytes sinensis fundatus* Rohwer, 1911**

– All legs black (medial protuberance on clypeal margin transverse, with apex gently emarginate, medial impressed line on disc of propodeum distinct), length 17–18 mm. India, China, Korea and Japan (except Hokkaido and Ryukyus)

[*Tachytes sinensis sinensis* Smith, 1856]

23 IOD on vertex about equal in length to antennal joint 3, which is 2.5 times as long as broad at apex 24

– IOD on vertex distinctly longer than antennal joint 3, which is at most twice as long as broad at apex 25

24 Haris on head and thorax golden (antennal joint 10 less than twice as long as wide at apex, disc of propodeum finely granulate-reticulate, with median impressed line indistinct and smooth area transversely striolate on apical portion, wings flavescent), length 13–17 mm. Formosa

***Tachytes shirozui* Tsuneki, 1966**

– Hairs on frons and clypeus golden, on vertex and thorax-complex silvery to grayish white (antennal joint 10 about 2.3 times as long as wide at apex, disc of propodeum rather coarsely punctate-reticulate, with median line distinctly impressed, with smooth area apically longitudinally striolate, wings clear hyaline), length 10–12 mm. Formosa, Korea and Japan (Honshu and Kyushu)

***Tachytes fruticis* Tsuneki, 1964**

25 Hairs on head and thorax golden—brassy, legs from apex of femora below ferruginous, wings flavescent (anterior margin of clypeus usually incised in middle, antennal joint 10 about 2.3 times as long as wide at apex, disc of propodeum finely granulate, smooth area without striae, polished), length 12–14 mm. India, Burma, China, Formosa, Korea and

Japan (Honshu, Kyushu and Shikoku) ***Tachytes modestus* Smith, 1856**

– Hairs on frons and clypeus pale brassy, on thorax-complex silvery to greyish white (anterior margin of clypeus broadly roundly produced, entire, antennal joint 10 less than twice as long as wide at apex, disc of propodeum in the main finely closely transversely rugoso-striate, smooth area also transversely striolate), length 8.5–10 mm. Formosa ***Tachytes hengchunensis* sp. nov.**

26 Pile on frons and clypeus silvery, clypeus: Fig. 165, IOD on vertex usually subequal to antennal joints 2+3+4, but sometimes slightly shorter, on mesonotum interspaces between punctures polished (mandible reddish except base and apically slightly darkened, propodeum strongly hairy, its posterior aspect without lateral carinae), length 5–8 mm. Japan (incl. Hokkaido and Ryukyus), Formosa, Philippines, Palau, Marianas, Hawaii, Thailand and India ***Tachysphex bengalensis* Cameron, 1889**

– Pile on frons and clypeus golden, clypeus: Fig. 191, IOD on vertex subequal to antennal joints 2+3, on mesonotum interspaces between punctures minutely coriaceous (mandible reddish toward middle, propodeum sparsely pubescent, its posterior aspect with fine lateral carinae, 3 pile bands on abdomn less distinct), length 8 mm. Formosa ***Tachysphex changi* sp. nov.**

27 With one cubital cell (frons and clypeus modified into a beak-like process), length about 3 mm. Philippines and Formosa ***Tenila domestica* (Williams 1928)**

– With 3 cubital cells (frons and clypeus normal) 28

28 Abdomen with basal two segments red (other characters as in *Lyroda taiwana*), length 8–10 mm. India, Celebes, Philippines 〔*Lyroda formosa* (Smith, 1859)〕

– Abdomen wholly black 29

29 Four pile bands on abdomen, length 6–7 mm. India, Philippines (?) 〔*Lyroda venusta* Bingham, 1897〕

– Three pile bands on abdomen 30

30 Clypeus with anterior margin of medial lobe wider than lateral margin, roundly emarginate and with median appendage (Fig. 201), apical margin of the appendage lying in a line with antero-lateral pointed corners of the medial lobe (other characters as in ♀), length about 7–8 mm. Formosa ***Lyroda taiwana* sp. nov.**

– Clypeus with anterior margin of medial lobe equal in length to lateral margin or narrower, truncate and its medial appendage distinctly produced anteriorly (Fig. 211) 31

31 Propodeum always with a distinct medial carina, attaining to the apex of disc, apex bordered by a transverse carina to a certain extent, length 7–8 mm. Japan *Lyroda japonica japonica* Iwata, 1933

– Propodeum usually with the medial carina indistinct, if defined, not reaching apex, apex usually without transverse carina, at most with a short weak one, length 7–8 mm. Formosa ***Lyroda japonica takasago* subsp. nov.**

DESGRIPTIONS AND RECORDS OF THE SPECIES

1. Genus *Larra* Fabricius, 1793

The genus *Larra* in Formosa can be divided into two groups, i.e. group *amplipennis* and group *carbonaria*:

Group *amplipennis*. On dorsal aspect of head inner orbits subparallel, with IOD markedly wide (more than half as great as IOD at base of clypeus in ♀, only slightly less than as great as

that in ♂), abdomen in part red, in ♀ front tibiae armed with some spines and 2nd antennal joints pilose.

Group *carbonaria*. On dorsal aspect of head inner orbits sinuately convergent posteriorly, with IOD much narrower (less than half that at base of clypeus in ♀, about 1/2 in ♂), abdomen wholly black, in ♀ front tibia unarmed and 2nd antennal joint glabrous and polished.

Two species of the genus *Larra* have been on record from Formosa, each basing on a single male specimen, namely, *L. sparsa* Rohwer (1911) and *L. carbonaria* Sm. (Tsuneki, 1966). The first species is, however, considered a synonym of the second and, therefore, the species of the genus recorded from Formosa is in reality but a single. During the course of the journey we could collect 54 ♀♀ 168 ♂♂ of the genus, including 5 species, of which 3 have been presumed to occur on this Island, but the discovery of a new species and of the existence of *L. polita* Sm. is quite unexpected results. Further, this species presents us some interesting problems regarding distribution and taxonomy.

1. *Larra amplipennis* (Smith, 1873)

? *Larrada simillima* Smith, Cat. Hym. Brit. Mus., IV: 275, 1856; *Larra simillima*: Bingham, Faun. Brit. Ind., Hym. I: 199, 1897. (India).
Larrada amplipennis Smith, Trans. Ent. Soc. Lond., 1873, Pt. 2: 193, 1873. (Japan).
Larra sanguinea Williams, Bull. Exp. Sta. Hawaii, S. P. A., Ent. Ser., 19: 40, 67, 1928. (Philippines).
Larra sanguinea aeripilosa Tsuneki, Etizenia, 4: 8, 1963. (Thailand).
Larra amplipennis: Tsuneki, Life Study (Fukui), 6 (1): 4, 1962 (Ryukyus); Kontyu, 32: 221, 1964 (Japan, Ryukyus); Life Study, 8 (4): 62, 1964. (Japan).
Larra amplipennis sanguinea: Tsuneki, Etizenia, 17: 8, 1966. (Ryukyus).
Larra sanguinea: Baltrzar, Cat. Philip. Hym. (Pac. Ins. Monogr., 8): 330, 1966.
(*Larra amplipennis*: Matsumura, 1911, p. 121; 1930, p. 22; Yano, 1932, p. 277; 1950, p. 1477; Yasumatsu, 1939, p. 374; Iwata, 1963, p. 115; Iwata et Tanihata, 1963, p. 101.)

Specimens examined: 3 ♀♀ 14 ♂♂. 1 ♀ 2 ♂♂, Chiayi Pref. (Chuchi, 22. VII.); 1 ♀, Pintung Pref. (Hengchun, 2. VIII.); 1 ♀ 12 ♂♂, Ilan Pref. (Tsukeng, 20–21. VIII).

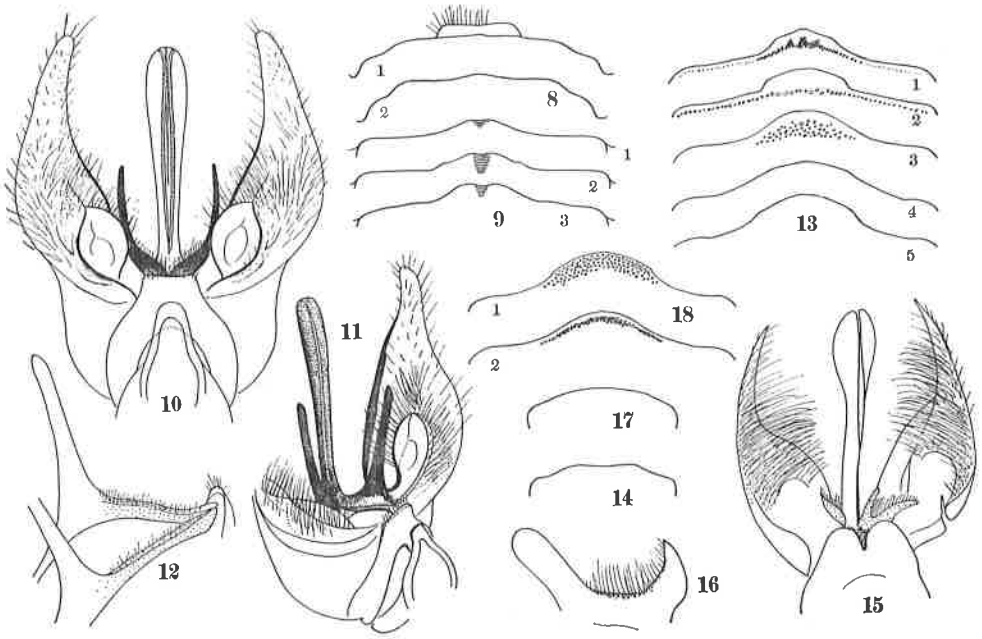
Remarks. Special attention was paid relating to the geographic variation and the synonymic relation of the species:

(1) *Geographic variation*. First, comparison was made between populations of Formosa and Japan. (1) Colour of wings. Generally quite similar (♀♂). (2) Sculpture on disc of propodeum (♀♂). Medial carina is weak or lacking in the majority of specimens of Formosa, while the Japanese specimens mostly provided with the carina fairly marked. But the range of the overlapping is not necessarily narrow, especially in males. Transverse striae is generally weaker in the Formosan specimens. (3) The length relation between IOD on vertex, antennal joints 2+3+4 and joint 3. As given in Table 2 there is no difference in females, but a slight difference in males. Such a slight difference, however, can not be catched with

Table 2. Measurements of the related parts of head (*Larra amplipennis* Smith).

Specimen sex		Antennal joint 3	Antennal joints 3+4+5	IOD on vertex
F. ♀.		24	52	42
		19	47	39
		19	47	38
	Av.	20.7	48.7	39.7
	Rat.	52	123	100
J. ♀.		22	54	44
		20	42	39
		25	60	53
		24	57	47
		26	56	41
	Av.	23.2	53.8	44.8
	Rat.	52	120	100
F. ♂.		15	38	39
		18	40	45
		17	39	44
		16	39	42
		17	39	43
	Av.	16.6	39.0	42.6
	Rat.	39	91	100
J. ♀.		18	42	48
		18	42	49
		17	41	47
	Av.	17.7	41.7	48.0
	Rat.	37	87	100

Remarks. F., Formosan. J., Japanese. Av., Average. Rat., Ratio.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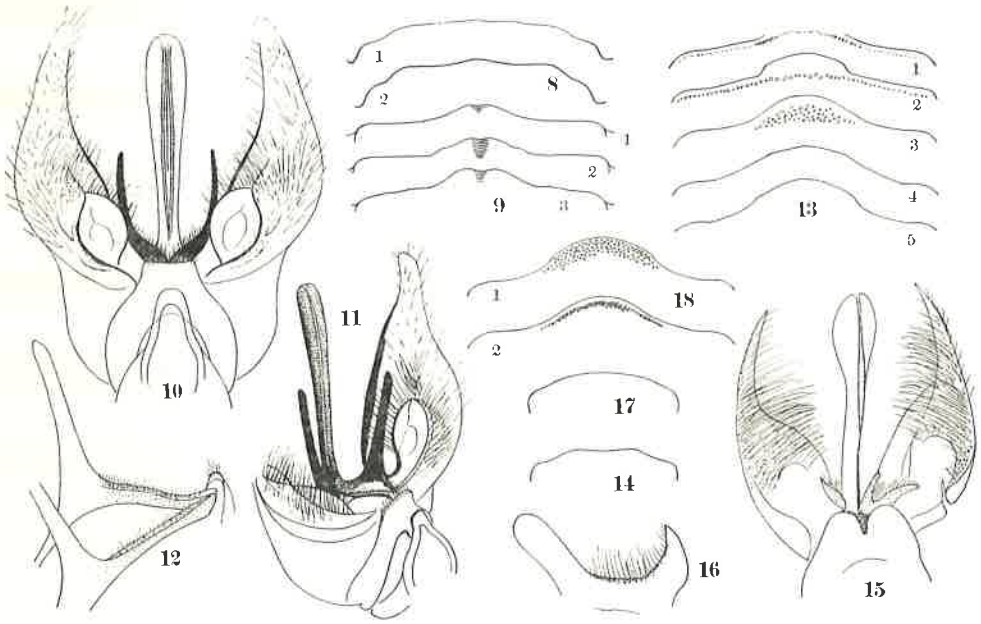
naked eyes, hence practically insignificant. (4) Medial protuberance on anterior margin of clypeus (♂). As compared with the total width of the anterior margin it is slightly narrower in the Formosan specimens, but there is a fair degree of variation (Fig. 9).

Comparison with the specimen from Iriomote Is. formerly recorded by me as *L. amplipennis sanguinea*. The Formosan specimens much darker in wing coloration, but they are consistent in the relative width of the clypeal protuberance and in the sculpture of propodeum.

As a general conclusion we can say that as far as the description of the Philippine specimens goes the Iriomote specimen is closest to it and the Formosan population next to it and the Japanese population slightly remote from it; certainly they may represent respectively a geographic variation, but the overlapping between different tendencies is not always small and the differences themselves do not concern with any important characters, so that it seems to me not always necessary to divide them into different subspecies. But in reality it may be a matter of opinion, especially when the difference in the general body size is taken into consideration.

(2) *Relation to* ***L. simillima*** *Smith. L. amplipennis* may be a synonym of *L. simillima* (Smith, 1856) described from India and Africa. In his remarks to *simillima* Smith says "this species closely resembles *L. anathema*, from which it is distinguished by the colouring of the abdomen, by not having an impressed line on the vertex, or a longitudinal carina (on the disc of propodeum ?), and by the truncation of the metathorax being punctured, not transversely finely strigose". In the comparison with *L. anathema*, *amplipennis* well agrees in these characters to *simillima* (though posterior aspect of propodeum laterally punctate-striate). In the original description of *simillima* "the clypeus thinly clothed with aurichalceous pubescence" is the sole difference. In the Bingham's description the sculpture of propodeum is shown only by "the median segment



Figs. 8–18. Figs. 8–12 : *Larra amplipennis* (Smith). Figs. 13–16 : *Larra carbonaria* (Smith). Figs. 17–18: *Larra fenchihuensis* sp. nov.
8 (1 and 2), Clypeus (♀). 9 (1, 2 and 3), Clypeus (♂). 10, Genitalia (♂), ventral view. 11, Ditto, seen obliquely from apex. 12, Volsella, lateral view. 13 (1–6), Clypeus (♂), variation. 14, Dorsal portion of propodeum in cross section. 15, Genitalia (♂). 16, Volsella in lateral view. 17, Dorsal portion of propodeum in cross section. 18, Clypeus (♂).

... more coarsely punctured than the mesonotum". In *amplipennis* disc of propodeum medianly and laterally transversely striate and intervals between striae punctured, on intermediate area between the striated stripes alone simply punctured. In other respects the description well agrees with the charactes of *amplipennis*. Comparative affirmation must be done in future.

(3) *The male genital organ* (Figs. 10–12). In the external characters this species differs from the group of other closely related species in that the upward convergence of the inner-orbital lines is comparatively small, with the result of broad IOD on vertex (♀♂), abdomen widely coloured red (♀♂), the 2nd antennal joint in ♀ pilose, not polished and front tibiae in ♀ are strongly spined. Quite similarly, the male genital organs differ distictly from those of other species in that the penis valve not particularly enlarged on apical portion, volsella comparativly much longer and and the basal portion of paramere with a pouch-like excavation inside.

Bridge of parameres without medial incision on top, but with a fringe of sparse hairs. Volsella not yet differentiated, cuspis, a well chitinized slender elongation, black in colour, at base narrowly extended ventrally reaching near top of bridge, without any elevated appendage (namely, digitus) The extended portion (lamima volsellaris) ferruginous and sparsely covered with short hairs on its upper ridge (Fig. 12). Penis valve slightly enlarged toward apex, with the end rounded (Fig. 20), not spoon-shaped as in other Formosan species of the genus, and finely serrate along the medial line. Paramere strongly chitinized along the dorso-interior margin, the area deeply darkened, at base inside with a deep rounded excavation or a open pouch, surrounded by hair-bearing elevation. From the excavation upwrds the inside of the paramere fairly closely covered with long erect hairs, not transversely appressed as in other species.

2. *Larra carbonaria* (Smith, 1858)

Larrada carbonaria Smith, Jour. Proc. Linn. Soc., Zool., 2: 102, 1858 (♀, Singapore).
Larrada docilis Smith, Trans. Ent. Soc. Lond., 1873, p. 192 (♂, nec ♀, Japan).
Larrada Erebus Smith, Ibid., p. 193 (♀, Japan).
Larra carbonaria: Bingham, Faun. Brit. Ind., Hym., I: 198, 1897 (India).
? *Larra nana* Bingham, Faun. Brit. Ind., Hym., I: 200, 1897 (Tenasserim).
Larra sparsa Rohwer, Proc. U.S. Nat. Mus., 39 (1794): 483, 1911 (Formosa). (SYN. NOV.)
Larra carbonaria: Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 41, 67, 1928 (Philippines); also p. 100 (biol.).
Larra erebus: Yasumatsu, Ins. Jap. Ill. Icon., p. 374, 1933 (Japan).
? *Larra nana*: Yasumatsu, Trans. Sapporu Nat. Hist. Soc., 16 (2): 97, 1940 (Botel-Tobago Is.).
Larra carbonaria: Iwata, Trans. Shikoku Ent. Soc., 7 (4): 115, 1963 (biol.).
Larra carbonaria erebus: Tsuneki, Kontyu, 32: 221, 1964; Life Study (Fukui), 8 (4): 62, 1964.
Larra carbonaria: Baltazar, Pac. Ins. Monogr., 8: 330, 1966.
Larra carbonaria: Tsuneki, Etizenia, 17: 9, 1966 (Formosa and Ryukyus).
(*Larra* sp., Iwata, 1938, p. 10 (biol.); *Larra* sp., Okuno, 1961, p. 11 (biol.))

Specimens collected: 13 ♀♀ 26 ♂♂: 3 ♀♀ Nantou Pref. (Penpuchi, 26, 30. VIII); 7 ♀♀ 15 ♂♂, Chiayi Pref. (Chuchi, 20–22. VII;); 2 ♂♂ Pingtung Pref. (1 ♂, Fangliao, 31. VII; 1 ♂, Fengchun, 2. VIII.); 3 ♀♀ 9 ♂♂, Ilan Pref. (Tsukeng, 19–21. VIII).

Notes on some characters and variations (1) The form and punctuation of clypeus in ♂. More or less varied in form as given in Fig. 13; punctuation also varied, but the punctured area not reaching spical margin, surface usually dull. (2) The form and sculpture of propodeum (♂♀). Disc of propodeum not smoothly transversely rounded, but with three longitudinal impressed areas, in the cross section it may appear as given in Fig. 14, median carina always present, though varied in length, surface sculpture fairly varied, but usually somewhat coarsely transversely rugoso-striate, more or less sinuately so, sometimes basal portion reticulate, rugose-striae distinct on the three impressed areas and inditinct or weak on the two raised areas where sometimes simply punc-

tured, intervals between striae either punctured or finely irregularly reticulate; posterior aspect transversely striate or rugoso-striate, with narrow deep furrow in middle, always reaching apical end, sometimes more or less shallowed on apical portion; sides of the segment with sculpture considerably varied, most usually sparsely punctured and with a narrow and short zone of striae from lower end of stigmata posteriorly, the striae sometimes (especially in ♂) broadly extended, occupying whole the area, sometimes very weak and restricted to a narrow patch just behind the stigmata (especially in ♀), with all the intermediate grades between the extremities, posterior ventral portion usually more or less striate.

Comparison with ***L. luzonensis*** *Rohwer.* This species is structurally and sculpturally very close to *L. luzonensis*, but the slight differences can be discovered on the basis of statistic investigation, although of no value in the practical use:

(1) Clypal structure (♀). In many specimens of *carbonaria* anterior margin with a small triangular (or subtriangular) protuberance in middle, just at the apex of the general broad triangular structure (Fig. 19, cf. Fig. 8). Sometimes the same can de observed in *luzonensis* also, but the frequency of the occurrence is much less in *luzonensis*. (2) Length of vertex (♀). As compared with IOD on vertex it is longer in *carbonaria* than in *luzonensis*. (3) Punctures on mesopleuron (♀). In both fairly varied, but, in geneial, punctures closer in *carbonaria* than in the other (in *carbonaria* punctures and intervals mostly subequal, in *luzonensis* usually the latter wider). (4) Male genitalia. Quite similar. It is difficult to find any difference.

Subspecific categories. In my previous papers (1964 and 66) as distinctions to separate subsp. *erebus* Smith occurring in Japan from the typical form the from of clypeus (♀♂), sculpture of propodeum (♀♂), colour of front legs (♂) and general body size (♀♂) were considered. The Formosan specimens above listed were, therefore, carefully compared with a number of the Japanese specimens. According to the results, (1) the form of clypeus in ♀ is practically similar, (2) that in ♂ shows tendency that the medial protuberance is comparatively broader in the Formosan specimens than the Japanese. Of the 26 Formosan specimens 9 possess the broad protuberance*, 14 medium and 3 narrow, while in the 48 Japanese specimens 6 broad, 25 medium and 18 narrow. This is quite contrary to my previous belief based on insufficient material (Tsuneki, 1966). (3) Sculpture of propodeum (♀♂) and (4) colour of front legs: No significant differences could be observed. As to (5) general body size, the Japanese population is distinctly larger, ♀, 12–18 mm (exception 10 mm), mostly 15–16 mm, and ♂, 8–13 mm, mostly about 10 mm, while in the Formosan examplas, ♀, 9–15 mm, mostly 12–13 mm, and ♂, 6.5–11 mm, mostly 7–8 mm. Examination of the material further shows that the colour of mandibles (♀♂) in the Formosan specimens, different from the description of Williams (1928), is almost wholly red, just as in the Japanese examples. Thus, of the characters above mentioned those of the clypeus in the male and the general body size only can be used as geographic variations.

