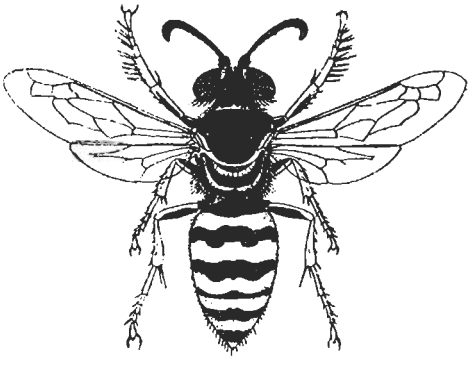
SPECIAL PUBLICATIONS

OF THE

JAPAN

HYMENOPTERISTS ASSOCIATION

NO. 38



MISHIMA

June 20, 1992

STUDIES ON THE PHILIPPINE SPHECOIDEA (HYMENOPTERA) (I)

By K.TSUNEKI, C.NOZAKA, T.TANO, H.KURUKAWA and T.MUROTA*

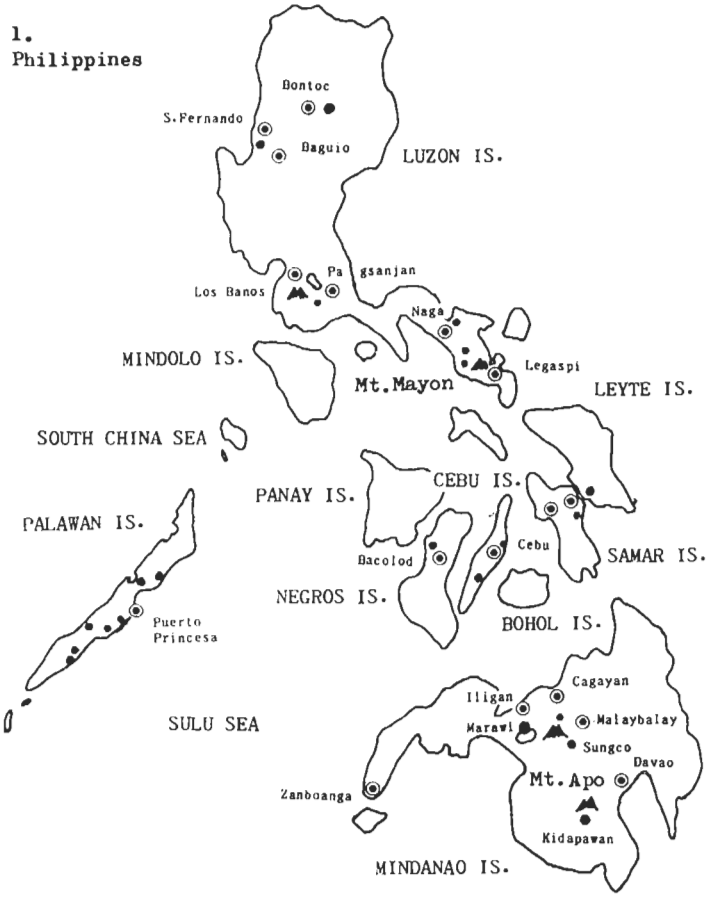
The material used in the present studies was collected by the authors other than Tsuneki in their eight times expeditions to the Islands of Luzon, leyte, Samar, Cebu, Negros, Mindanao and Palawan during 1978 - 1983, and the final determination of the taxonomic work of it was conducted by him.

THE PROCESS AND COURSES OF OUR EXPEDITIONS

THE FIRST RESEARCH: 1978, LUZON ISLAND

Period: March 25 - April 5. Participants: Nozaka, Tano and Murota.

Fig. 1.
The Philippines



* Members of Japan Hymenopterists Association, Fukui Prefecture.

Mar. 25: Fukui - Manila.
26: Manila - Baguio (Pr. Benquet): Mines View Park.
27: San Fernand (Pr. La Union): Long Beach.
28: San Fernand - Baguio: River beach between the cities.
29: Baguio - Manila - Los Banos (Pr. Laguna): Suburbs.
30: Makiling Botanical Garden.
31: Laguna: Inside the village.
Apr. 1-2: Pagsanjan (Pr. Laguna).
3-4: Hidden Valley Spring (Pr. Alaminor).
5: Manila - Fukui.

THE SECOND RESEARCH: 1978, LUZON ISLAND

Period: August 1 - 21. Participants: Kurokawa, Murota and Nozaka.

Aug. 2-5: Los Banos (Pr. Laguna). 6: Hidden Valley Springs. 7-9: Pagsanjan. 10-13: Stopped by the typhoon. 14: Naga City (Pr. Camarinessur). 15: Calabanga and Naga. 16: Bato (Pr. Camarinessur). 17: St. Domingo (Pr. Albay). 18: Manito (Pr. Albay). 19: Tabaco (Pr. Albay). 20-21: Manila - Fukui.

THE THIRD RESEARCH: 1979, CEBU and NEGROS ISLANDS

Period: March 27 - April 5. Participants: Tano, Nozaka and Kurokawa