On ***Larra sparsa*** *Rohwer (1911).* This species, described with a single male specimen obtained at Puli may be a synonym of *L. carbonaria*, though the description shows slight differences from the usual specimens of the latter species: (1) Apical half of mandible piceous. Among the specimens before me no such a specimen could be discovered, though sometimes there are specimens having mandibles on marginal area darkened. Usually the tip only is darkened. (2) Space between the eyes at the vertex greater than the length of the scape. In *carbonaria* the former slightly smaller than the latter when measured at the minimum position. (3) Scutellum not impressed. Usually scutellum and postscutellum medianly with a smll impression toward

* Basal width of the protuberance having about 1/3 the total width of the anterior margin was taken as medium, those broader and narrower than this were counted respectively as broad and narrow.

which the hairs on the surrounding bent; this, however, rarely lacking in some specimens. Other characters described well agree with those of *carbonaria*. Probably the differences above listed are either due to error of eye-measurement or they may fall within the range of variation.

3. *Larra fenchihuensis* sp. nov.

This species so closely resembles the preceding species, *L. carbonaria*, that it will be sufficient to give only the differences from it.

carbonaria	*fenchihuensis*
♀, 9–15 mm, motly 12–13 mm; ♂, 6.5–11 mm, mostly 7–8 mm (Formosan population).	♀, 12–16 mm, mostly about 14 mm; ♂ 10–13 mm, mostly 11 mm or so.
Mandibles except apex nearly wholly red (♀♂)	Largely blackish with medial region red, very rarely largely red (♀♂).
Antennal joint 3 only slightly longer than 2 (♀).	Distinctly longer than 2 (♀).
Joint 3 in ♂ 1.5–1.7 times the width at apex, joint 10 1.2–1.3 times so; in ♀ j. 3 2.0–2.3 time, 10 1.5–1.7 times so.	♂, 1.8–2.0 times, j. 10 1.8–2.0 times so; ♀ 2.5–2.7 times, j. 10 about twice so.
♂. IOD=j. 2+3; ♀. IOD : j. 3=4 : 3.	♂. IOD < j. 2+3 (IOD : j. 3=4 : 3); ♀. IOD ≒ j. 3.
Disc of propodeum with 3 longitudinal impressed areas, always with medial carina, transversely rather coarsely rugoso-striate, with punctures or minute reticulation (♀♂).	Transversely rounded (Fig. 17, cf. Fig. 14), without medial carina, transversely finely closely striate (♀♂).
Posterior aspect with medial furrow till apex, transverse striae strong and coarse (♀♂).	Medial furrow not reaching apex, transverse striae fine and close (♀♂).
Sides of propodeum with oblique striae markedly varied in extention and strength, but at least defined just posterior to stigmata (♀♂).	The area simply, rather finely punctured (♀♂).
8th sternite with apex rounded (♂)	With apex feebly emarginate (♂).
Bridge of parameres of male genitalia deeply incised on top (Fig. 15).	Incision nct deep, though distinct.
Clypeus with punctured area not reaching apical margin (♂).	Punctured area most usually reaching near apical margin (Fig. 18).
Upper frons with intervals of punctures shining (♀♂ esp. ♀).	Intervals half opaque, due to very minute coriaceous sculpture (♀♂, esp. ♀).
Punctures on pygidial area sparsely scattered (♀).	Fairly close, sometimes longitudinally confluent (♀).

In addition, punctures on vertex and mesopleuron, on an average, finer and sparser in this species than in *carbonaria*, but as the overlapping between the two tendencies is fairly great the characters can not safely be used for separating the two species.

At the time when I took notice the presence of this interesting species among the specimens of roughly classified *carbonaria*-group I separated them at once and was surprised to find that all the specimens had been collected at Fenchihu, a village at about half-way up Mt. Ali and that none of *carbonaria* was collected not only at the place but also anywhere so high an altitude. The fact seems to suggest that they may represent a local race of *carbonaria*. But the differences shown by the two populations are so clear-cut that I determimed to deal with them as a distinct species.

It will be an interesting subject to investigate the populations of *carbonaria*-group occurring furthr down the slope of Mt. Ali.

Holotype: Chiayi Pref. (Fenchihu) 24. VII. 1966, K. Tsuneki leg.

Paratypes: 3 ♀♀ 11 ♂♂, the same place, 24–26. VII. 1966, K. Tsuneki leg.

4. *Larra luzonensis* Rohwer, 1919

Larra luzonensis Rohwer, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 14: 10, 1919 (♀, Philippines); Williams, Ibid., 132 (biol.).

Larra luzonensis: Williams, Ibid., 19: 39, 68, 1928 (♀ & ♂, Philippines, Borneo).

Larra luzonensis: Baltazar, Pac. Ins. Monogr., 8: 330, 1966 (Philippine, Borneo, Hawaii).
Larra luzonensis: Tsuneki, Etizenia, 17: 9, 1966 (Ryukyus).

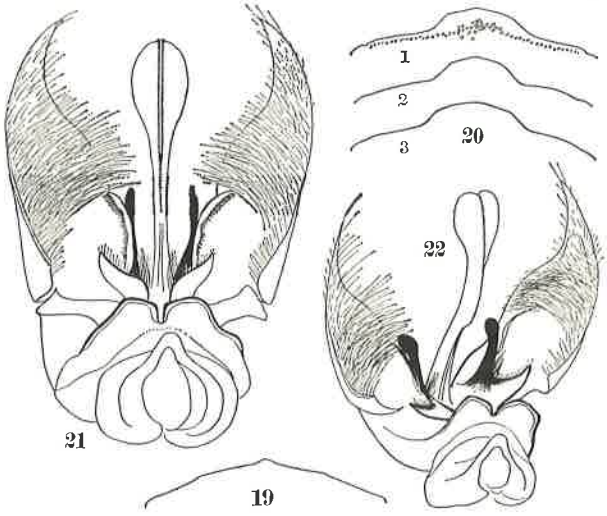
♀. Structurally very similar to *L. carbonaria* as mentioned earlier, but anterior margin of clypeus much less produced anteriorly and much more obtuse in the medial angle. It is, however, markedly different from *carbonaria* in having hind femora completely red. Length 10.8–16.5 mm, mostly 14–15 mm.

♂. Structurally slightly different in the pattrn of the frontal configulation, but can more easily be separated from *carbonaria* by the colour of hind legs as in ♀. Length 8.2–11.8 mm. mostly 9–10 mm.

Male genitalia: Figs. 21 and 22. Paramere at base inside with a large rounded glabrous hollow, surrounded inward with a curved elevation below which it is deeply incised in front (or from beneath in the natural position), remaining spical portion inside densely covered with long hairs. Top of bridge medially deeply incised. An elongated triangular reflected lobe at the anterior end of volsella (digitus ?), with a fringe of sparse short hairs on upper margin which is continuous to the transitional area to cuspis, a thin lamellate elongation, not so long as in *L. amplipennis*, dark brown in colour. Penis valve spoon-shaped and finely serrate along median line. (8th sternite rounded at apex as illustrated by Williams (1928).

This structure is very similar to that of *carbonaria*. The sole difference seems to be that the chitinization of the volsella is slightly more developed and turned into dark brown, in stead of ferruginous in *carbonaria*.

Thus, structurally this species is so close to *carbonaria* that the question naturally arises as to their specific validity. Ecological evidence, however, definitely supports the view that they are respectively a distinct species, since in the eastern coast of Formosa they are sympatric and yet there is no tendency of gene flow between them.



Figs. 19–22. Fig. 19; *Larra carbonaria* (Smith), a form of clypeus (♀).
Figs. 20–22. *Larra luzonensis* Rohwer.
20, Clypeus (♂), variation. 21, Genitalia (♂), ventral view. 22, Ditto, seen slightly obliquely from apex.

Specimens: 10 ♀♀ 70 ♂♂. 1 ♀, Pingtung Pref. (Fangliao, 31. VII.); 1 ♀ 4 ♂♂, Taitung Pref. (1 ♀, Chihpenchi, 13. VIII; 4 ♂♂, Taitung, 15. VIII); 8 ♀♀ 66 ♂♂, Ilan Pref. (Tsukeng, 20–22. VIII).

Remarks. As perceived from the above list of localities of the specimens all but one of the materials were collected from the areas lying east to the central Formosan mountains. The location where the exceptional one example was captured is situated near the southern extremity of Formosa and is not segregated from the eastern coast by the high mountains. The fact seems very interesting as opposed to the distribution pattern of the following species (*L. polita* Sm.) which occurs only (at least mainly) on the areas located west of the central mountains. This species structurally closely resembles *L. luzonensis*, only differing in the colour of the legs, and has been known from Borneo only. The fact, together with the clear-cut habitat segregation,

seems to suggest that they may be a geographical race respectively of a single species. Further, the second fact seems to throw a question as to the biogeographic significance of the central Formosan mountains, apart from the taxonomic rank of the two populations. In connection with the first problen the variation in the colour of the front and mid legs of *L. luzonensis* was particularly examined in order to search for the possibility of gene flow between them. The results were as follows:

♀. In all, mid legs wholly black, only the articulations brownish, front tibiae tend to show brownish tinge, in one specimen only fairly distinctly brownish in front.

♂. (1) Mid and front femora black, sometimes with the articulations brownish, front tibiae largely black, with a more or less brownish tinge .... 9 specimens. (2) Mid legs black, with knees brown; front femora black, tibiae fairly broadly dark brown .... 32 specimens. (3) Mid femora with brownish streaks or patchas, sometimes fairly broadly so; front femora with more or less brown maculae, tibiae broadly brown .... 29 specimens.

The results seem to indicate that the changes are noting more than the intra-population variation.

5. *Larra polita* (Smith, 1858)

Larrada polita Smith, Jour. Proc. Linn. Soc. Lond., Zool.: 102, 1858 (Borneo).
? *Larra rufipes* Smith, Jour. Proc. Linn. Soc., Lond., Zool., p. 17, 1859; —: Bingham, Faun. Brit. Ind., Hym. I: 200, 1897.
Larra rufipes: Yasumatsu, Trans. Sappolo Nat. Hist. Soc., 16 (2): 97, 1940 (Botel-Tobago Is.).

♀♂. Structurally well agrees with *L. luzonensis*, differing only in the colour of the legs:

Hind femora and tibiae wholly red; mid femora and tibiae completely red; front femora with a more or less extention of reddish macula apically and tibiae more broadly reddish. Length, ♀: 10–16 mm, mostly 12–13 mm; ♂: 5.5–11.5 mm, mostly 7–8.5 mm.

This species was described by F. Smith as early as 1858 from Borneo (Sarawak) based on a female specimen collected by A. R. Wallace. Since then, to my knowledge, no report has been made. However, *Larra rufipes* Smith, first known from Celebes and later from India may be a synonym of this species.

Specimens: 24 ♀♀ 45 ♂♂. 1 ♂, Taipei Pref. (Kieshanlu, 6. VII.); 15 ♀♀ 2 ♂♂, Nantou Pref. (14 ♀♀, Puli, 8. VII., 1 ♀ 2 ♂♂, Penpuchi, 10. VII, 29, VIII.); 9 ♀♀ 42 ♂♂, Chiayi Pref. (Chuchi, 20–22. VII.).

Remarks. As above listed all the specimens of this species were collected from the area lying west to the central Formosan mountains. The proplems arising from this peculiar distribution as contrasted to that of the closely related *L. luzonensis* were already related at some length in connection with the latter species. With reference to the taxonomic problem the variation in the colour of the legs of this species was examined, corresponding to the similar work done with *luzonensis*, in order to know whether or not the species in question are connected with each other through the intermediates of their variations. The red colour of the femora and tibiae of mid and hind legs was quite constant, so the states of the front legs alone was investigated. The results:

(1) Femora more or less on the apical portion and tibiae broadly (especially in front) ferruginous to brown .... ♂ 29, ♀ 12. (2) Femora and tibiae more narrowly ferruginous to brown .... ♂ 14, ♀ 10. (3) Femora black and tibiae very faintly and very narrowly brown .... ♂ 2, ♀ 2.

Almost complete lack of variation in the colour of the mid and hind legs has already indicated that both the speies are not connected to each other through the variations. It is clear, therefore,

that at least so far as the colour of the legs is concerned the two species questioned here are completely isolated from each other.

A note on biogeographic problem. *Larra polita* was described from Borneo and its occurrence in Formosa is clearly (as far as we know) restricted to its western districts, no record having been made from the Philippines. While, *Larra luzonensis*, as presumed from its name, was first known from the Philippines and its distribution in Formosa is, as far as our investigation goes, confined to its eastern region. The habitat segregation of the two species is so distinct that we are tempted to say as follows: "This fact seems to give an evidence to support the interesting suggestion that Formosa shows a tendency in some cases at least to be divided biogeographically into two districts by the high central mountain range, the east side having a close connection with the Philippines and the west side with the Oriental region, thus extending the Merril's line up to the central mountain range of Formosa."

2. Genus *Motes* Kohl, 1896

The genus *Motes* Kohl is characterized by the following characters: Mandibles lacking teeth on inner margin, claws of legs armed with a tooth near base, pronotum not thick, raised in middle high up nearly to the level of mesonotum and pygidial area in ♀ comparatively broadly truncate and not armed with spines at apex, with surface either polished or dull, with very delicate hairs only.

1. *Motes larroides taiwanus* subsp. nov.

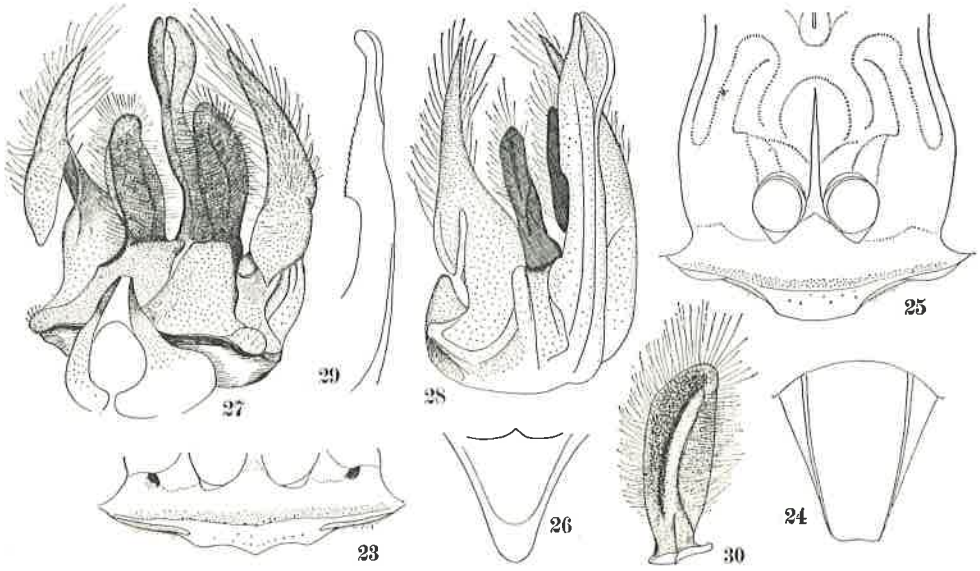
(*Motes larroides* Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 69, 1923 (Philippines and Singapore)).

The present subspecies differs from the nominate form, as far as the original description goes, in ♀ and ♂ IOD at vertex relatively much greater and the pile bands on abdomen less by one in number and in ♂, further, the presence of lateral carinae on the pygidial area. According to the original description "interocular space at vertex a little less than joints 2+3 in ♀" and "similar in ♂". In the Formosan specimens the ratio amply 3 : 2 in ♀ and about 5 : 4 in ♂, and the pile bands on abdomen only on tergites 1–3 in both sexes, instead of 1–4. Further, the pile on vertex and mesonotum without golden effulgence (♀♂). It must particularly be noted here that the numder of the pile bands on the abdomen is a constant character among the members of Larrinae, at least in our region.

Some supplementary description.

♀. Clypeus: Fig. 23, apically bluntly tridentate, and laterally with a furrow along the apical margin. Antennal joint 3 approximately 2.7 times as long as wide at apex, rhinaria (glabrous elliptic impressions) on joints 6–10, lunate impression on nape of pronotum complete and deep, mesonotum on posterior margin laterally with a few oblique curved striae, pygidial area (Fig. 24) finely very closely punctured with pile-bearing points, or rather very finely coriaceous, the pile very short, fine, soft and half appressed, mixing sparse longer erect hairs (not bristles), broad lateral carinae characteristic. Length relation between abscissae of radial vein mostly as in the nominate race, namely, $1=4 > 5 > 3=2$, but sometimes $1=4 > 5 > 3 > 2$ or $1 > 4 > 5=3 > 2$.

♂. Clypeus: Fig. 25. Antennal joint 3 about twice as long as broad at apex, *a comparatively large rhinarius on joint 5 only*, joints 3–5 slightly curved as in the typical race, lunate impression on nape complete and thorough, mosonotum on posterior margin with short longitudinal curved striae, first oblique then longitudinal, medially short and weak and laterally longer, stronger and



Figs. 23–30. *Motes larroides taiwanus* subsp. nov.
23, Clypeus (♀). 24, Pygidial area (♀). 25, Clypeus and face (♂). 26, 8th sternite (♂). 21, Male genitalia. 23, Ditto, oblique dorsal view. 29, Penis valve, lateral view. 30, Volsella (cuspis), doral view,

very conspicuous, pygidial area bordered on both side by carinae, not strong but distinct, not reaching apical margin which is truncate. Front and mid femora beneath densely covered with half-appressed silvery hairs, front and hind femora not excavated beneath. Length relation between abscissae of radial vein more or less varied, sometimes difference is observed between the right and left wings of the same individual. With 3 specimens: 4=1 > 5=3 > 2 (r. l.), 4 > 1=3 > 5 > 2 (r. l.); 4 > 1 > 5=3 > 2 (r.), 4 > 1=2=5 > 3 (l.).

Genitalia: Figs. 27 (obliquely from beneath) and 28 (obliquely from above). Cuspis of volsella: Fig. 30 (dorsal view). Penis valve: Fig. 29 (lateral view). 8th sternite: Fig. 26. Cuspis, a plump elongation, well chitinized and carrying hairs. Lamina volsellaris extends slightly divergently toward bridge in a flat broad polished ferruginous plate-like structure and the ventro-lateral (in Fig. 27 antero-lateral) corner swollen out into a small rounded elevation. Paramere is also characteristic in structure (Fig. 27).

Holotype: ♀, Ilan Pref. (Tsukeng), 22. VIII. 1966, K. Tsuneki leg.

Paratypes: 2 ♀♀, Hualien Pref. (Liyuchih), 16. VIII.; 2 ♀♀ 2 ♂♂, Ilan Pref. (Tsukeng), 19, 21, 22, VIII.; 1 ♀ 1 ♂, Nantou Pref. (Lihyuehtan), 24. VIII.

3. Genus *Liris* Fabricius, 1805

The genus *Liris* in Formosa can be divided into 4 subgenera, i.e. *Liris* Fabricius (s. str.), *dociliris* subgen. nov., *Nigliris* subgen. nov. and *Cratolarra* Cameron.

***Liris s.* str.** Mandibles without notch on outer margin, (otherwise close to *Dociliris*, group *Deplanata*).

***Dociliris* subgen. nov.** (Type: *Larrada subtessellata* Smith, 1856)

Mandibles excised on outer margin, with two teeth on inner margin, pronotum compressed in front, flattened, with top transversely ridged and medianly raised, but ending far below level of mesonotum, punctures on head and thorax fine and close; pygidial area in ♀ covered with

pile and bristles, and provided with spines on apical margin, in ♂ at least front femora beneath excavated or flattened.

Group *deplanata*. ♂. Front femora somewhat dorso-ventrally compressed, beneath slightly flattened and covered with long erect pubescence; hind femora normal.

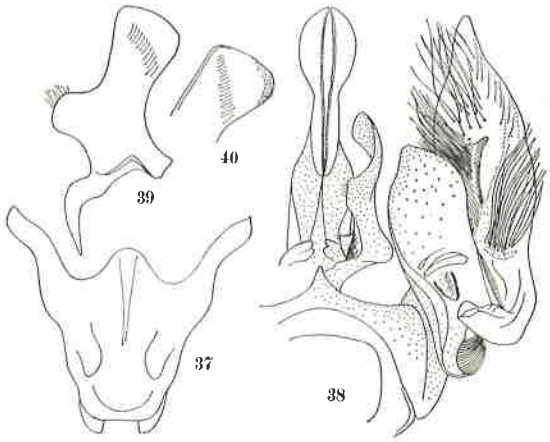
Group *docilis*. ♂. Front femora beneath broadly excavated and covered with close fine hairs, the hairs sometimes short and appressed, sometimes comparatiely long and erected; hind hemora beneath strongly excavated.

Group *larriformis*. ♂. Front and hind femora normal (the characters not well known).

***Nigliris* subgen. nov.** (Type: *Notogonia japonica* Kohl, 1883)

Mandibles as in *Dociliris*, pronotum not thick, medianly raised, reaching near level of mesonotum, punctures on head and thorax comparatively coarse, distinctly spaced; pygidial area in ♀ covered with short hairs, with spines on apical margin, legs in ♂ normal.

***Cratolarra*.** Mandibles excised on outer margin, with two teeth on inner margin, claws unarmed, pronotum thick, not carinate on top, with middle portion raised, reaching near level of mesonotum, punctures on head and thorax fine and close, pygidial area in ♀ bare, polished.



Figs. 37–40. *Liris* (*Liris*) *aurulenta* (Fabricius). 37, 8th sternite (♂). 38, Male genitalia, ventral view. 39, Volsella, lateral view. 40, Apical portion of cuspis, vertical view.

1. *Liris* (*Liris*) *aurulenta* (Fabricius, 1787)

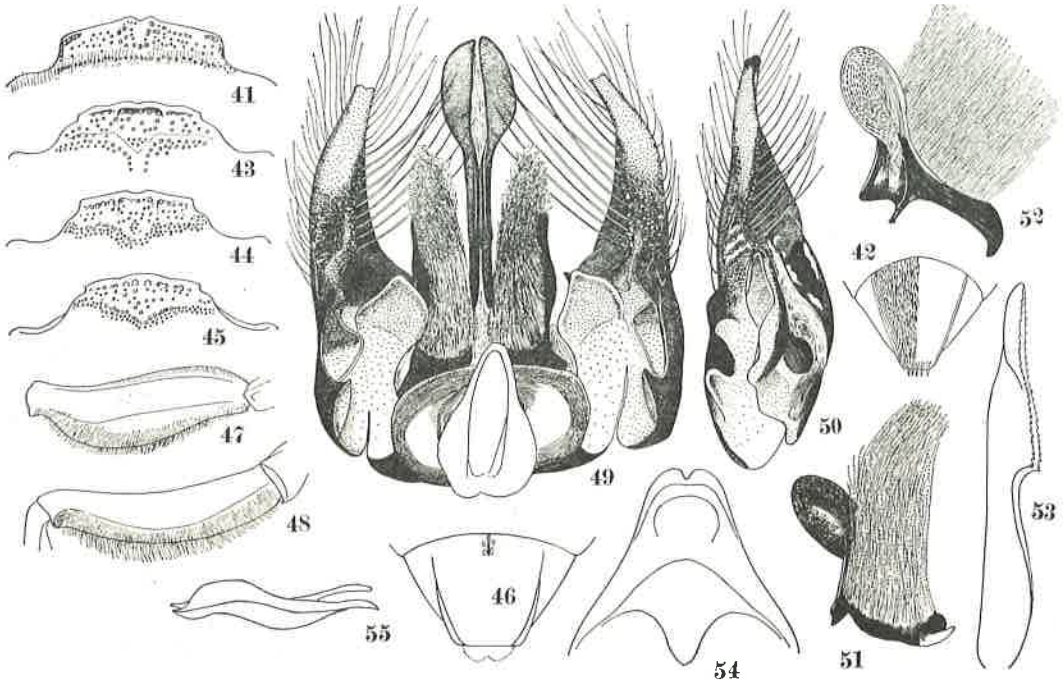
Sphex aurulenta Fabricius, Mant. Ins., I: 274, 1787 (China).
Larrada aurulenta: Smith, Cat. Hym. Ins. Brit. Mus., 4: 276, 1856 Cape (Colony and Gambia).
Liris aurata: Bingham, Faun. Brit. Ind., Hym., I: 206, 1897 (Africa, India, Ceylon, Burma, Sumatra, Java, Borneo, Celebes, China and Japan).
Tachytes auropilosus Rohwer, Proc. U.S. Nat. Mus., 39 (1794): 484, 1911 (SYN. NOV.).
Liris aurata: Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 14: 138, 1919 (biol.); Ibid., 19: 82, 1928 (Philippines, Formosa).
Tachytes sinensis var. *purpureipennis* Matsumura et Uchida, Ins. Mats., 1 (1): 42, 1926. (SYN. NOV.).
Liris aurata: Yano, Icon. Ins. Jap., Ed. I, p. 276, 1932 (Formosa, Ryukyus).
Liris aurata: Yasumatsu, Mushi, 14: 45, 1937 (Mariana, Micronesia).
Liris aurulenta: Van der Vecht and Krombein, Idea, 10: 34, 1955.
Liris aurulenta: Van der Vecht, Zool. Verh., 48: 19, 1961.
Liris aurulenta: Tsuneki, Kontyu, 32: 219, 1964; Etizenia, 17: 1, 1966.

Specimens collected: 9 ♀♀ 121 ♂♂. 1 ♂, Taipei Pref. (Kueishanlu, 5, VII); 1 ♀, Taoyuan Pref. (Yangmei, 6. VII.); 1 ♀ 6 ♂♂, Ilan Pref. (Tsukeng, 19–22, VIII.); 4 ♀♀ 10 ♂♂, Nantou Pref. (4 ♀♀ 6 ♂♂, Puli, 10, 11. VII.; 3 ♂♂ Penpuchi, 29. VIII.; 1 ♂, Lihyuehtan, 24. VIII.); 2 ♀♀ 92 ♂♂, Hualien Pref. (Liyuchih, 16. VIII.); 8 ♂♂, Chiayi Pref. (Chuchi, 20–23. VII.); 1 ♀ 4 ♂♂, Taitung Pref. (2 ♂♂, Chihpenchi, 13. VIII.; 1 ♀ 2 ♂♂, Taoyeh, 15. VIII.).

Remarks. As for the two new synonymies mention will be made in connection with the genus *Tachytes* (p. 42).

2. *Liris* (*Dociliris*) *deplanata binghami* Tsuneki, 1967

Notogonia deplanata, var., Bingham, Faun. Brit. Ind., Hym. I: 203, 1897 (India).



Figs. 41-55. *Liris* (*Dociliris*) *deplanata binghami* Tsuneki.
41, Clypeus (♀). 42, Pygidial area (♀). 43-45, Clypeus (♂), variation. 46, Pygidial area (♂). 47, Front femur, dorsal view. 48, Ditto, posterior view. 49, Male genitalia, ventral view. 50, Left paramere seen from inside. 51, Right volsella seen from inside. 52, Left volsella seen from outside. 53, Penis valve, lateral view. 54, 8th sternite (♂). 55, Ditto, lateral view.

Motes sp., Tsuneki, Life Study (Fukui), 6 (1): 5, 1962 (Amami-Ohshima I.).
Liris (*Notogonidea*) *deplanata*: Tsuneki, Ibid., 8 (4): 62, 1964; Kontyu, 32: 219, 1964.
Liris (*Notogonidea*) *deplanata binghami* Tsuneki, Etizenia, 18: 1-6, 1967.

Specimens examined: 18 ♀♀ 28 ♂♂. 3 ♂♂, Taipei Pref. (2 ♂♂, Yangmingshan, 24. VIII.; 1 ♂, Kueishanlu, 6. VII.); 1 ♀ 1 ♂, Ilan Pref. (Tsukeng, 21. VIII.); 5 ♀♀ 11 ♂♂, Nantou Pref. (Penpuchi, 12, 13. VII, 26-29. VIII.); 12 ♀♀ 13 ♂♂, Chiayi Pref. (Fenchihu, 24-26. VII.).

3. *Liris* (*Dociliris*) *surusumi* Tsuneki, 1966

Liris (*Notogonidea*) *surusumi* Tsuneki, Etizenia, 17: 4, 1966 (♀) (Ryukyus).
Liris (*Notogonidea*) *shirozui* Tsuneki, Ibid., p. 5, 1966 (♂) (Formosa) (SYN. NOV.).

Specimens examined: 7 ♀♀, Chiayi Pref. (Fenchihu, 23, 24, VII.).

Remarks. (1) In comparison with the types from Ishigaki Is. the Formosan specimens (♀♀) show slight variation as follows:

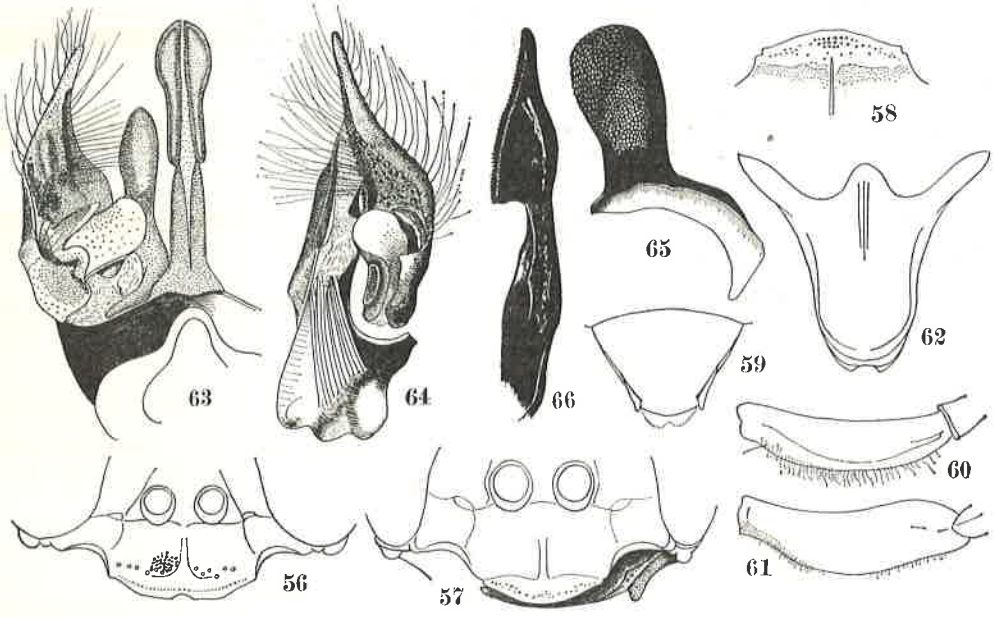
Medio-basal carina on 2nd sternite stronger and more distinct, with the inclination on both sides always black, without reddish coloration (the colour is varied between type specimens); IOD at vertex slightly more than 2/3 as long as antennal joint 3; posterior aspect of propodeum without the divergent carinae on medio-dorsal region, but the lateral carinae separating the aspect from the sides of the segment much more marked; length relation between abscissae of radial vein: $4 > 1 > 3 > 2 > 5$, instead of $4 > 1 > 3 > 5 > 2$. Pile on the sides of lower front and of clypeus and on temples greyish white or even silvery in oblique light, always inconspicuous,

pubescence on mesopleuron and propodeum slightly long, also not striking; in some specimens pale brownish pile band faintly observable on each side alone of apical margin of abdominal tergites 1-3 (or 4), bristles on pygidial area somewhat more brownish than in the type.

(2) At the time when I described *Liris* (*Dociliris*) *shirozui*, basing on a single male specimen from Formosa, I could not combine it with *L.* (*D.*) *surusumi*, the species placed as new by one page ealier which was described upon two female specimens from Ishigaki, an island locating in the southern region of the Ryukyus. This was chiefly because of the difference of the localities and a considerable difference in the characters of pilosity, sculpture and somewhat in the colour of the wings. But now, examining the Formosan specimens of *surusumi* which differ somewhat in pilosity from the Ryukyu specimens I at once became aware of the fact that they must be one and the same species. Apart from the usual sexual characters concerning the clypeus, antennae, pygidial area and legs, it differs only in the sculpture of the body as follows:

Punctuation on mesonotum slightly larger and sparser and on hypo-epimeron of mesopleuron rugoso-punctate, on its lower portions near scrobal furrow the surface irregularly, rather coarsely rugoso-reticulate (in ♀, mesopleuron finely closely punctured, showing in part a tendency toward rugulosity). Such differences are, however, considered to fall within the range of sexual variation in this group. The characteristic structure of the antero-lateral areas of the mesonotum completely agrees with each other and the propodeal characters are also similar.

(3) *Supplements to the description of the male.* The following escaped from the description of *shirozui*. Pygidial area roundly raised as in the usual tergite, not flattened and only apically bordered on both sides by carinae, the carina turned into a flattened tooth at apex and acutely produced from the surface, apical margin broadly lamellate, semitransparant yellowish, with apex rounded, reaching slightly beyond the line connecting apical extremities of the lateral teeth (Fig. 59), the surface closely covered with somewhat large aciculate hair-bearing punctures,



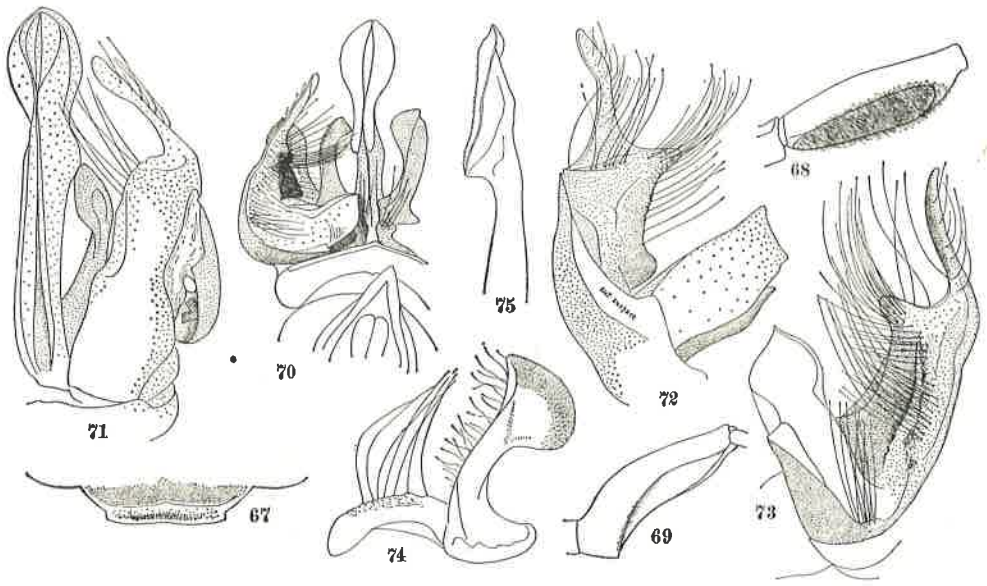
Figs. 56-66. *Liris* (*Dociliris*) *surusumi* Tsuneki.
56, Clypeus (♀). 57, Clypeus (♂). 58, Ditto. 59, Pygidial area (♂). 60, Front femur (posterior view). 61. Ditto (dorsal view). 62, 8th sternite (♂). 63, Male genitalia. 64, Right paramere (inside view). 65, Right volsella (inside view). 66, Penis valve (lateral view).

and provided at base in middle with a short blunt longitudinal carina, observed only in oblique light, the hairs castaneous brown, comparatively long and thick, and gradually longer, thicker bristle-like apically. Abscissae of radial vein in fore wing: 4 > 1 > 3 > 2 > 5, as in ♀. Genitalia: Fig. 63 (ventral view), right paramere (seen from inside) and volsella: Figs. 64 and 65, lamina volsellaris merely lengthened ventrally, without accompanying hairs; cuspis (Fig. 65) thin lamellate enlargement, slightly rolled out externally; penis valve: Fig. 66. Last ventral plate : Fig. 62. Close reexamination of the clypeus revealed a minute incision at the antero-lateral corners of the clypeus (Fig. 58).

4. *Liris* (*Dociliris*) *laboriosa* (Smith, 1856)

Larrada laboriosa Smith, Cat. Hym. Ins. Brit. Mus., IV: 278, 1856 (♀, Philippines).
Notogonia laboriosa: Bingham, Faun. Brit. Ind., Hym. I: 204, 1897 (♀, India: Tenasserim).
Notogonia crawfordi Rohwer, Proc. U.S. Nat. Mus., 37: 659, 1910 (♀, Philippines, syn. after Williams, 1928).
Notogonidea laboriosa: Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 72, 1928 (♀, ♂, Philippines, Formosa with others).
Motes laboriosa: Krombein, Proc. Hawaii. Ent. Soc., 13 (3): 382, 394, 1949 (Marianas).

Specimens: 2 ♂♂, Pingtung Pref. (Hengchun, 1, 8. VIII.); 1 ♂, Taitung Pref. (Taoyeh, 14. VIII.); 1 ♂, Chiayi Pref. (Chuchi, 21. VII.).



Figs. 67–75. *Liris* (*Dociliris*) *laboriosa* (Smith).
67, Clypeus (♂). 68, Mid femur (♂), obliquely from behind. 69, Hind femur, ditto. 70, Male genitalia. 71, Ditto, dorsal view. 72, Left paramere, ventral view (slightly obliquely from outside). 73, Right paramere seen from inside. 74, Left volsella, from inside. 75, Penis valve, lateral view.

Remarks. Williams (1928) recorded as the distributional areas of this species, besides the type locality of this species and India, Japan and Ryukyus. Probably this was based on the record of Matsumura and Uchida (1926). But the occurrence of this species in the 4 main islands of Japan is possibly incorrect, and the identification of the Ryukyu specimens recorded as *laboriosa* is also doubtful. He further recorded 2 ♀♀ of this species from Formosa (locality undescribed). According to the result of our collecting journey this species seems rather rare in Formosa and

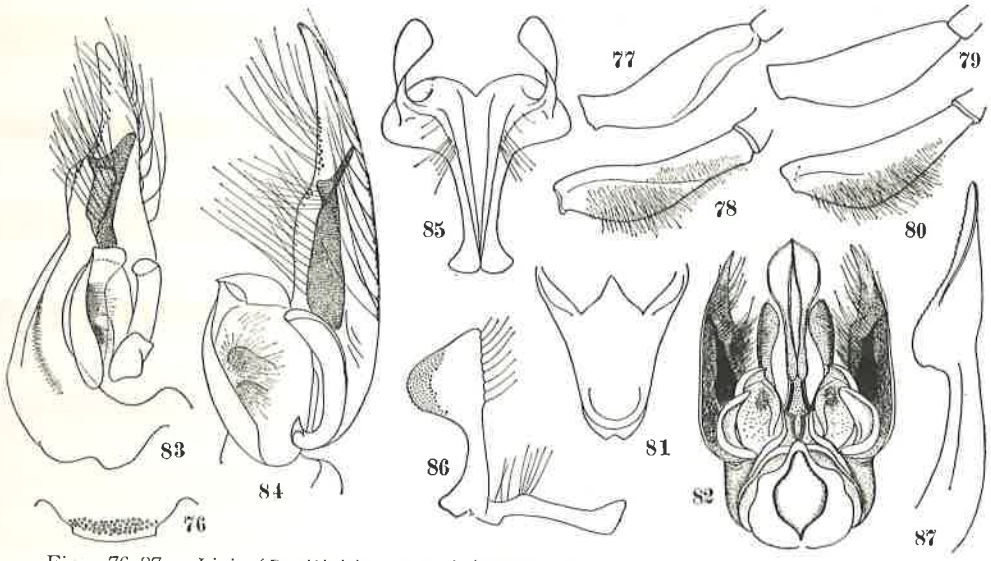
is apparently restricted in distribution to the southern regions of the Island.

Of the four male specimens one has the pile on face and clypeus strongly glittering silverily, only with a faint lustre of brass in certain light, while in the remainder the pile is distinctly brassy, sometimes rather golden. Clypeus in ♂: Fig. 67; rhinaria on joints 4–12 in ♂, usual glabrous area occupying whole the span of each joint, on 12 semielliptic, at base only. Front femur beneath broadly excavated, slightly hollowed out (different from allied species) and provided with long dense appressed slightly brassy pubescence, mid femur posteriorly flattened and closely pubescent (Fig. 68), hind femur with the form similar to *subtesselata-docilis* group, but the excavation very much stronger (Fig. 69). Male genitalia: Figs. 70 and 71, left paramere seen from beneath and slightly obliquely from outside: Fig. 72, right paramere seen from inside: Fig. 73, and obliquely from above (dorsal view): Fig. 71, at base with well developed lamellate appendages separated by a deep incision, inner lobe markedly lengthened and not well chitinized, while the outer lobe well chitinized and blackish, but shorter and narrower. The two lobes can not form a pouch owing to its abnormal development. Above the inner lobe, in the median line of paramere is a well chitinized black area, highly carinated and carrying long hairs. Volsella: Fig. 74, fairly well chitinized, but without differentiation of digitus. Penis valve: Figs. 70 (ventral view) and 75 (lateral view). Generally the chitinization of the organs well-developed.

5. *Liris* (*Dociliris*) *rohweri* (Williams, 1928)

Notogonidea rohweri Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 78, 1928 (♀♂, Philippines, Singapore).

Liris (*Notogonidea*) *rohweri*: Tsuneki, Etizenia, 17: 2, 1966 (Formosa and Ryukyus).



Figs. 76–87. *Liris* (*Dociliris*) *rohweri* (Williams).
76, Clypeus (♂). 77, Front femur (♂), dorsal view. 78, Ditto, posterior view. 79 and 80, Ditto, variation. 81, 8th sternite (♂). 82, Male genitalia. 83, Right paramere, from inside. 84, Ditto, obliquely from beneath. 85, A pair of volsella, from apex. 86, Left volsella, lateral (outside) view. 87, Penis valve, lateral view.

Specimens examined: 22 ♀♀ 40 ♂♂. 1 ♂, Teipei Pref. (Yangmingshan, 24. VIII.); 1 ♂, Taoyuan Pref. (Yangmei, 5. VII.); 8 ♀♀ 3 ♂♂, Ilan Pref. (Tsukeng, 19–22. VIII.); 5 ♀♀ 11 ♂♂, Nantou Pref. (1 ♀, Lihyuehtan, 14. VII.; 10 ♂♂, Puli, 8–16. VII.; 4 ♀♀ 1 ♂, Penpuchi, 26–30. VIII.); 9 ♀♀ 23 ♂♂, Chiayi Pref. (Chuchi. 21–25. VII.).

Remarks. The characters of this species were given in detail by the original author and I further added some supplementary notes with respect to comparison with the related species, *L. docilis* Sm. In the present paper some explanations regarding the structure of the male genitalia will be presented. The total feature seen from beneath: Fig. 82. It is slightly emended from the figure given in my previous paper in relation to the inside structure of the basiparamere and the form of penis, basing upon the fresh specimens. Basiparamere with a deep incision from outside, the areas on both sides growing into lamellate structures of particular forms (Figs. 83 and 84) and constitute a sort of a pouch in combination. Just above this pouch a well chitinized black portion present from which stiff hairs grow out. Volsella as a pair: Fig. 85 (seen from apex), its lateral view: Fig. 86, differentiation of digitus not yet developed. Penis valve in ventral view: Fig. 82, in lateral view: Fig. 87. Eight sternite: Fig. 81 (seen from inside). The clypeus and front leg with a variation in the male are also illustrated (Figs. 76–80). Rhinaria on antennal joints 7–11 in ♀, minute elliptic impressions.

According to Williams (1928) this species is not common in the Philippines. In Formosa it is fairly common on the flat land as well as low mountain regions.

6. *Liris* (*Dociliris*) *subtessellata* (Smith, 1856)

Larrada subtessellata Smith, Cat. Hym. Ins. Brit. Mus., IV: 277, 1856 (♀, India, Sumatra and Java).
Notogonia subtessellata: Bingham, Faun. Brit. Ind., Hym. I: 202 (♀♂, India, Burma, Ceylon).
Notogonidea luzonensis Rohwer, Bull. Hawaii. S.P.A., Ent. Ser., 14: 9, 1919 (♀, Philippines, partim).
Notogonidea subtessellata: Williams, Ibid., 19: 76, 1928 (partim, only specimens with red hind femur, Philippines, Borneo, Singapore, Hongkong).
Motes subtessellata: Yasumatsu, Trans. Sapporo Nat. Hist. Soc., 16 (2): 97, 1940 (Botel-Tobago).
Notogonia subtessellata: Richards, Proc. Zool. Soc. Lond., 360, 1928 (Irak).
Liris subtessellata: Beaumont, Mitt. Schweiz. Ent. Ges., 34 (3): 229, 1961 (Cyprus).
Liris (*Notogonidea*) *subtessellata*: Tsuneki, Etizenia, 4: 9, 1963 (Thailand); Idid., 17: 2, 1966 (Formosa and Ryukyus).

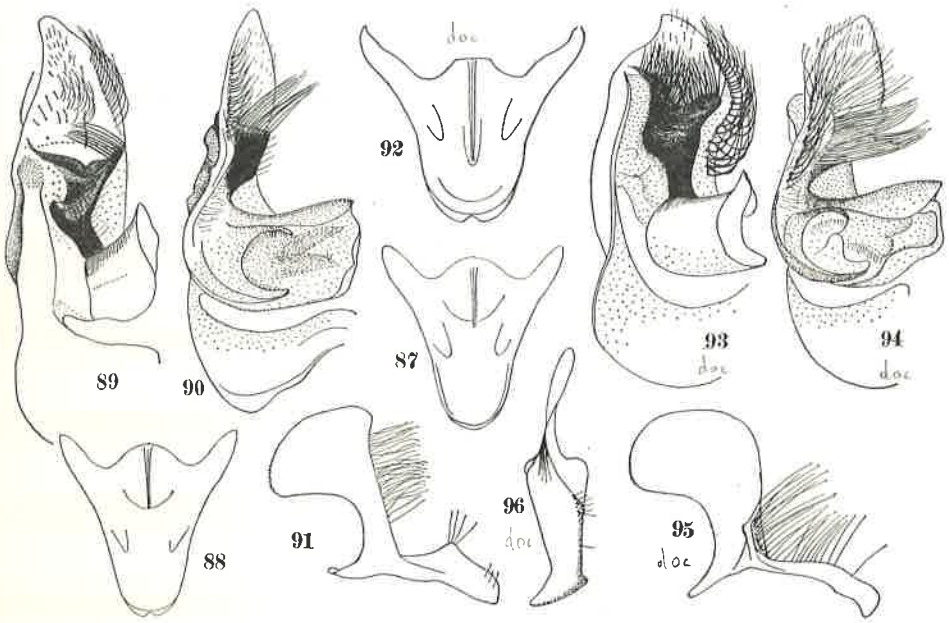
Specimens examined: 41 ♀♀ 164 ♂♂. 6 ♂♂. Taipei Pref. (3 ♂♂, Yangmingshan, 3. VII.; 3 ♂♂, Keishanlu, 6. VII.); 1 ♂, Taoyuan Pref. (Yangmei, 6. VII.); 5 ♀♀ 22 ♂♂, Ilan Pref. (11 ♂♂, Tien-Hsien, 17. VIII.; 5 ♀♀ 10 ♂♂, Tsukeng, 19–21, VIII.); 3 ♀♀ 16 ♂♂, Hualien Pref. (Liyuchih, 16. VIII.); 8 ♀♀ 37 ♂♂, Nantou Pref. (4 ♀♀ 15 ♂♂, Puli, 8, 11, VII.; 25. VIII.; 2 ♀♀ 4 ♂♂, Lihyuehtan, 24. VIII.; 2 ♀♀ 18 ♂♂, Penpuchi, 13, 14. VII, 26–30. VIII.); 22 ♀♀ 57 ♂♂, Chiayi Pref. (20 ♀♀ 53 ♂♂, Chuchi, 20–22, 25. VII.; 2 ♀♀ 4 ♂♂, Fenchihu, 24–26. VII.); 15 ♂♂, Taitung Pref. (13 ♂♂, Taitung, 15, 16. VIII.; 2 ♂♂, Taoyeh, 14. VIII.); 3 ♀♀ 10 ♂♂, Pingtung Pref. (2 ♀♀ 1 ♂, Hengchun, 7. VIII.; 1 ♀ 5 ♂♂, Fangliao, 31. VII.; 2 ♂♂, Ssuchungchi, 6. VIII.; 2 ♂♂, Kentin, 9. VIII.).

Remarks. In my previous paper (1966) it was pointed out that the two forms included by Williams (1928)* within the category of this species were in reality two different species, *Liris subtessellata* and *Liris docilis*, and the distinguishing characters between the species were enumerated. Of the characters dealt with at that time those concerning the clypeus must be emended, through the observation of a number of specimens, as follows:

Punctuation is of little use to separate the species, but in ♀ the anterior margin of the produced median lobe of clypeus, bordered on each side by a small tubercle, is relatively distinctly wider in this species than in *docilis*. The distance between the tubercle and the outer frontal base of mandible is much less than half as great as the distance between the said tubercles, that

* Probably he might follow Rohwer (1919) in dealing with the two forms as mere variations, since in the description of *Notogonidea luzonensis*, a synonym of *subtessellata*, Rohwer designated as the type a legged form (♀), while he mentioned that the paratype has the hind femora black.

is to say, the anterior margin of the median lobe. While in *docilis* it is approximately half as great as the width of the compared portion, or even somewhat greater.



Figs. 87–96. Figs. 87–91: *Liris* (*Dociliris*) *subtessellata* (Smith).
Eigs. 92–96: *Liris* (*Dociliris*) *docilis* (Smith).
87, 88 and 92: 8th sternite (♂); 87, variation. 89 and 93, Right paramere, inside view. 90 and 94, Left paramere, ventral view. 91 and 95, Volsella, lateral view. 96, Volsella, from apex.

Further, it must specially be added that the male genitalia (Figs. 1–7) are distinctly different in the structure of the paramere and volsella between the two species. Paramere more robust and rather thickset in *docilis* (Figs. 93 and 94) than in *subtessellata* (Figs. 89 and 90), with the apical lamellate portion broader and shorter. The hairs and bristles inside the paramere are much more abundant and greyish black in *docilis*, while in *subtessellata* they are sparser, more restricted in areas and ferruginous in colour. The form of the basal appendage is also somewhat different between the two species. The difference is also observed as to the form and hairing of the volsella as givan in Fig. 95 (*docilis*) and Fig. 91 (*subtessellata*). But the penis valve without notable distinction, except that chitinization much stronger in *docilis*, deep black in colour as against ferruginous brown in *subtessellata*.

This species is widely distributed from the eastern Mediterranean Sea to the western Pacific as far northward as the southern Ryukyus.

7. *Liris* (*Dociliris*) *docilis* (Smith. 1873)

Larrada docilis Smith, Trans. Ent. Soc. Lond., 2: 192, 1873 (♀, probably ♂ in reality, but not his ♂, Japan).
Larrada Tisiphone Smith, Ibid. (nec 1858), p. 192 (Japan).
Larra tisiphonoides Dalla Torre, Cat. Hym. etc., 8: 625, 1897.
Notogonia manilensis Rohwer, Proc. U.S. Nat. Mus., 37: 659, 1910 (♂, Philippines).
Notogonidea luzonensis Rohwer, Bull. Exp. Sta. Hawaii, S.P.A., Ent. Ser., 14: 9, 1919 (♀, partim .... paratype, Philippines).
? *Notogonia laboriosa*: Matsumura et Uchida, Ins. Mats., 1 (1): 43, 1926.

Notogonidea subtessellata: Williams, Bull. Exp. Sta. Hawaii. S. P. A., Ent. Ser., 19, 76, 1928 (partim).
Motes subtessellata: Krombein, Proc. Hawaii. Ent. Soc., 13 (3): 382, 394, 1949. (Marianas, Hawaii).
Motes tisiphone: Tsuneki, Life Study (Fukui), 6 (1): 2, 1962 (Ryukyus).
Liris (Notogonidea) subtessellata docilis: Tsuneki, Kontyu, 32: 221, 1964 (Japan and Ryukyus).
Motes subtessellata: Baltazar, Pac. Ins. Monogr., 8: 333, 1966 (partim).
Liris (Notogonidea) docilis: Tsuneki, Etizenia, 17: 1, 1966 (Formosa and Ryukyus).
Liris (Notogonidea) vortex Tsuneki, Ibid., p. 7, 1966 (Formosa). (SYN. NOV.).

Specimens examined: 30 ♀♀ 137 ♂♂ (22 ♀ 95 ♂, K. Tsuneki leg., 6 ♀ 40 ♂, T. Tano leg.; 2 ♀ 2 ♂, B. S. Chang leg.): 2 ♀♀ 2 ♂♂, Taoyuan Pref. (Kuangyin, 10. IX.); 5 ♀♀ 19 ♂♂, Ilan Pref. (Tsukeng. 19–22. VIII); 9 ♀♀ 42 ♂♂, Nantou Pref. (1 ♀ 2 ♂♂, Lihyuehtan, 14. VII., 24. VIII.; 1 ♀ 24 ♂♂, Puli, 8–17. VII.; 6 ♀♀ 16 ♂♂, Penpuchi, 13, 14. VII., 27–30. VIII.; 1 ♀, Chiengtin, 17. VII.; 2 ♂♂, Meichi, 12. VII.); 13 ♂♂, Hualien Pref. (12 ♂♂, Tienhsiang, 17. VIII., 1 ♂, Liyuchih, 16. VIII.); 10 ♀♀ 48 ♂♂, Chiayi Pref. (5 ♀♀ 24 ♂♂, Chuchi, 20–22. VII., 13 ♂♂, Shihtsulu, 29. VII.; 5 ♀♀ 11 ♂♂, Fenchihu, 24–26. VII.); 2 ♀♀ 1 ♂, Taitung Pref. (1 ♂, Chulu, 13. VIII.; 2 ♀♀, Taoyeh, 14. VIII.); 1 ♀ 11 ♂♂, Pingtung Pref. (Hengchun, 1–9. VIII.).

Remarks. In the fresh specimens the female bears the clypeus always incised in the middle of the apical margin. Punctures on bevel and apical margin very sparse, frequently forming a sparse puncture line between anterior margin and bevel and the surface glittering. In the worn-out specimens, even though slight in degree, the medial incision disappears and the surface turned opaque. In the male the excavatien beneath front femur also varied more or less and the medio-apical incision of the clypeus very slight, or more frequently completely lacking.

Sculpture on dorsal aspect of propodeum is also considerably variable; transverse rugose striae sometimes sparse and strong, sometimes close and delicate, or partly sparse and partly (posteriorly) close. In the majority of the specimens collected in the mid-slope of Mt. Ali the close striae of the area showed a tendency to draw parallel curves and sometimes more or less circling around a centre located near medio-posterior margin — a state very close to that of *L. vortex* m. described upon a single specimen collected at Nanshanchi. This fact, together with the variation in degrees of the excavation of the front femur indicates that *L. vortex* is better to be allocated within the specific range of *L. docilis* (Smith).

Taxonomic relation of this species to *L. subtessellata* and the morphological differences between the two species have already been related in connection with the latter species.

Paramere of male genitalia: Fig. 94 (left side seen from beneath) and Fig. 93 (right side seen from inside). Volsella: Fig. 95 (lateral view) and Fig. 96 (apical view). 8th sternite: Fig. 92. Penis valve as in *subtessellata*, only much darker.

8. *Liris* (*Dociliris*) *larriformis* (Williams, 1928)

Notogonidea larriformis Williams, Bull. Exp. Sta. Hawaii. S. P. A., Ent. Ser., 19: 73, 1928.
Liris (Notogonidea) larriformis: Tsuneki, Etizenia, 17: 4, 1966.

Specimen examined: 1 ♀, Pingtung Pref. (Kentin, 2. IV. 1965, T. Shirozu leg.).

Remarks. We could not capture this species in Formosa. The detailed characters of the male are unknown and the subgeneric position was rather provisionally assigned.

9. *Liris* (*Nigliris*) *japonica* (Kohl, 1883)

Larrada nigricans Smith, Trans. Ent. Soc. Lond., 2: 192, 1873 (♀ ? and ♂, Japan, nec Walker, 1871).
Larra (Notogonia) japonica Kohl, Verh. zool.-bot. Ges. Wien, 33: 357, 1883 (♀, Kioto).
Notogonia japonica Kohl, Ibid., 34 : 254, 1884 (orig. descr. reprod.).
Larra nigricolor Dalla Torre, Cat. Hym. etc., VIII: 670, 1897.

Notogonia manilae Ashmead, Proc. U.S. Nat. Mus., 28: 130, 1904 (Philippines) (SYN. NOV.); *Notogonidea manilae*: Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 75, 100, 1928; *Motes manilae*: Yasumatsu, Mushi, 14 (1): 44, 1941; —: Krombein, Proc. Hawaii. Ent. Soc., 13 (3): 382, 395, —: Baltazar, Pac. Ins. Monogr., 8: 331, 1966.

Notogonidea williamsi Rohwer, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 14: 9, 1919.

Notogonia praetermissa Richards, Proc. Zool. Soc. Lond., 1928: 361 (France); *Leptolarra praetermissa*: Beaumont, Bull. Soc. Fouad Ier Ent., 24: 18, 1940 (Egypt); *Liris praetermissa*: Beaumont, Mitt. Schweiz. Ent. Ges., 34 (3): 236, 1961; *Liris japonica praetermissa*: Tsuneki, Kontyu, 32: 221, 1964.

? *Notogonia docilis*: Yano, Icon. Ins. Jap., Ed. I: 275, 1932; — Iwata, Kontyu, 12 (1): 7, 1938; — *Motes docilis* Yano (Yasumatsu), Ibid., Ed. II: 1477, 1950.

Motes japonicus: Tsuneki, Life Study (Fukui), 2 (4): 8, 1959; Ibid., 6 (1): 5, 1962; —: Haneda, Ibid., 2 (4): 7, 1959; 5 (1-2): 6, 1961 (biol.).

Liris japonica: Beaumont, Mitt. Sohweiz. Ent. Ges., 34 (3): 237, 1961.

Liris (Notogonidea) japonica: Tsuneki, Kontyu, 32: 221, 1964.

Specimens examined: 53 ♀♀ 55 ♂♂. Taoyuan Pref. (Yangmei), Nantou Pref. (Lihyuehtan, Puli, Penpuchi), Chiayi Pref. (Chuchi, Fenchihu, Shihtsulu), Pingtung Pref. (Hengchun), Taitung Pref. (Taitung, Taoyeh), Hualien Pref. (Liyuchih, Tienghsian), Ilan Pref. (Tsukeng), VII-VIII.

Romarks. (1) The Formosan specimens are somewhat smaller on an average than the Japanese ones. But the body length distribution curves of both populations are deeply overlapped with each other and they can not be separated by this character except for the extreme ones of the larger size. As to other characters including those of the male genitalia, as far as I have examined, there can be admitted no appreciable difference between them.

(2) Among the male specimens of Formosa, however, we can distinguish 6 types in the combination of the two characters, viz. pilosity on the vantral plates 3-6 of the abdomen and the rhinaria of the antennal joints:

i) Type 1. Sternites 3-6 covered with sparse long stiff hairs and intervals filled densely with short erect curved pubescence (Fig. 97), rhinaria on antennal joints 6 and 7 only, both elliptic in form, usually not filling whole the span of the joint. This is the type always found in the Japanese male specimens.

ii) Type 2. With the long stiff hairs and short curved pubescence as in Type 1, but the rhinaria on joints 6, 7 and 8, on 6-7 elliptic, sometimes reaching from base to apex of the joint, on 8 only at base.

iii) Type 3. Sternites without long stiff hairs, provided only with dense short curved pubescence (Fig. 98), rhinaria on joints 6 and 7.

iv) Type 4. pubescence as in Type 3, but rhinaria on joints 6, 7, 8 and 9, on 6-8 filling the posterior face, on 9 from base to a certain distance of the same side with apex rounded.

v) Type 5. Without both the characteristic long stiff hairs and the close short curved pubescence (Fig. 99) (sometimes with sparser shorter less strong hairs, and short pubescence, if present, sparser and completely appressed), rhinaria on joints 6 and 7, elliptic in form.

vi) Type 6. Without both kinds of hairs, rhinaria on joints 6, 7 and 8, on 6-7 from base to apex, on 8 to a certain distance.

To sum up the types above listed are as given in Table 3.

Table 3. Six types regarding ventral pile and antennal rhinaria

Type	Long stiff hairs	Short erect pile	Rhinaria on joint 6-7	8	9
1	+	+	+	−	−
2	+	+	+	+	−
3	−	+	+	−	−
4	−	+	+	+	+
5	−	−	+	−	−
6	−	−	+	+	−

It seems important in considering the taxonomic value of these types that the characters separating the types shift gradually from one type to another. As for the long stiff hairs there

are some variations in length and stiffness among the specimens of type 5 and as for the rhinaria there are cases in which the apicalmost one is very small or is present in one of the antennae and absent in the other. Further, it must specially be added that the three types of the abdominal hairing are not resulted from the degrees of wearing out. Among the fresh specimens we can clearly distinguish difference in the hairing of the said area. Moreover, it is given further evidence by the fact that the Japanese specimens, irrespective of their age, belong always to type 1.

Localities of the specimens belonging to each type:

Type 1. Taoyuan Pref., 2 exs. Ilan Pref., 2 exs. Hualien Pref., 1 ex.

Type 2. Taoyuan Pref., 1 ex. Ilan Pref., 1 ex.

Type 3. Taoyuan Pref., 1 ex.

Type 4. Taoyuan Pref., 1 ex. Nantou Pref., 8 exs. Hualien Pref., 6 exs. Chiayi Pref., 11 exs. Pingtung Pref., 1 ex. Taitung Pref., 1 ex.

Type 5. Taitung Pref., 1 ex. Chiayi Pref., 15 exs. Hualien Pref., 1 ex.

Type 6. Hualien Pref., 1 ex. Chiayi Pref., 2 exs.

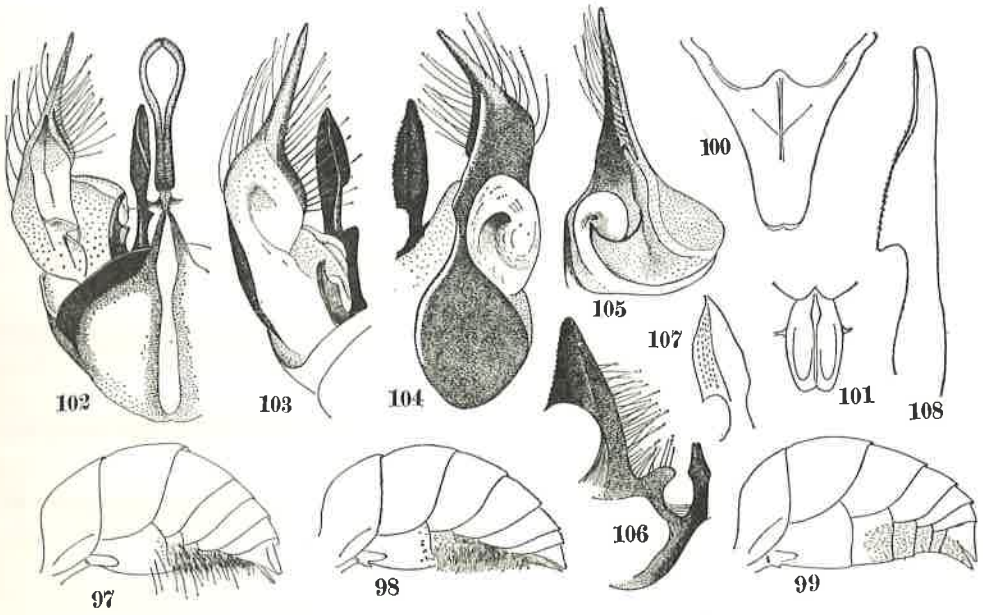
According to the result it appears that types 1, 2 and 3 are restricted in distribution to the northern half of Formosa and types 5 and 6 to the middle regions, while types 4 is widely distributed thoughout Formosa. Except for type 4, however, the specimens of each type are too scanty to give any definite conclusion as to their range of distribution.

As for the females it seems rather strange that no corresponding types to those mentioned regarding the males could be discovered among the specimens. The ventral plates are provided with only a few long stiff hairs on posterior margin of each segment, without the dense short erect curved pile. As for rhinaria which have widely been overlooked their distribution is quite identical with that of the Japanese specimens, that is to say, on antennal joints 6–12, on 6 very minute and from 7 to 11 progressively slightly larger toward apex. They are glabrous elliptic impressions and located toward middle of each joint, at the largest occupying about half the length of the segment. There is no exception regarding the distribution of the impressions on joints 6–12, but is a more or less difference in size. Out of 53 specimens 3 (from Chuchi and Liyuchih) are abnormal in that the rhinaria are very large on joints 8–11, almost filling whole the length of each segment, though still elliptic (much elongated) in form.

To judge from the facts mentioned above it seems justified to regard them mere variations within the categories of a single species, although in some cases they may appear to possess a geographic tendency.

(3) The comparative studies of the male genital organs among the 6 types and of the Japanese population showed that there is no essential difference whatever even regarding detailed characters (Figs. 102–108). Only we can observe that the pubescence adorning the fringe of the ventral side of the volsella appears slightiy finer and softer in the Formosan specimens than in the Japanese ones, though among the former there is no difference with the types. Such a slight difference between the populations is, however, of little value in separating species.

(4) On the other hand, a species described from the Philippines and later known to distribute widely over the western Pacific islands, *Liris* (*Nigliris*) *manilae* Ashmead (1904), is considered a synonym of *L. japonica* Kohl, though it may represent a subspeies with the Formosan form. Williams (1928) in his study on the Larrinae of the Philippines says that *Notogonidea manilae* occurs in Formosa (p. 75) and judging from his descriptions, the specimens dealt with here by me are nothing else than this species. He further alluded to that a somewhat larger insect from Japan and *N. retiaria* Turner of Australia are very close to, if not varieties of, *N. manilae*. He regarded it, however, as distinct, basing on "the ♂ armature differing slightly in



Figs. 97–108. *Liris (Nigliris) japonica* (Kohl).
97, 98, 99, Three states of hairing on ventral plates of abdomen. 100, 8th sternite (♂), 101, Metasternal plate (♂). 102, Male genitalia, ventral view. 103, Ditto, slightly different aspect. 104, Ditto, dorsal view. 105, Ditto, lateral view. 106, Volsella, with two processes on lamina volsellaris. 107, Cuspis, obliquely dorsal view. 108, Penis valve, lateral view.

chitinization and form of the sagittae".

According to my observation, as above mentioned, no essential difference could be found between the armatures of the males of the two populations. The fact was recently given evidence by the detailed genitalial figure presented by K. V. Krombein (1950, p. 140).

However, as it is certain that the two populations differ in the averaged body size and in some other less important characters it seems not necessarily unreasonable to divide them at the subspecific level.

In connection with this, it seem of interest that *N. retiaria* Turner was later synonymized by Williams (1945) with *N. manilae*.

(5) In his remarks to *Larra* (*Notogonia*) *japonica*, Kohl (1883) referred to the fact "Ich besitze einer Stück mit der Fundortangabe Alger, welche mir in keinerlei Weise von den japanischen Stücken vershieden scheint" (S. 358)*. Later in 1928 the specimens of this form were independently discovered in South France and named *Notogonia praetermissa* by O. W. Richards. It was further found to occur in North Africa. Recently the relationships between *praetermissa* and *japonica* were separately discussed by de Beaumont and myself. In my opinion there is no sufficient reason to separate them by the species category.

(6) A note on an abnormal form. A female specimen collected at Shihtsulu, Alishan, showed a striking deviation in the sculpture of the propodeum. Dorsum distinctly *longitudinally* rugoso-striate (about 14 striae excluding the lateral carinae) with short transverse branches not reaching the next striae. In the normal specimens main trend of sculpture is the transverse rugose striae, with short longitudinal rugose carinulae on intervals, thus forming an irregular

* This example, togother with 4 ♀♀ on which the description of *japonica* was based, was recently reexamined by de Beaumont (1961).

network having meshes of subquadangle mainly transversely arranged. The presence of the very marked longitudinal striae gives us quite a strange impression. The lateral striae running from stigmata to the apex of the segment is very much stronger and more complete than in the normal examples. Still further, the striae on the sides are also longitudinal in the main, instead of oblique, the difference being fairly striking. In addition to the above, the punctuation on mesopleuron finer and much sparser, with averaged intervals as great as the width of punctures (in the normal specimens less than so).

It seems certain that the specimen represents a mutant and probably also a subspecies, since the locality is, different from the lowland plain lived by the usual form, situated high on the side of Mt. Ali, about 1700 m above the sea level. It is regretted, however, that the collected material was but a single specimen and it cannot finally be determined whether it is a member of the population having such characters or merely a single variante.

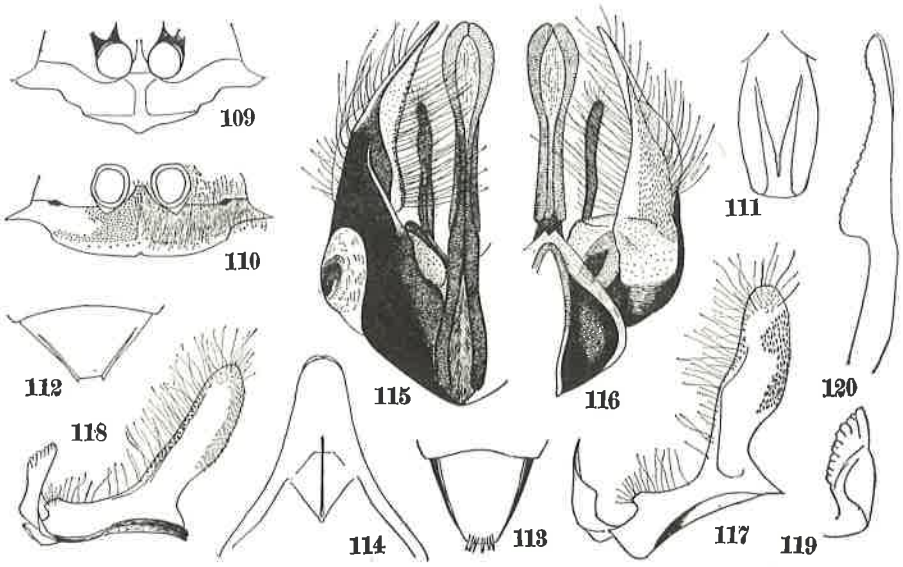
Distribution. This species has a very wide range of distribution, ranging from North Africa, South Europe (probably through the southern areas of the Palaearctic region) to East China, Korea, Japan including the Ryukyus, Formosa, the Philippines, the Marianas, Carolines as far south as Australia, including various geographic races. Future investigation will also verify the occurrence of this species widely in India and Southeast Asia.

10. *Liris* (*Nigliris*) *albopilosa* sp. nov.

This species belongs to the group of *L. nigricans* Walker (incl. *L. japonica*) of de Beaumont, having punctures on thorax well spaced and comparatively large, propodeum on dorsal aspect irregularly reticulate and radial cell of fore wing with antero-distal angle more than 90° and postero-distal angle reaching further distally than the antero-distal angle. In particular high raised pronotum characteristic of the group. It reaches with its medial angle near level of mesonotum. As specific distinctions against the closely allied *L. japonica* head and thorax closely covered with whitish pubescence, not so long as in *L. liroides*, also a closely resembling Philippine species, the bands on abdomen much broader than usual, clypeus with a medio-apical tooth (♂), punctures on mesopleuron sparse, with intervals larger than the width of the punctures etc.

♂. Length 5.0–7.3 mm. Black, middle of mandibles broadly reddish yellow, palpi and tarsi of legs brownish black, wings hyaline, apical margin clouded. Head closely covered with appressed short silvery hairs, those on upper frons and vertex finer and slightly sparser, letting punctures fairly well visible, on lower frons, clypeus and temples thicker, closer and the surface completely invisible, apical beveled area of clypeus and a patch above each antennal sockets glabrous and polished. Thorax also closely covered with white hairs, the hairs thicker than usual, longer than on head, mostly recumbent and especially close on lateral and posterior zones of mosonotum and on propodeum, except sides, where the surface hardly visible, on dorsum appressed forwards, on posterior aspect radiating from the central pit, located slightly above middle on the medial sulcus, apical portion of the radiating hairs all gradually curved posteriorly. Abdomen with four broad bands of silvery pile, each broader in middle and on lateral areas, ventral plates from apex of 4 to 6 closely covered with short erect delicate blackish pubescence (as in some type of *L. japonica* ♂) mixed with very sparse long fine hairs growing from near apical margin of each sternite.

IOD on vertex approximately as long as antennal joints 3 and 4 combined (15 : 16), joints 4 and 5 appear, on the average, slightly longer than each preceding joint (in some state quite similar in length), joint 3 about 1.7 times as long as broad at apex; rhinaria on joints 7–11, each elongate elliptic in form, on the first three about 4/5 the length of each joint, that on 10 slightly smaller and on 11 very small (size considerably varied, in some, even on 11 fairly large), some-



Figs. 109–120. *Liris* (*Nigliris*) *albopilosa* sp. nov.
109, Clypeus (♂). 110, Ditto (♀). 111, Metasternal plate (♂). 112, Pygidial area (♂). 113, Pygidial area (♀). 114, 8th sternite (♂). 115, Male genitalia, dorsal view. 116, Ditto, ventral veiw. 117, Left volsella, from inside. 118, Right volsella, from outside. 119, Ventralmost process of lamina volsellaris (digitus ?). 120, Penis valve, lateral view.

times they are on joints 6–11, 6–12, or 7–12, every case those on 6 and 12 smaller or smallest. Contour of dorsal surface of head normal, generally similar to *japonica*, but the area posterior to the post-ocellar transverse sinuate impressed line markedly more depressed, as contrasted with post-ocellar region, than in *japonica*. Clypeus comparatively short and broad, with apical margin polished and beveled, without the particular marginal area, and provided in middle with a distinct tooth (Fig. 109). Pronotum on nape with a transverse lunate furrow, complete and deep, very slightly shallowed toward middle, pronotum on posterior margin with a narrow posterior inclination densely covered with silvery pile, not so flatly attached to mesonotum as in many congeners; scutellum and postscutellum usually without the medial impression (only rarely with a feeble impressed line), on mesopleuron anterior oblique suture and scrobal suture deep and distinct, crenate. Propodeum on dorsum basally raised and apically depressed, with a weak medial carina, weaker posteriorly, lateral carinae arising some distance from stigmata extending to posterior aspect, but not always connected with the posterior lateral carina arising at apex and running for about 1/3 of the aspect, in some specimens, however, it completely connected with the carina; metasternal plate: Fig. 111, without medial carina (in *japonica* this carina present). Pygidial area: Fig. 112, with lateral carinae not completely bordering on both sides, at apex shortly produced into teeth, sternite 2 at base somewhat laterally compressed, forming an obtuse median carina, sternite 8 with apex feebly incised in middle (Fig. 114), sometimes the incision very indistinct. Genitalia: Figs. 116 (ventral view) and 115 (dorsal view), volsella from inside: Fig. 117, from outside: Fig. 118, penis valve (lateral view): Fig. 120. Legs with all femora normal, not flattened nor deformed, front and mid femora beneath closely covered with somewhat long half-appressed pile, hind tibiae with a distinct carina on posterior margin and slightly sinuate in the posterior view, apical joints of tarsi not lengthened as in other congeners, about as long as joint 3, the same is true even with front and mid legs. In fore wings abscissae of radial vein markedly varied in relative length as given below and cannot be used as a specific character,

excepting 4 > 1 ≧ others.

4 > 1 > 3 > 5 > 2 (in type), 4 > 1 > 2=5 > 3, 4 > 1 > 2=3=5, 4 > 1 > 3=5 > 2, 4 > 1=2 > 3 > 5, 4 > 1=2=3 > 5, 4 > 1 > 5 > 2=3, 4 > 1 > 2 > 5 > 3, of which 4 > 1 > 2=3=5 most frequent.

Clypeal bevel impunctate and polished, punctures on upper frons very fine and close, on vertex posterior to lateral ocelli slightly larger and spaser, but the intervals still narrower than point, on mesonotum much larger (as in *japonica*), well separated, but the interspaces still narrower than punctures (but sparser than in *japonica*), only in part subequal, on scutellum and mesopleuron sparser, slightly finer, with intervals distinctly larger than the width of punctures. Dorsum of propodeum (not well visible owing to close appressed hairs in fresh specimens) at base rather coarsely irregularly reticulate, the sculpture posteriorly finer and on medio-apical portion subgranulate, on lateral areas turning into coarse striae, on posterior aspect transversely coarsely somewhat arcuately striate, the striae laterally and upwards much stronger, lateral carinae as mentioned above; sides of the segment obliquely, fairly strongly and closely striate or rugoso-striate, in most specimens the striae disturbed toward middle of their length by the short cross rugae; abdominal tergites very minutely densely punctured, punctures basally more minute and closer, apically finer and sparser.

♀. Length 7.0–8.5 mm. Similar to the male. Pilosity similar including on legs, but on head and body slightly less abundant, but markedly abundant as compared with other relatives. IOD at vertex approximately as long as antennal joints 2+3 (ratio 16 : 17), joints 4, 5 and 6 progressively slightly longer than each preceding joint, joint 3 about twice as longas wide at apex, joints 6–12 carrying rhinaria, ellipitc in form, on 6 small, sometimes very small, others large and distinct except ultimate one which is often smaller, but there is no variation in their distribution as far as examined specimens concerned. Clypeus (Fig. 110) with produced area comparatively broad, gently rounded, always with a minute incision in middle, beveled area smooth and shining, without the reflected marginal area as in ♂. Metasternal plate as in ♂, pygidial area: Fig. 113, hairs not stiff, short and recumbent, mixing a few erect longer hairs, apical margin provided with 4–5 short spinules. Apical joints of tarsi normally lengthened, more than as long as joint 3 of the respective tarsus. Abscissae of radial vein in fore wing as in ♂, quite variable. In punctuation generally similar to ♂, but the hair-bearing points on abdomen too weak to be called punctures, practically impunctate.

Holotype: ♂ Hualien Pref (Liyuchih, 16. VIII. 1966), K. Tsuneki leg.

Paratypes: 20 ♀♀, other specimens 31 ♂♂. All but three were collected on the areas lying east to the central mountains:

7 ♀♀ 20 ♂♂, Taitung Pref. (5 ♀♀ 18 ♂♂, Taitung, 15. VIII.; 1 ♀, Chihpenchi, 13. VIII.; 1 ♂ 2 ♂♂, Taoyeh, 14. VIII.); 13 ♀♀ 23 ♂♂, Hualien Pref. (Liyuchih, 16. VIII.); 6 ♂♂, Ilan Pref. (Tsukeng, 20. VIII.); 1 ♂, Chiayi Pref. (Chuchi, 20. VII.); Pingtung Pref. (2 ♂♂, Fangliao, 31. VII.; 1 ♂, Hengchun, 2. VIII.; 4 ♂♂, Kenting, 9. VIII.)

Remarks. The variations of the distribution of rhinaria on antennal joints in males are as follows:

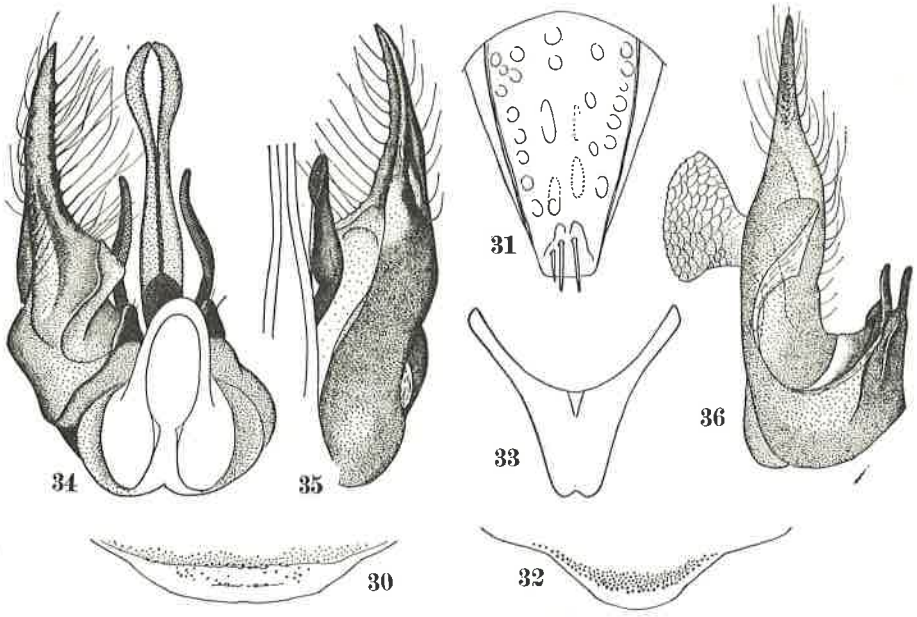
Joints 6–12.	3 exs.	(Liyuchih, Taitung)
Joints {6–12 (right) / 7–12 (left)}	1 ex.	(Tsukeng)
Joints 7–11	32 exs.	(Taitung 10, Liyuchih 15, Taoyeh 2, Chuchi 1, Tsukeng 2, Hengchun 1, Fangliao, 1)
Joints 6–11	11 exs.	(Taitung 7, Liyuchih 3, Fangliao 1)
Joints 7–12	11 exs.	(Tsukeng 3, Liyuchih 4, Kentin 4.)

In one specimen captured at Liyuchih the 4th joint of the right antenna was abnormal, i.e. much abbreviated, basally rather constricted and markedly incrassate toward the apex, apparently similar in form to the 2nd joint.

11. *Liris* (*Cratolarra*) *pitamawa* (Rohwer, 1919)

Cratolarra pitamawa Rohwer, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 14: 7, 1919 (♀, Luzon).
Notogonidea (*Cratolarra*) *pitamawa*: Williams, Ibid., 19: 80, 1928 (♀,♂, Philippines).
Cratolarra fuscinerva: Tsuneki, Etizenia, 17: 8, 1966 (♀,♂, Formosa).

Cratolarra is characteristic in having the pronotum well developed and thick, not acutely ridged on top and raised to about level of mesonotum (♀♂), upper frons and vertex markedly weak in the contour (♀♂), and pygidial area bare and polished (♀). In my previous papers I have dealt with the group as a genus, but now it was sunk to a subgenus of *Liris* (s. l.). The treatment is in agreement with the view of Williams (1928).



Figs. 30–37. *Liris* (*Cratolarra*) *pitamawa* (Rohwer).
30, Clypeus (♀). 31, Pygidial area (♀). 32, Clypeus (♂). 33, 8th sternite (♂).
34, Male genitalia, ventral view. 35, Ditto, dorsal view. 36, Ditto, lateral view.

In this species the mandibles with two teeth on inner margin, well developed in ♀, but less so and very minute in ♂. Clypeus: Figs. 30 (♀) and 32 (♂), rhinaria on antennal joints 7–11 in ♀, small elliptic impressions, on 4–13 in ♂, usual rectangular bare area on posterior side of each joint, except 13. Punctures on head and thorax very fine and close, rather finely coriaceous. In many respects this species seems closely related to *Liris nigra* Lind.

Male genitalia: Figs 34 (ventral view), 35 (dorsal) and 36 (lateral); volsella characteristic in form (Fig. 36). 8th sternite: Fig. 33 (♂). Pygidial area: Fig. 31 (♀), with 2 or 3 spines at apex.

Specimens examined: 5 ♂♂ 4 ♂♂. 1 ♀ 1 ♂, Chiayi Pref. (1 ♀, Chuchi, 21. VII.; 1 ♂, Fenchihu, 24. VII.); 2 ♀♀ 2 ♂♂, Nantou Pref. (Lihyuehtan), 14. VII, 24. VIII.; 2 ♀♀, Ilan Pref. (Tsukeng), 19, 22. VIII.

4. Genus *Tachytes* Panzer, 1806

1. True feature of *Tachytes auropilosus* Rohwer and *Tachytes sinensis purpureipennis* Matsumura et Uchida

Tachytes auropilosus Rohwer, Proc. U. S. Nat. Mus., 39 (1794): 484, 1911 (♀, Formosa).
Tachytes sinensis Sm. var. *purpureipennis* Matsumura et Uchida, Ins. Mats., 1 (1): 42, 1926 (♀, ♂, Okinawa and Formosa).

In my previous paper (1966) I paid some consideration to these questionable species and finally I placed the latter species with a query under the ferruginous legged form of *T. sinensis*, but could not determine the status of the former species.

During my stay at Puli (type locality of *T. auropilosus*) for about 20 days in the middle of July and late in August I searched for this species with a considerable effort. Nevertheless, I could not rediscover this curious species, although I could collect a fair number of the specimens belonging to the genus *Tachytes* in and around the city. I further searched for this *Tachytes* everywhere I visited, but it did not make its appearance until I left the Island. However, in the course of rough classification of the collected material in my laboratory I came to notice that abundant specimens having characters well agreeing with the original description of *T. auropilosus* had been collected not only in Puli but also in various lowland villages of Formosa. But, they were not the member of *Tachytes*, but belonged to a different genus. It is *Liris* (*Liris*) *aurulenta* (Fabricius)! Everyone will most easily confirm the identity of that phantom *Tachytes* with this beautiful Larrine wasp except the colour of the pygidial hairs which, however, is probably due to after change.

No doubt, this is the true feature of *Tachytes auropilosus*!

The same also must be true with that species called *Tachytes sinensis* var. *purpureipennis*. In this case the description is too simple and the enigma might not have been solved without the aid of the detailed description of Rohwer.

2. *Tachytes sinensis fundatus* Rohwer, 1911 (conj. nov.)

Tachytes fundatus Rohwer, Rroc. U.S. Nat. Mus., 39 (1794): 484, 1911 (Horisha, Formosa).
Tachytes sinensis, a form, Tsuneki, Etizenia, 17: 10, 1966 (Formosa and Ryukyus).

Specimens examined: 2 ♀♀ 2 ♂♂, Taipei Pref. (Yangmingshan, 1. VII. 1965), T. Shirozu; 1♀, Taoyuan Pref. (Kuangyin). 10. VIII. 1966, B. S. Chang.

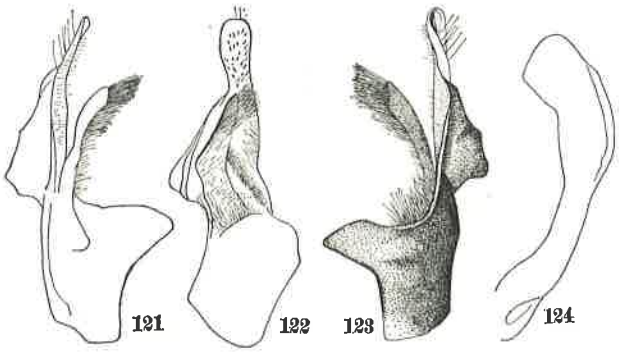
Remarks. We could not collect this subspecies of *sinensis* in the suburbs of the city Puli (Horisha, type locality). Probably the appearance of this form is earlier than other species (?). The specimens captured on Yangmingshan, north of Taipei, by Prof. T. Shirozu are regarded to represent this subspecies. But they differ in some respects from the original description of *fundatus*, ♀, to which some comments will be given below.

(1) No line from the anterior ocellus. In all the specimens examined an impressed bare, more or less glossy line runs from the anterior ocellus below, though varied in width. (2) Space between the eyes at the vertex hardly as great as the length of the first flagellar (3rd antennal) joint. In the Japanese female specimens it is almost always as great as the length of the compared joint, while in the Formosan form it is slightly less than so, ratio 27–28 : 25. Such a slight difference, however, can not be perceived without actual measurement. (3) Pedicel not twice as long as wide. Does it mean "more than as long as wide and less than twice so" ? In *sinensis* including the Formosan race the 2nd joint of antenna is hardly as long as wide. If *twice* is removed from the description it well coincides with the case.

Some other characters given in the description: Length ♀ 20 mm, ♂ 16.5 mm. Scutellum,

metanotum and the dorsal aspect of propodeum with an impressed longitudinal line, which broadens into a triangular fovea at the apex of the propodeum (♀. Remarks of K.T.: the impressed line sometimes very feeble). Black; tegulae and legs below femora red or reddish brown (♀. Remarks of K.T.; usually femora at apex and beneath more or less ferruginous). ♂: Anterior margin of the clypeus slightly produced in the middle, otherwise as in female; space between the eyes at the top not more than two thirds the length of the first flagellar joint (3rd antennal joint); emargination of the *seventh* (proabbly mistake of 8th) ventral plate arcuate, lobes broad, obtuse; hairs of the pygidium silvery; hairs on thorax not so dense. (All well agree with the characters of the specimens under examination.)

Male genitalia: Figs. 121–124



Figs. 121–124. *Tachytes sinensis fundatus* Rohwer, male genitalia.
121, Right paramere with volsella, inside view. 122, Left paramere, broadest view of apical portion, from beneath slightly outside. 123, Right paramere with volsella, lateral view. 124, Penis valve, lateral view.

3. *Tachytes shirozui* Tsuneki, 1966

Tachytes shirozui Tsuneki, Etizenia, 17: 11, 1966 (♀, Formosa.)

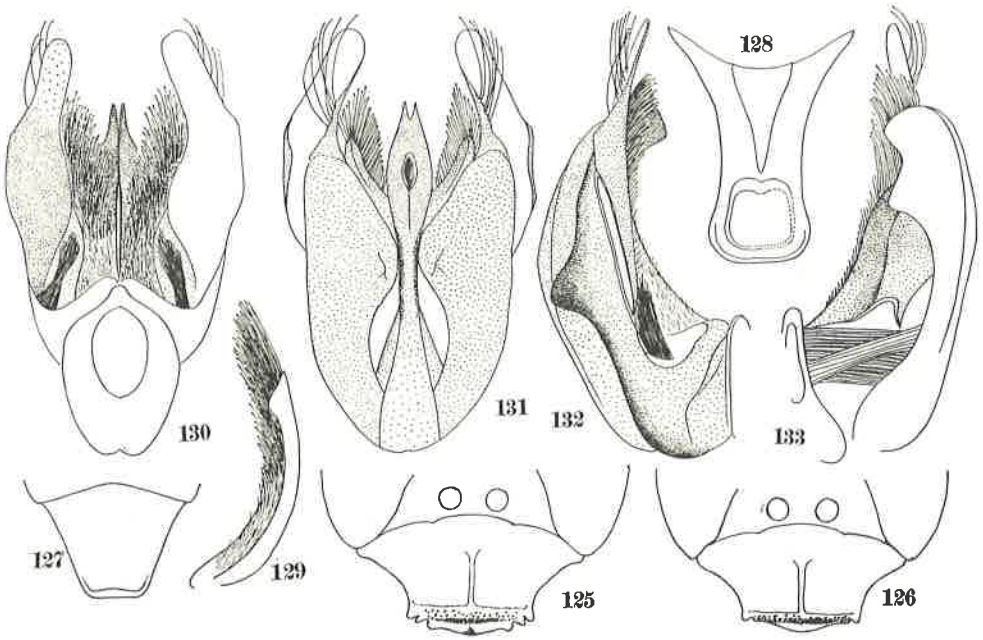
The male remains undescribed.

♂. Length 11–17.5 mm, mostly 15 mm or so. Pilosity deep golden and long on head, whole thorax-complex, lst abdominal tergite and all femora beneath as in ♀. Clypeus long (Fig. 126) as in ♀ (Fig. 125), but without the medial incision, IOD at vertex about 1/7 the width of head (in ♀ approximately 1/4.5) and very slightly longer than antennal joint 3 (20 : 23) which is about 2.5 times as long as wide at apex (dorsal view), succeeding joints progressively very slightly reducing in length, joint 4 approximately 5/6 as long as joint 3 and twice as long as wide at apex. Propodeum with the ground short appressed pile much less abundant than in ♀ and the surface fairly well visible, but the segment covered with long pubescence as in ♀. pygidial area: Fig. 127, covered with short stiff silvery hairs, in some light with brassy effulgence on apical portion. Length relation between sections of radial vein as in ♀. Genitalia seen from beneath: Fig. 130, from above: Fig. 131, paramere in the lateral view: Fig. 132 (external view), well chitinized and black, only apically brownish and dorsally with discoloured area, from inner margin of which growing a few long stiff hairs, on ventral side near base with an elongate impression in which a bundle of castaneous silky bristles included (Fig. 130). Penis valve with an elliptic impression on dorsal aspect near apex, its lateral view: Fig. 133, volsella on ventral side completely covered with thick hairs, the hairs longer apically. Eight sternite: Fig. 128. Punctuation as in ♀.

Specimens collected: 4 ♀♀ 38 ♂♂, Nantou Pref. (2 ♀♀ 13 ♂♂, Penpuchi, 10. VII.; 25–30. VIII.; 1 ♀♀ 25 ♂♂, Wushe, 29. VIII.).

Remarks. The type was a somewhat aged female having the clypeal margin fairly worn out. The fresh specimens newly obtained retain the complete clypeus which shows a small impression at the apex in the middle, instead of a medial incision. The males were quite abundantly observed on the flowers of *Ampelopsis heterophyta* Sieb. et Zucc. growing on the cliffs along

the high way between Wushe and Lushan late in August in 1966.



Figs. 125–133. *Tachytes shirozui* Tsuneki.
125, Clypeus (♀). 126, Ditto (♂). 127, Pygidial area (♂). 128, 8th sternite (♂). 129, Volsella. 130, Male genitalia, ventral view. 131, Ditto, dorsal view. 132, Left paramere with penis valve (hairs of volsella can be seen). 133, Ditto, inside view.

4. *Tachytes formosanus* Tsuneki, 1966

Tachytes formosanus Tsuneki, Etizenia, 17: 12, 1966 (♂, Formosa).

The female of this species remains undescribed.

♀. More closely vesembling the female of *T. sinensis* having the black legs. But it is on the average smaller in body size, with 4 silvery pile bands on abdomen, has the median impressed line in front of anterior ocellus much narrower and less shining, medio-apical flattened triangular impresssion on disc of propodeum well shining.

Length 16–19 mm. Pilosity as in ♂, except pygidial area which is castaneous brown, in some light with cupreous shine. Mandibles sometimes wholly black with aeneous shine on apical portion, sometimes broadly dark reddish in the middle region; palpi, calcaria, spines and claws of legs largely brown. Clypeus (Fig. 134) in structure similar to ♂ (Fig. 135), or to *sinensis* ♀, IOD at vertex very much wider than in ♂ (but much less broad than in *shirozui*), slightly less than as long as antennal joint 3 (ratio 4 : 5) and approximately as great as length of vertex*, length ratio between antennal joints 3, 4 and 5 about 25 : 21 : 19 , joint 3 nearly 2.5 times as long as wide at apex, median longitudinal impression on scutellum and postscutellum very weak, the so-called smooth area on disc of propodeum elongate triangular, with surface almost flattened and half-shining. Length relation between abscissae of radial vein: $4 > 1 > 3 > 2 > 5$, but the difference between 1, 3 and 4 rather slight. Posterior aspect of propodeum on posterior portion obliquely (divergent upward) finely closely rugoso-striate, the rugose striae anteriorly gradually less distinct and rather finely closely rugoso-punctate (as in ♂), sides of the segment smooth,

* Length of vertex: The distance between posterior margin of the postocellar impression and the line connecting the posterior margins of eyes.

but posteriorly and dorsally scattered sparsely with comparatively large rounded shallow punctures.

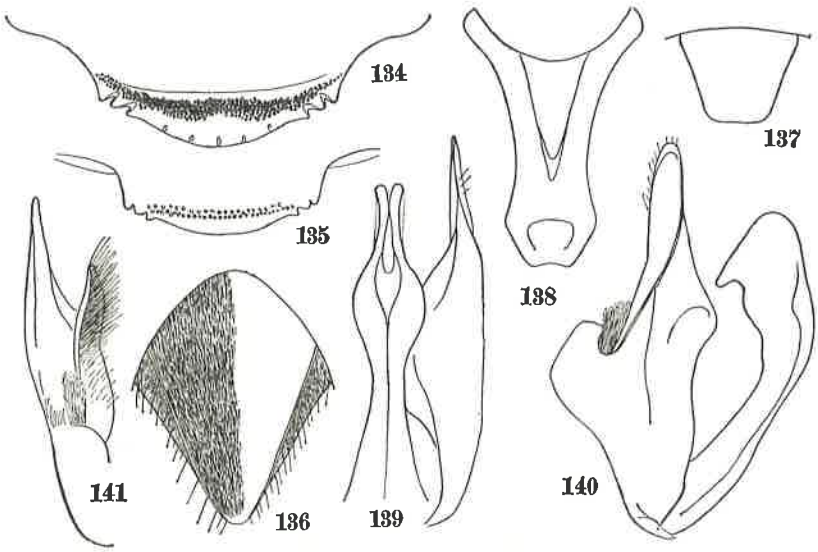
Specimens examined: 5 ♀♀ 37 ♂♂. 1 ♂, Taipei Pref. (Yangmingshan, 24. Vlll.) 3 ♂♂, Taoyuan Pref. (Yangmei, 5, 6. VIII.); 2 ♀♀ 9 ♂♂, Ilan Pref. (Tsukeng, 19–22. VIII.); 3 ♂♂, Nantou Pref. (1 ♂, Puli, 13. VII.; 2 ♂♂, Penpuchi, 30. VIII.); 1 ♂, Chiayi Pref. (Chuchi, 21. VII.); 2 ♀♀ 14 ♂♂, Taitung Pref. (Chulu, 12. VIII.); 1 ♀ 6 ♂♂, Pingtung Pref. (1 ♀, Manchou, 4. VIII.; 5 ♂♂, Kentin, 2. VIII.; 1 ♂, Oluampi, 3. VIII.).

Remarks. By examining the female it becomes obvious that this species is very close to *Tachytes silvicola* Williams (1928) known from Luzon and also to *T. silvicolloides* Williams (1928) recorded from the Is. of Samar. According to the original description the former is considered a synonym of *Tachytes sinensis* Smith. *T. formosanus* differs from *T. silvicola* at least by the IOD at vertex less than as long as antennal joint 3 and the presence of 4 pile bands on abdomen and from *T. silvicolloides* differs at least in that the IOD at vertex smaller than the length of antennal joint 3, the anterior marginal area of clypeus with the posterior bordering line of punctures roundly curved, without medial emargination on the extreme apex and wings fairly strongly yellowish.

Further examination of the male genital organs and the related sclerites showed that the structure of the genitalia given in my previous paper was reconfirmed, but at the same time the 8th sternite must slightly be emended in the form of the apical convergency. The corrected form was given in Fig. 138. Variation in body length (♂) from 13 to 18 mm, mostly 15 mm or so.

In one male specimen captured on Yangmingshan IOD at vertex is about 3/2 the length of antennal joint 3, but the genital organ completely agrees in struchure with the usual specimens and it seems not unreasonable to place such a deviation within the variation of this species.

Finally it must further be confirmed that the most important specific character of this species among the closely related congeners lies in the struchure of the penis valve of the male genitalia. For this purpose the figure was reproduced (Fig. 140).



Figs. 134–141. *Tachytes formosanus* Tsuneki.
134, Clypeus (♀). 135, Ditto (♂). 136, Pygidial area (♀). 137, Ditto (♂). 138, 8th sternite (♂), from inside. 139, Male genitalia, dorsal view. 140, Ditto, lateral view (paramere and penis valve). 141, Left paramere and volsella.

5. *Tachytes fruticis* Tsuneki, 1964

? *Tachytes magellanica* Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 91, 1928 (Philippines).
Tachytes fruticis Tsuneki, Etizenia, 5: 8, (♀ ♂, Japan and Korea)
Tachytes fruticis Tsuneki, Ibid., 17: 14, 1966 (Formosa)

Specimens examined: 4 ♀♀ 11 ♂♂. 2 ♀♀ 4 ♂♂, Taoyuan Pref. (Yangmei, 5, 6. VII); 1 ♀ 4 ♂♂, Nantou Pref. (1 ♀ 2 ♂♂, Puli, 13, 17. VII.; 2 ♂♂, Penpuchi, 29. VIII.); 1 ♀ 1 ♂, Chiayi Pref. (Chuchi, 21. VII.); 1 ♂, Taitung Pref. (Chulu, 12. VIII.); 1 ♂, Pingtung Pref. (Kentin, 9. VIII.).

Remarks. This species closely resembles *Tachytes magellanica* Williams, 1928, and the detailed study of the latter may show that they are conspecific. So far as the description of *magellanica* is concerned, however, *fruticis* (♀♂) differs from it at least in that joint 3 of antennae not shorter than joint 4, but rather slightly longer, clypeus not notched medianly at apex as a rule (rarely so in ♂), smooth area on disc of propodeum not carinate. Further, the most important is the fact that the male genitalia of *fruticis*, in comparison with the figure of *magellanica*, have the parameres with apical portion slenderer and longer, with its lateral angulate expansion stronger and more distinct. In these respects the Formosan specimens well agree with the Japanese representatives.

6. *Tacytes modestus* Smith, 1856

Tachytes modestus Smith, Cat. Hym. Ins. Brit. Mus., 4: 299, 1856 (♀, India).
Tachytes modesta: Bingham, Faun. Brit. Ind., Hym. I: 190, 1897 (♀ ♂, Burma, China).
? *Tachytes dilwara* Nurse, Jour. Bombay Nat. Hist. Soc., 15: 3, 1903.
? *Tachytess surigensis* Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 88 (Philippines).
Tachytes modesta: Yano, 1932, p. 276; *Tachytes modestus* Yasumatsu, 1939, p. 375.
Tachytes modestus: Tsuneki, Etizenia, 5: 5, 1964; — Ibid., 17: 14 (Formosa).

Specimens examined: 15 ♀♀ 33 ♂♂. 2 ♂♂, Taoyuan Pref. (Yangmei, 5.VII.); 7 ♀♀ 12 ♂♂, Ilan Pref. (Tsukeng, 20–22. VIII.); 4 ♀♀ 8 ♂♂, Nantou Pref. (Puli, 16. VII., 25. VIII.); 1 ♂, Chiayi Pref. (Chuchi, 20. VIII.); 3 ♂♂, Tainan Pref. (Kuantsuling, 19. VII.); 4 ♂♂, Taitung Pref. (1 ♂, Chihpenchi, 13. VIII.; 3 ♂♂, Taoyeh, 14. VIII.) 3 ♀♀ 2 ♂♂, Pingtung Pref. (3 ♀♀, Kentin, 3, 9. VIII.; 2 ♂♂, Manchou, 4. VIII.).

Remarks. This widely distributed Asiatic species has been known from India through the Continent to Japan. Recently the species was known to occur also in Formosa and it has a high possibility that *Tachytes surigensis* known from the Is. of Mindanao is a synonym of the present species. As I previously (1966) referred to, *T. surigensis* Williams has the external characters in both sexes practically identical with those of *T. modestus* except for the clypeal form in ♀. The examples dealt with by him, however, were scanty (1 ♀ 5 ♂♂), and if the single female examined had the somewhat worn-out clypeus the difference completely disappears.

In this connection it must be mentioned that Williams placed a considerable stress in regard to the taxonomic value upon the detailed structure and punctuation of the clypeus in both sexes. But it seems to go too far. According to the examination of a number of specimens of the same species, the characters of the clypeus sometimes fairly variable. In order to use the characters as criterions of taxonomy, therefore, statistic backing up seems to be necessary. Furthermore, the clypeus is easily worn out by the digging work of the wasp and the detailed structure becomes undiscernible. As an instance of variation the clypeal forms in the fresh males of *T. modestus* collected in Formosa were given here (Fig. 142).

As to the male genitalia, however, *T. surigensis* is said to bear a single very prominent bristle on the dorsal side of the paramere near the apex. It is completely absent in *T. modestus*. Further, as compared with the William's figure, the paramere in *modestus* much slenderer and longer apically, with the lateral angulate process much more acute.

I took out the genital organs from five Formosan male specimens collected in different localities. They are completely unanimous with each other and also with those of the Japanese specimens.

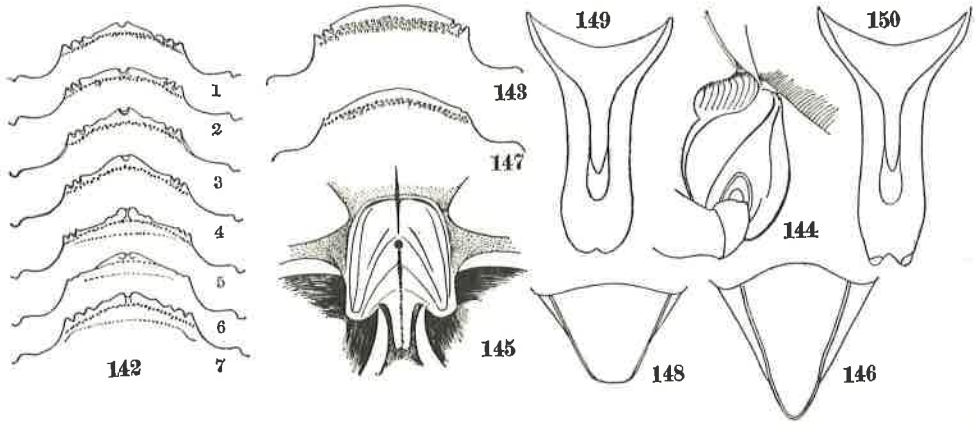
Basing on the above mentioned genitalial difference alone *T. surigensis* was treated as a species distinct from *T. modestus*. But further studies seem to be necessary.

7. *Tachytes hengchunensis* sp. nov.

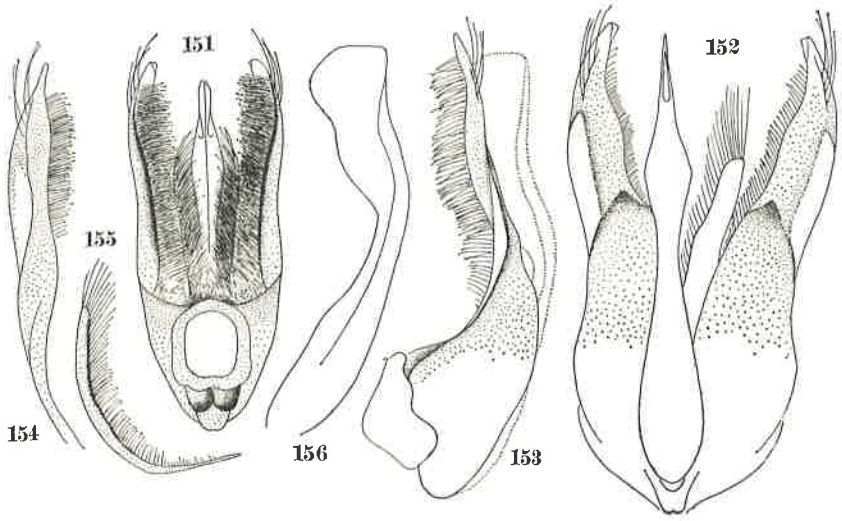
This species seems somewhat resembling *T. vicina* Cameron, 1889, but is smaller and differing at least in that the dorsal aspect of propodeum much shorter than mesonotum, with the smooth area on its medio-apical portion not polished and wings nearly clear hyaline. Further, the short stiff hairs on pygidium coppery black, not pure black. This species seems also close to *T. astuti* Nurse, 1909, known from India, but is much smaller, different at least in that the IOD on vertex much broader.

In the Williams' key to the Philippine species it directly runs to the group of *Tachytes bakeri* and *magellanica*. From the former, however, it can be distinguished by the differences in the sculpture on the posterior aspect of the propodeum, in the punctuation of the clypeus and in the length relation between abscissae of radial vein, and from the latter by the distinctions of the body size much smaller, of the clypeus medianly at apex not notched and with another punctuation, as well as of the IOD at the vertex relatively much broader. On the other hand, this species is apparently similar to the Japanese species, *T. latifrons* m., but is different from this in the state of convexity of the clypeus (crest at about 1/3 of the raised area from base, in *latifrons* almost regularly convex), in the IOD at the vertex relatively much smaller and in the metasternal plate otherwise structured.

♀. Length about 12.0 mm. Black, mandibles medianly broadly reddish (in the type partly turned into bronzy), tibial spurs ferruginous and posteriorly more brownish, spines nearly white and palpi slightly brownish. Pubescence on face and clypeus brassy, abundant, long and appressed, mixing erect hairs; temples, pronotum, humeral angles, lateral and posterior areas of mesonotum, mesopleuron, sides of scutellum, postscutellum wholly, postero-lateral regions broadly of propodeum, front and mid femora posteriorly and beneath, front and mid tibiae apically and hind



Figs. 142–150. Fig. 142, *Tachytes modestus* Smith, variation of clypeal form (♂). Fig. 143–150. *Tachytes hengchunensis* sp. nov. 143, Clypeus (♀). 144. Left mid coxa, with precoxal swelling and impression. 145, Metasternal plate (♀). 146, Pygidial area (♀). 147, Clypeus (♂). 148, Pygidial area (♂). 149, 150, 8th sternite (♂), two forms.



Figs. 151–156. *Tachytes hengchunensis* sp. nov., male genitalia.
151, Ventral view. 152, Dorsal view. 153, Paramere. 154, Ditto, excluding basiparamere. 155, Volsella. 156, Penis valve.

tibiae broadly covered with short appressed silvery (slightly brassy) pile, mixing longer erect hairs; abdominal tergites 1–4 with comparatively broad silvery pile bands. Pygidial area covered with stiff dark coppery hairs, brightly shining in certain light.

IOD at vertex as long as antennal joints 2+3, frontal groove in front of anterior ocellus fine, glittering, but largely covered with appressed hairs; clypeus (Fig. 143) with relative width (at outer bases of mandibles) to length in middle approximately 5 : 2, disc convex, with its crest near base and broadly inclined anteriorly, marginal area bordered posteriorly by a nearly straight line on the closely punctured inclination of the disc, without medial notch, with three lateral teeth as usual. Antennal joint 3 nearly 2.3 times as long as broad at apex and subequal in length to the following joint, scutellum medio-posteriorly with a feeble tubercle, postscutellum medianly with a weak impressed line. Propodeum with dorsal aspect slightly less than half as long as mesonotum, with a shallow groove in middle, the bare area broad triangular (seen vertically from above), medianly longitudinally gradually but stoutly raised, the surface anteriorly somewhat polished and whole the surface transversely closely striate, the medial elevation continued to the top of the posterior aspect in a feature of inverted isosceles triangle, then turning into the median furrow which is comparatively narrow, reaching near the apex. Mesopleuron with precoxal elevation and furrow as in Fig. 144, metasternal plate: Fig. 145, pygidial area: Fig. 146. Front metatarsus with 6 outer spines (including the apical one). In one of fore wings abscissae of radial vein: $4 > 1 > 3 > 2 > 5$, in the other $3 \fallingdotseq 2$.

Vertex finely closely punctured, clypeus more grossly, very closely punctured with anterior marginal area irregularly weakly sculptured, fairly shining. Punctures on mesonotum and scutellum fine and close, propodeum slightly more grossly shallowly and very closely punctured or granulate, seen obliquely from behind the surface transversely somewhat arcuately striate, posterior aspect similar in sculpture, but posteriorly more distinctly transversely striate. Abdominal sternites minutely coriaceous, somewhat glossy, with a few large hair-bearing punctures near each apical margin.

♂. Length 9–10 mm. (one of the two specimens fairly strongly worn out, the other also not

fresh). Very similar to ♀. But the lateral teeth of the anterior margin of the median lobe of clypeus only two in number, short and blunt (Fig. 147), disc of propodeum about half as long as mesonotum. Antennal joint 3 about twice as long as broad at apex, subequal to joint 4 or 5, (IOD= 2 + 3), metasternal plate as in ♀, pygidial area: Fig. 148, covered with silvery hairs. Genitalia very similar to those of *T. latifrons*, but the paramere slenderer and more narrowed at apex, penis valve with apico-ventral angle more rounded (Fig. 156).

Holotype: ♀, Pingtung Pref. (Hengchun, 8. VIII,), K. Tsuneki leg.

Paratypes: 1 ♂, Pingtung Pref. (Kentin), 3. VII. (T.T.); 1 ♂, Taitung (Taoyeh), 14, VIII. (K.T.)

Remarks. The males are worn out specimens, almost lacking the pile bands on the abdomen and the pubescence on other portions of the body is also heavily rubbed off. Especially one of them has the clypeus and mandibles and even the 8th sternite (Fig. 150) markedly worn out.

5. Genus *Tachysphex* Kohl, 1883

1. *Tachysphex bengalensis* Cameron, 1889

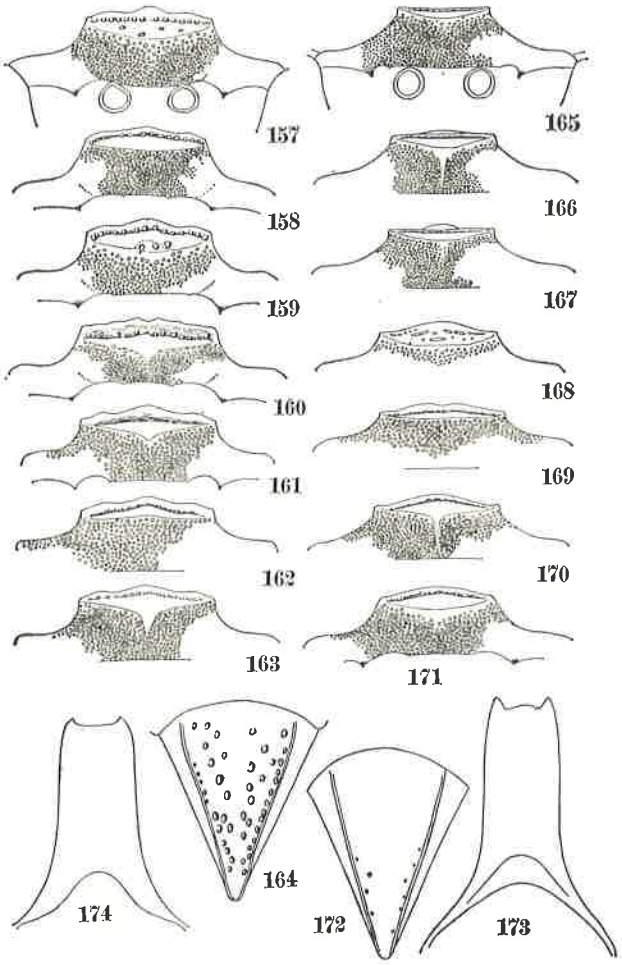
Tachysphex bengalensis Cameron, Mem. Proc. Manchester Lit. Phil. Soc., 4 (2): 144, 1889 (♀, India).
Tachysphex bengalensis: Bingham, Faun. Brit. India, Hym. I: 193, 1897 (♀, India).
Tachysphex bengalensis: Turner, Mem. Dept. Agr. Ind., Ent. Ser., 5 (4): 198, 1917 (♀, India).
Tachysphex bengalensis: Williams, Bull. Exp. Sta. Hawaii. S.P.A., Ent. Ser., 19: 92, 1928 (♀♂, Philippines).
? *Tachysphex mindorensis* Williams, Ibid., p. 92, 1928 (♀ ♂, Philippines).
Tachysphex japonicus Iwata, Trans. Kansai Ent. Soc., 4: 27, 1933 (♀ ♂, Japan). (SYN. NOV.)
Tachysphex japonicus: Sibuya, Ibid., p. 51, 1933 (biol.).
Tachysphex bengalensis: Yasumatsu, Trans. Sapporo Nat. Hist. Soc., 16 (2): 97, 1940 (Botel-Tobago).
Tachysphex japonicus: Yasumatsu, Icon. Ins. Jap., Ed. II: 1476, 1950.
Tachysphex bengalensis: Krombein, Proc. Hawaii. Ent. Soc., 13 (3): 382, 393, 1949 (Marianas, Carolines).
Tachysphex japonicus: Tsuneki, Life Study, 6 (1): 4, 1962 (Ryukyus); Ibid, 8 (4): 63 (Korea); Etizenia, 17: 14, 1966 (Ryukyus).

Specimens: 34 ♀♀ 28 ♂♂. 4 ♀♀ 5 ♂♂, Taipei Pref. (Yangmingshan, 3. VII.; 25. VIII); 4 ♀♀ 1 ♂, Nantou Pref. (4 ♀♀ 1 ♂, Penpuchi, 13. VII,; 26–30. VIII. 1 ♂, Lihyuehtan, 24. VIII.); 1 ♀ 4 ♂♂, Ilan Pref. (Tsukeng, 20–22. VIII); 1♀, Chiayi Pref. (Chuchi, 20. VII.); 7 ♀♀ 6 ♂♂, Hualien Pref. (Liyuchih, 16. VIII.); 9 ♀♀ 6 ♂♂, Taitung Pref (7 ♀♀ 6 ♂♂, Taitung, 11, 15. VIII.; 1 ♀, Chulu, 12. VIII.; 1 ♀, Taoyeh, 14. VIII.); 8 ♀♀ 5 ♂♂, Pingtung Pref. (4 ♀♀ 1 ♂, Hengchun, 2, 8. VIII.; 3 ♀♀ 4 ♂♂, Kentin, 9. VIII.; 1 ♀, Ssuchungchi, 6. VIII.).

Remarks. The Formosan specimens of *Tachysphex* which I determined to allocate within the species, *T. bengalensis* Cameron, show fairly varied characters and there remains some doubt as to whether they really belong to a single species or not. I could not find, however, any definite combination of some characters among them clearly separable into different groups. In the following such variations will be described and discussed.

(1) Clypeus. In form varied as shown in Figs. 157–160 (♀) and Figs. 165–168 (♂). Anterior polished area in ♀ usually extended backward beyond the bevel to anterior portion of the gently convexed disc. But the extent sometimes occupies approximately half the length of the clypeus, sometimes only a third. Particular attention should be paid to Fig. 168 which represents the form in *Tachysphex mindorensis* Will. Further mention will be given regarding this example (captured on Yangmingshan) in connection with the following characters.

(2) IOD at vertex. In ♀, most usually it is slightly more than as long as antennal joints



Figs. 157–174. *Tachysphex bengalensis* Cameron. 157–163, Clypeus (♀); 157–160, Formosan exs., 161–163, Japanese exs. 165–171, Clypeus(♂), 165–167, common to Form. and Jap.; 168, Form.; 169, Ryukyu and Jap.; 170, 171, Jap. (168 and 171 in the form of *T. mindorensis*). 164, Pygidial area (♀). 172, Ditto(♀), different in punctuation. 173, 8th sternite, a form in Jap. exs. 174, Ditto, a form in Form. exs.

2 and 3 combined (7:6—5:4), but in a considerable number it is as long as that length. In ♂, the distance usually as long as antennal joints 2+3+4. In 4 specimens (2, Yangmingshan; 1, Lihyuehtan; 1, Tsukeng), however, it is distinctly less than as long as the 3 joints united (4:5). Of the 4 one of the Yangmingshan examples possesses the clypeus of the *mindorensis*-type, while others another types.

(3) Antennal joints. In ♀, joint 3 equal to, or longer than, joint 4. In ♂, joint 3 slightly or fairly longer than joint 4 (5 : 4—3 : 2), but sometimes subequal (about 7 : 6). Joints 4 and 5 in both sexes slightly but distinctly longer than each preceding joint. The same is the case with joint 6 in ♂, but in ♀ 5 and 6 subequal. No rhinaria nor tyloidea on any joint.

(4) Punctures on vertex and mesothorax (♀ ♂). On vertex usually the averaged intervals as wide as punctures, but in some specimens wider than punctures. On mesonotum (except medio-posterior area) punctures close, subreticulate; some specimens, however, with distinct interspace; density of punctures on mesopleuron (except posterior portion) fairly varied, sometimes subreticulate, sometimes sparse, with intervals as great as, in some males even greater than, width of punctures. On scutellum, as on posterior area of mesonotum, punctures slightly larger and much sparser.

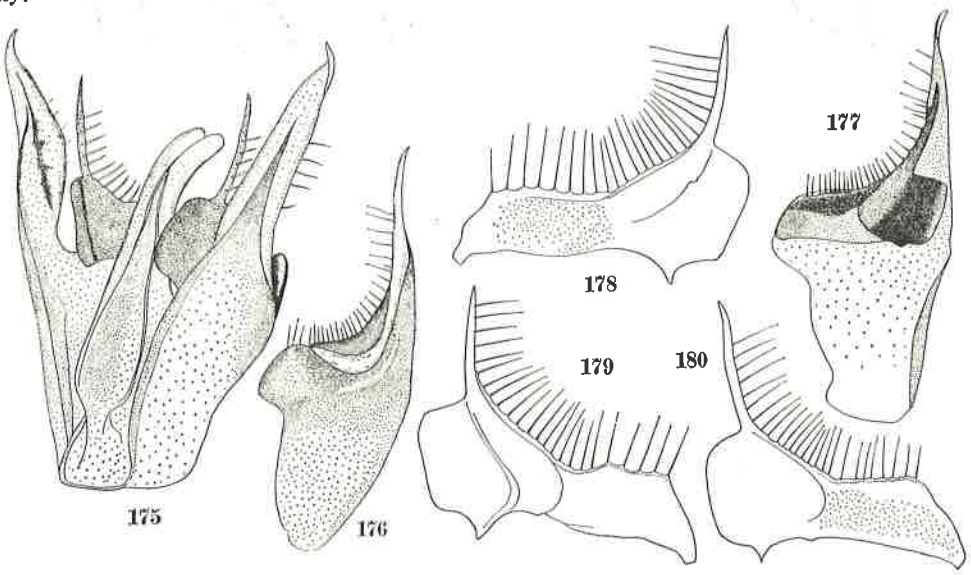
(5) Sculpture on dorsal aspect of propodeum (♀ ♂). At base fairly closely longitudinally striate, more or less rugosely so, the striae posteriorly broadly closely and irregularly rugose, so that the surface apparently reticulate. Relative length of the basal striated area markedly varied, occupying sometimes only basal 1/5, sometimes in the extreme case 4/5 of the dorsum, with various intermediate degrees in between; intervals of the striae finely wrinkled. In some specimens the striae and rugae rather coarse and stronger. On medio-apical area sculpture always somewhat or considerably weak, with surface more or less glossy in oblique light, but never smooth and polished.

(6) Pygidial area (♀). In form generally similar (Figs. 164, 172), sometimes the surface largely (except apical portion) minutely coriaceous, sometimes largely (except basal portion) polished, with punctures sometimes almost lacking, sometimes scattered all over the area, some-

times mainly restricted to the lateral marginal area, sometimes partly rugosely confluent, with no correlation with the states of the ground sculpture, nor with other characters.

(7) Relative width of submarginal cell as measured on radial vein. Relative length of abscissae as follows (♀♂): 4 > 1 ≧ 2 > 3 ∠ 5, varying without linked relation with other characters. Abscissa 5 (= apical transverse radial vein) very slightly oblique, not reaching apex of submarginal cell 3 and with a distinct appendicular cell.

(8) Male genitalia (Fig. 175, obliquely from above). Paramere: Fig. 176 (from outside). Paramere and volsella: Fig. 177 (from inside). Volsella: Figs. 178, 179 and 180. Penis valve: Figs. 181–184. Paramere and volsella rather constant in form and structure, but the penis valve fairly markedly varied in the form of apical inclined portion, especially in its inside dentation. Except for the apical very minute teeth, they are sometimes 3-, 4-, or 5-dentate, but sometimes even 6- or 7-dentate, the teeth always progressively reducing in size toward apex. With 3 out of the 4 examples that have the antennal joints comparatively longer than usual the organs were particularly examined. They have the penis valve 6- or 7-dentate. But other specimens from Taitung and Liyuchih that have the normal antennnae possessed the penis valve also 6- and 7-dentate. Thus the variation in dentation is without correlation with the IOD or the antennal length, or with the form of the clypeus. This is also true with respect to punctuation on thorax. Generally speaking, in the Formosan specimens the teeth in question are comparatively large and well-defined up to the 4th, sometimes to the 3rd or 5th from the base, but thence minute and indistinct usually.



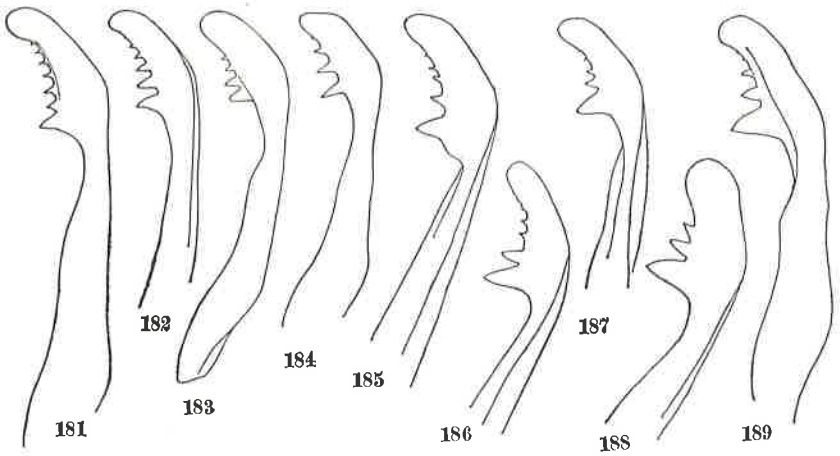
Figs. 175–180. *Tachysphex bengalensis* Cameron, male genitalia.
175, Taitung ex., obliquely from above. 176, Right paramere wight volsella, from outside. 177, Left paramere with volsella (Taitung ex.). 278–180, Volsella; 178, Tsukeng ex., from outside; 179, Ditto, from inside; 180, Kenting ex.

(9) Pile bands on abdomen. The bands are always 3 in number without exception, as described by Williams (1928), different from "the lst to 5th segments" given by Bingham (1897).

(10) Conclusion. As above described there is no definite correlation among these variations in characters to make groupings among the specimens. They are, therefore, considered to represent merely the fructuative variations within a species. However, the question as to whether the Formosan population forms a distinct geographic race or not can not be determined, because of

the insufficient information relating to the typical race. But it is presumable that the Formosan population may fall within the same taxonomic category with the Philippine population dealt with by Williams.

Notes on Tachysphex japonicus. This species widely occurs in Korea and in Japan from Hokkaido to Okinawa. According to the study of the Formosan population of *Tachysphex bengalensis*, however, the species is considered nothing more than a subspecies of this species, since in no essential character the Japanese population differs from the population of Formosa. Some remarks on these characters will be given in the following:



Figs. 181–189. *Tachysphex bengalensis* Cameron, penis valve.
181–184, Formosan exs.; 185–189, Japanese and Ryukyu exs. 181, Lihyuehtan ex. 182, Liyuchih ex. 183, Taitung ex. 184 Kentin ex. 185, Amami Is. ex. 186, Ashizuri (Kyushu) ex. 187, 189, Fukui ex. 188, Ishikawa ex.

(1) Male genitalia. Paramere and volsella quite similar. Penis valve also similar in general form, but the teeth on the inside are mostly 3 in number, rarely 4, with the basalmost one markedly large and conspicuous, sometimes accompanied with 1 or 2 very minute ones on apical portion (Figs. 185–189). In one of the specimens from Shikoku (Ashizuri) wherein the antennal joints 2+3+4 markedly greater in length than IOD at vertex the teeth are 7 in number, of which the basal 2 large and marked, the next two small but easily observable and apical 3 very minute and ill-defined (Fig. 186). In other specimens having the same antenno-IOD relation the dentation of the penis valve normal.

(2) IOD and antennal joints. In ♀, similar to the Formosan population; in ♂, usually IOD slightly less than as long as joints 2+3+4, but in a considerable proportion it is as great as, or even more than so.

(3) Clypeus. ♀. In form generally similar, but on an average the medial produced area relatively somewhat wider as compared with the case in the Formosan population. Anterior margin of the medial produced area about twice as broad as the lateral area (the distance between the lateral angle of the medial area and the lateral end of clypeus at the antero-external corner of mandible). In the Formosan population the former is always less than twice as great as the latter (half of the former should be compared with the latter). ♂: In the Formosan population the anterior rounded protuberance of the medial area is weak (Fig. 166) or small (Fig. 167), or sometimes lacking (Fig. 165), while in the Japanese or the Ryukyu specimens the protuberance usually large, and fairly frequently the anterior margin broadly rounded, just as given by Williams as to *T. mindorensis*, even sometimes with the antero-lateral angles obtuse (Fig. 171). At the same

time, however, the specimens having the anterior margin almost truncate or with small protuberance are also present. As to punctuation, the extent of the polished area also markedly varied with individuals (♀ ♂).

(4) Punctures on vertex and mesopleuron. Generally closer than in the Formosan representatives. On vertex usually averaged interspaces narrower than punctures.

(5) Averaged body size is in ♀ slightly larger, but in this case the difference not so marked as in other species, in ♂ almost without difference.

(6) Other characters referred to the Formosan *bengalensis* generally similar.

(7) Conclusion. On the basis of characters 1, 3 and 4 the Japanese population (including those of Korea and Is. Amami-Ohshima) is dealt with as a subspecies of *T. bengalensis* Cameron. Hence it should be called *Tachysphex bengalensis japonicus* Iwata.

Notes on Tachysphex mindorensis. Judging from the variations in characters of the clypeus and genital organs in the Formosan as well as the Japanese specimens of *T. bengalensis* there arises some doubt as to the validity of *T. mindorensis* Williams. The figures given by the original author with respect to the male genitalia of *T. bengalensis* and *mindorensis* are not detailed and there seems to be some possibility that the penis form of *mindorensis* is one of the variations (similar to that of Japanese specimens) within the range of *T. bengalensis*. The same may be true as regards the form of the clypeus in the male. To settle the problem the detailed comparative study is needed in future.

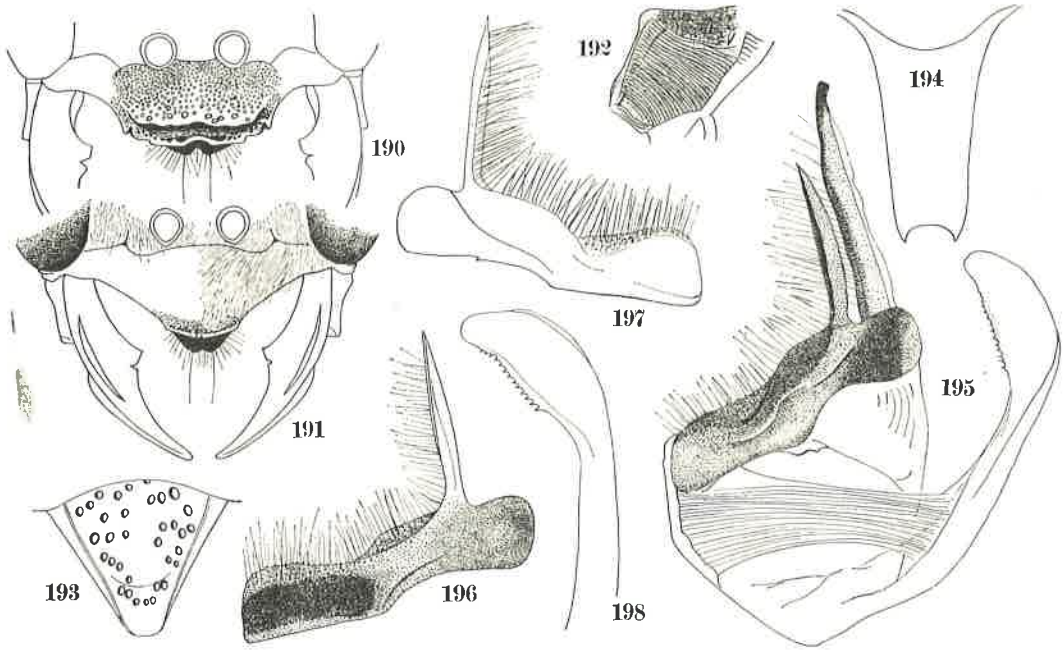
2. *Tachysphex changi* sp. nov.

This species is characteristic in having the integument of the head and thorax microscopically finely coriaceous with superimposed punctures, the inner orbits subparallel on the frontal region, pubescence on frons pale golden in ♂, silvery in ♀, as in *T. selectus* Nurse and in the structure of the clypeus, pygidial area (♀) and genitalia (♂).

♂. Length about 8.5 mm. Black, mandibles in middle bright red under permeate light, apical portion also red in certain permeate light, otherwise apparently brilliant black, palpi dark brown, with apical joints ferruginous, tegulae of wings (sometimes apex of front tibiae), tarsi apically beneath, spines and spurs ferruginous. Wings hyaline, sometimes slightly yellowish, appendicular cell darkened, stigma and veins dark brown to black. Pubescence on frons and clypeus pale golden, close but not thick, so that the surface well visible under perpendicular light, hairs on mesonotum, scutellum, mesopleuron and postscutellum not dense, also fine, paler golden, those on temples and propodeum whitish, abdominal segments 1, 2 and 3 with apical silvery pile band, not strikingly conspicuous, front and mid femora beneath with close long appressed hairs.

Head seen in front with inner orbits subparallel up to about middle of face, thence convergent posteriorly, ocelllar elevation distinctly outlined, with medial furrow not deep, postocellar impression fairly deep, with an anchor-formed glittering impressed line on bottom. IOD at vertex subequal to antennal joints 2+3, at base of clypeus approximately 2.6 times as wide as at vertex, interantennal distance slightly less than as great as width of antennal socket, the latter about 3/5 the length of oculo-antennal space, supra-antennal glittering tubercles about as long as antennal joint 2, clypeus: Fig. 191, with disc medianly gently convex. Antennal joint 3 approximately 1.7 times as long as 2, nearly twice as long as wide at apex (dorsal view, in lateral view about 1.7 times so), distinctly shorter than 4 (ratio about 5 : 6), joints 4–8 subequal in length. Lunate impression on nape of pronotum complete and deep, not interrupted nor shallowed in middle, collar transversely carinate, with 2 symmetrical depressions on both sides of the medial elevation, resulting in 3 raised areas; mesonotum roundly raised high above pronotum, with anterior median

scutal line in two slightly divergent fine carinae, reaching posteriorly about 1/4 of the scutum, prescutal sutures indistinct, parapsidal sutures in well-defined impressed lines, about as long as antennal joint 2; scutellum and postscutellum without median impression; on mesopleuron anterior oblique furrow not strong, weakly crenulate, episternal scrobe without accompanying distinct furrow, metasternal plate apically in middle deeply incised; propodeum with disc distinctly shorter than mesonotum, about as long as scutellum and postscutellnm united, with lateral margins posteriorly roundly convergent and with surface nearly flattened, without medial furrow nor carina, posterior margin medianly obtusely slightly produced (Fig. 192, in the lateral view), posterior aspect flattened or slightly concave, with medial deep furrow on upper portion, lateral carinae bordering on the sides of the segment distinct only on upper half. Abdomen normal, pygidial area flattened, with lateral margins only on apical portion bordered by short carinae. Incision beneath front femora near base mediocre. In fore wing abscissae of radial vein: $4 > 1=2 > 3 > 5$, 5 very short, slightly oblique, with fairly distinct appendicular cell, abscissae of cubital vein in cell 2: $3 > 1 > 2$, ratio between 3 and 1 nearly 3 : 2.



Figs. 190–198. *Tachysphex changi* sp. nov.
190, Clypeus (♀). 191, Ditto (♂). 192, Propodeum (♂), in profile. 193, Pygidial area (♀). 194, 8th sternite (♂). 195, Male genitalia, left half, from inside. 196, Volsella. 197, Ditto, from inside. 198, Penis valve.

Of genitalia the left half seen from inside: Fig. 195, paramere with upper half markedly slender and fringed with close long hairs on the inside, apex strongly chitinized, blackened and truncate at the extremity. Volsella: Fig. 197 (from inside) and Fig. 196 (from outside), its body slenderer, with hairs less stiff and much more abundant than in *T. bengalensis*. Penis valve (Fig. 195) with apical inclined portion provided on the inside with a series of small teeth, rather serrate. Eight sternite: Fig. 194.

Head and thorax microscopically finely coriaceous, half mat, with superimposed punctures, the punctures on ocellar and impressed regions on vertex fine and sparse, with interspaces larger than points, on posterior region of vertex slightly closer, intervals narrower than points, on frons

and clypeus much closer but somewhat weaker, on mesonotum anteriorly and laterally closer and finer, posteriorly sparser and slightly larger, on medio-posterior area and scutellum with intervals as great as, or even greater than the width of the punctures, on postscutellum finer and closer; posterior margin of mesonotum longitudinally shortly (in holotype weakly, in paratype strongly) closely striate; mesopleuron punctured as on mesonotum, anteriorly closer, upwards finer and closer, on central and posterior regions with intervals wider than punctures, metapleuron almost impunctate, with a few short longitudinal atriae on upper portion. Propodeum on dorsal aspect with a thick transverse carina at the extreme base, thence longitudinally fairly closely rugoso-striate for a small extent and then amplitude of the rugae becoming larger, with additional transverse short branches irregularly filling the interspaces, giving somewhat an appearance of irregular reticulation, on medio-apical area with a small smooth patch, less striated and fairly glittering in certain light; posterior aspect transversely fairly closely and strongly rugoso-striate, with intervals uneven, sides of the segment on upper portion nearly longitudinally, gradually obliquely downwards, distinctly closely striate or rugoso-striate; abdomen with close minute hair-points all over, half opaque.

♀. Length about 9.0 mm. Very similar to the male. IOD at vertex as great as antennal joints 2+3, at base of clypeus thrice as great as at vertex, inner orbits slightly roundly convergent upward on frontal region, not parallel as in ♂. Pubescence on frons and clypeus not golden, but silvery, also fine and not dense and surface punctuation well visible. Clypeus very characteristic (Fig. 190), with disc very gently raised and distinctly separated by the roundly inclined narrow polished bevel from the flatened anterior marginal area, which is at base finely closely wrinkled and scattered with comparatively coarse punctures, with extreme margin narrowly polished and minutely roundly emarginate in middle; labrum also medianly deeply emarginate in parallel with the clypeal margin (Fig. 190); antero-lateral corners of clypeal margin bluntly tridentate. Mandibular structure as in ♂, with medial region very narrowly reddish. Antennal joint 2 half as long as joint 3 which is approximately 2.3 times as long as wide at apex (dorsal view) and distinctly shorter than joint 4 (ratio about 2/3). Nape furrow and collar structure as in ♂, also mesonotum (posterior margin distinctly crenate), scutellum and postscutellum similar. Pygidial area (Fig. 193) gently convex on basal portion and gently concave on apical portion, with marginal carinae high and distinct, with surface polished and scattered sparsely with comparatively coarse punctures. Front and mid femora beneath with close comparatively long pubescence, half recumbent, the former without incision near base beneath. Front tibiae with two long bristles externally near apex, front metatarsi provided with 9 bristles (not uniform in length) on outer side, of which apical 4 gathered up and bundled; tarsal joint 4 of all legs not deeply incised from apex as in *T. bengalensis*, but with apical margin entire, the body short, less than half as long as broad at apex. Abscissae of radial vein: $4 > 1 = 2 > 3 > 5$, 3 varied in length between the right and left wings. Punctuation and sculpture on head and thorax-complex as in ♂.

Holotype: ♂, Chiayi Pref. (Chuchi, 22. VII.), K. Tsuneki leg.

Paratype: 1 ♀, the same as above; 1 ♂, Taoyuan Pref. (Kuangyin), 4. IX. 1966, B. S. Chang leg.

6. Genus *Lyroda* Say, 1837

1. Taxonomic problem on the East Asitic species

As the description of *Lyroda venusta* Bingham, 1897, was inadequate some questions arise as to the relationships between the East Asiatic species. Further, to make the confusion greater, *Lyroda venusta*: Williams (1928) known from the Philippines is considered including more than

one species and it seems doubtful whether the true *venusta* Bingham is involved within the Williams' *venusta*.

I have before me two species of *Lyroda* collected by myself on the Island of Formosa. One of the species (*taiwana*, 8 ♀♀ 4 ♂♂) can not be separated in structural characters from *Lyroda formosa* (Smith), as far as the previous descriptions go, but it has the completely black abdmen and, further, it has the pile bands on the abdominal segments 1–3 only, different from the descriptions of the original author and of Bingham (Williams did not touch on this character). Therefore, it may be a colour variation of *Lyroda formosa* (Smith). On the other hand, this species (*taiwana*) clearly differs from *Lyroda venusta*: Williams (*sensu* specimens illustrated on the clypeus) and probably also from *Lyroda venusta* Bingham, because of the difference in the body size and presence of pluinose band on abdominal segment 4 (but by no means without question as to their separation, since no important distinction is concerned here, especially because the sculpture on the propodeum generally well agrees).

The other Formosan species (*takasago*) is very close to the Japanese representative, *Lyroda japonica* Iwata, but it is separable from this by the difference in the state aud colour of the pilosity. It seems better to treat the specimens as a geographic race *i.e.* subspecies of *japonica*.

Quite strange to say, the male of *Lyroda venusta*: Williams well agrees in the clypeal form with the same sex of *takasago*, as is also true in other general characters. But, its female distinctly differs from *takasago* in the form of the clypeus. Judging from the facts above mentioned it seems possible that the male and female of his *venusta* belong respectively to a different species. And, further, as he described "there is some variation in the clypeus ...." it seems also possible that the females of his *venusta* includes more than one species, that is to say, at least the species of which he illustrated the clypeal form and *japonica* ! Still further, it also can not be denied that the female of *taiwana* might also be included within his material, since it is very close to the female of *japonica*.

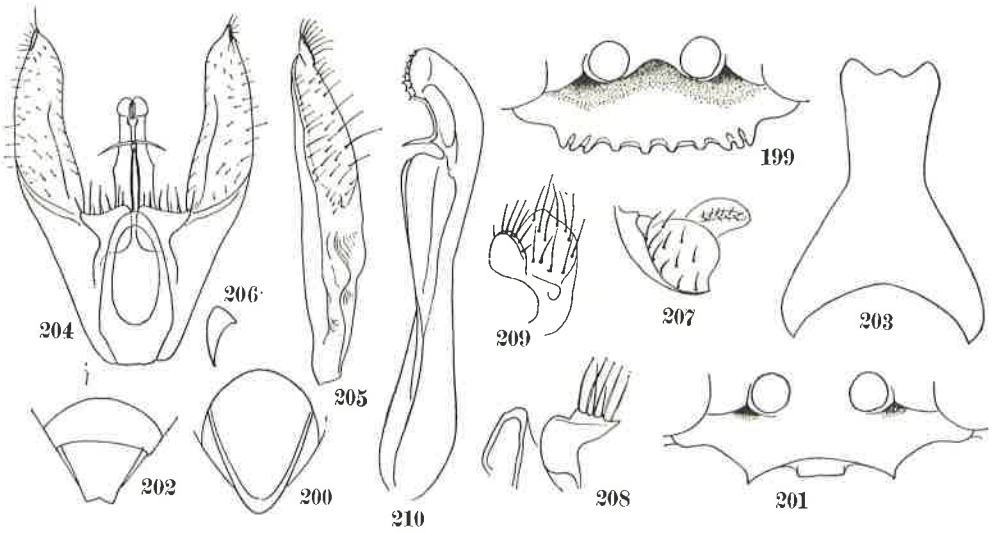
To settle the questions the reexamination of the Philippine specimens of *Lyroda* having the black abdomen and also the specimens of true *venusta* (preferably the type) is needed. In the present paper I dealt with the two Formosan species as distinct from *venusta* Bingham.

2. *Lyroda taiwana* sp. nov.

♀. Length 7.3–9.5 mm. Black, mandibles glittering reddish brown, apically darkened; abdominal segments 1 and 2 beneath on the sides and sometimes medio-apical area of sternite 1, two lateral mat areas at base of sternite 2 and apical margins of sternites 2–5 more or less reddish brown; palpi, outer margin of wing tegulae, caudal segment of abdmen apically, tibial spurs, apical portions of tarsi brown to dark brown. Wings hyaline, faintly yellowish and apically weakly clouded, with veins and stigma brown. Densely silverily pilose on clypeus, frons on median line broadly and along inner orbits (unobservable in certain light), temples (ditto), collar of pronotum, humeral angles, posterior margin of mesonotum (laterally broadened), lateral excavations of scutellum, sides of postscutellum, propodeum on marginal areas of dorsal aspect, on posterior aspect except upper medial area and on apex of its sides, mesopleuron, antennae up to joint 3 and legs up to femora. The subsequent joints of antennae and tibiae of legs also fairly closely pilose; pilosity quite distinct in oblique light, but in some light almost invisible. The pile on frons, pro- and mesonotum sometimes with a brassy lustre, on clypeus apically, lateral excavations of scutelum long and thick, on other portions mixing long whitish, on dorsal aspect greyish pubescence. Pygidial area closely covered with dark brown hairs, in some light with a coppery shine. The pilosity generally dense, but not so much in degrees and not so delicate as in the following species,

especially remarkable in that the frons not completely covered with pile.

Ocellar area raised, ocelli in a broad triangle, the anterior larger than the posterior (about 3 : 2), OOD : POD = 8 : 11; IOD at vertex subequal to antennal joints 2+3+4 (measurement 34 : 37), frons with a median groove running from median ocellus to base of antennae, clypeus: Fig. 199, having a tooth or a tubercle between the lateral three and median two teeth, just as given by Williams with respect to *L. formosa* ♀. Antennal joint 3 about 3.7 times as long as wide at apex, relative length between joints 3, 4 and 5: 18, 13 and 12; collar of pronotum medianly highly elevated and hollowed on both sides and again subconically swollen on the lateral ends, extreme anterior margin of pronotum transversely furrowed and coarsely regularly and very deeply excavated by 6–7 large foveae, each fovea with bottom semitransparent brown and separated from each other by stout carina; propodeum on disc always with a medial carina from base



Figs. 199-200. *Lyroda taiwana* sp. nov.
199, Clypeus (♀). 200, Pygidial area (♀). 201, Clypeus (♂). 202, Pygidial area (♂). 203, 8th sternite (♂). 204, Male genitalia. 205, Right paramere, from inside. 206, Cross section of paramere. 207, Volsella, apical view. 208, Ditto, lateral view (from outside). 209, Ditto (from inside). 210, Penis valve, in profile.

to apex, but without lateral carinae. on posterior aspect medianly distinctly grooved, sides of the segment toward middle longitudinally weakly furrowed from lower half of stigmata, the furrow posteriorly shallow and gradually indistinct (stigmatal furrow). Abdominal sternite 2 with deep transverse furrow near base. Hind femora gently curved in dorsal view, otherwise normal. Sections of radial vein of fore wing mostly $1=4>3>2\div5$, sometimes $3>2>5$, rarely $3=2=5$.

Punctures on head very minute and dense, on mesonotum, scutellum slightly larger but similarly dense, on collar of pronotum as fine as on head, its nape region transversely rugoso-striate; propodeum on dorsal aspect irregularly, comparatively coarsely but not strongly reticulate, on medio-posterior region rather transversely (or obliquely) not strongly rugoso-striate, sometimes partly smooth and glossy; the sculpture fairly varied in size of reticulation and in the extent of rugose-striae, but irregular reticulation always defined; posterior aspect transversely, somewhat arcuately (posteriorly markedly so) rugoso-striate, the rugae somewhat stronger toward middle, sides of the segment from the stigmatal furrow upward obliquely closely, somewhat rugosely striate, below the furrow transversely more closely and more finely rugoso-striate, the striae in the furrow somewhat stronger. Abdminal tergites very minutely closely punctuate, half mat, sternites

finely very closely, but not strongly punctured, apical margin of each segment smooth and polished, this smoothed area broadened on the medial region.

♂. Length 7.3–8.5 mm. Similar in general characters to ♀. But the pilosity somewhat more broadly extended on the given areas and always with more or less brassy shine. On frons lateral areas broadly (and medianly narrowly) pilose; scutellum even on posterior margin and postscutellum nearly wholly covered with the pile. In a considerable number of specimens the pile on frons, temples above, dorsal side of thorax wholly and from middle of pleurons above nearly golden, but on clypeus always silvery and on propodeum only with a faint brassy shine dorsally. Characters relating to ocelli as in ♀, antennal joint 3 approximately 2.5 times as long as wide at apex and about 4/3 the length of joint 4, 4 subepual to 5. IOD at vertex relatively broader than in ♀, approximately twice as long as antennal joints 2 and 3 united. Clypeus: Fig. 201, very similar to that of *L. formosa* (cf. Fig. by Williams, 1928), anterior margin in middle broadly roundly emarginate, with the sides of emargination subacutely produced, with in middle a trapeziformed protuberance, slightly bent down and having a subquadrate polished area on the surface. Caudal segment of abdomen with a pygidial area (Fig. 202) smaller than in ♀, laterally carinate and apically broadly emarginate, 8th sternite: Fig. 203, genitalia: Fig. 204, paramere (right): Fig. 205, basiparamere is considered a hollowed structure, its cross-section probably as given in Fig. 206, with the straight line inside; penis valve: Figs. 204 and 210, provided with a serrate margin on the median line of the apical swelling, below which a pair of sickle-shaped slender branches shot off; Volsella: Fig. 208 (external view), Fig. 207 (apical view) and Fig. 209 (internal view), not well developed, consisting of massive lamina volsellaris attaching to the top of bridge and primitive cuspis (or this may be an undeveloped digitus) attaching to the side of it, the latter can not be observed without dissection. Paramere characteristic in having on outer side at apex an elongate platform with the surface roughly granulate for supporting a sparse tuft of stiff hairs, the hairs on other portion below the area also bristle-like, not soft pubescence as in some other genera.

Punctuation and sculpture as in ♀. Dorsal aspect of propodeum variously reticulate, the sculpture always irregular and not strong. But the occurrence of medio-apical weak rugoso-striated area comparatively more frequent than in ♀, its extent generally broader and more frequently accompanied with a polished patch. Sculpture on the sides of the segment similar and quite specific as contrasted with that of the following species. In colour palpi dark brown, and reddish maculae or coloration on ventral side of the abdomen completely lacking.

Holotype: ♀, Pingtung Pref. (Hengchun, 1. VIII. 1966), K. Tsuneki leg.

Paratypes: 12 ♀♀ 22 ♂♂, Pingtung Pref. (9 ♀♀ 17 ♂♂, Hengchun, 1, 2, 8. VIII.; 2 ♀♀, Ssuchungchi, 6. VIII.; 1 ♀ 5 ♂♂, Kentin, 9. VIII); 1 ♀ 2 ♂♂, Chiayi Pref. (Chuchi, 25. VII.).

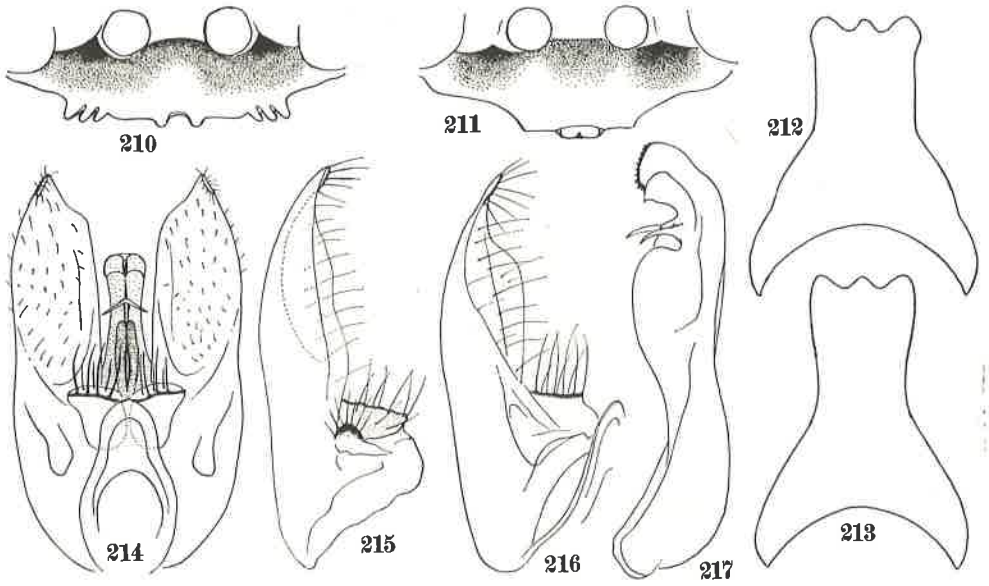
3. *Lyroda japonica takasago* subsp. nov.

(*Lyroda japonica* Iwata, Annot. Zool. Jap., 14: 7-9, 1933 (♀ ♂, Japan))

♀. Length 8.7–11.5 mm. Very closely resembling the nominate form, differing in the following points:

(1) Pilosity on head and thorax silvery and less abundant and very much shorter on frons and basal half of clypeus where in oblipue light only faintly defined. (In *japonica* s. str. pile on the said areas golden.)

(2) Second cubital cell less narrowed upwards, the abscissae of radial vein with the following relative length: $1=4 > 3 > 2 \geqq 5$ (in typical form always: $1=4 > 3 > 5 \geqq 2$. In



Figs. 210–217. *Lyroda japonica takasago* subsp. nov.
210, Clypeus (♀). 211, Ditto (♂). 212, 8th sternite (♂). 213, Ditto in *japonica* s. str. 214, Male genitalia, ventral view. 215, Right paramere with volsella, from inside. 216, Left paramere with volsella, from outside. 217, Penis valve, in profile.

takasago abscissa 2 mostly 2/3 the length of 3, while in *japonica* s. str. it is usually about half as long as 3.

♂. Length 7.0–8.3 mm. (1) Pilosity silvery, but shorter and less abundant on frons and basal half of clypeus as in ♀. (In *japonica* s. str. pilosity silvery with weak golden shine.)

(2) The character of 2nd cubital cell as in ♀.

(3) Propodeum without medial carina, or with a very weak one not attaining to apex, apex usually without transverse carina, rarely with a short weak one. (In *japonica* s. str. both median and apical carinae always distinct.)

(4) Genitalia similar in general, differing only in that the bristle-like hairs on the paramere, volsella and cuspis much longer than in the nominate form.

(5) Eight sternite (Fig. 212) similar in apical tridentate structure, but the central region of the sternite parallel and broader than in the typical race (Fig. 213) in which the form of the area rather resembles that of *L. taiwana*.

Generally speaking, the differences are rather slight.

Distinctions from L. taiwana.

(1) Clypeus: Figs. 210 (♀) and 211 (♂), cf. Figs. 199 (♀) and 201 (♂) in *taiwana*.

(2) Propodeum. In this species always with lateral carinae on disc (in *taiwana* lacking), sides of the segment below the stigmatal furrow without striae, finely punctured or coriaceous (in *taiwana* obliquely finely striate) (♀ ♂).

(3) Male genitalia. Paramere broader than in *taiwana*, with hair-supporting platform thinner, more indistinct (Fig. 214, cf Fig. 204), lamina volsellaris (Fig. 215) slightly different.

(4) Eight sternite in ♂: Fig. 212, cf. Fig. 203.

Holotype: ♀, Ilan Pref. (Tsukeng, 19. VIII.), K. Tsuneki leg.

Paratypes: 4 ♀♀ 1 ♂, Ilan Pref. (Tsukeng, 19, 22. VIII.); 1 ♀, Hualien Pref. (Liyuchih, 16. VIII.); 1 ♀ 1 ♂, Taitung Pref. (Taoyeh, 14. VIII.); 1 ♀, Pingtung Pref. (Hengchun, 8. VIII.) ; 2 ♂♂, Chiayi Pref. (Chuchi,, 21. VII.).

Genus *Tenila* Brethes, 1913

1. *Tenila domestica* (Williams, 1928)

Rhinonitela domestica Williams, Bull. Exp. Sta. Hawaii S.P.A., Ent. Ser., 19: 98, 1928. (Philippines).
Rhinonitela domestica: Yasumatsu, Mushi, 12 (1): 12, 1939 (Formosa); ———: Iwata, Ibid.: 13-16. (biol.)

Remarks. We could not collect this species. The recorded specimens were collected and observed by K. Iwata in Kentin-kuonyuan (Pingtung Pref.) in May, 1937.

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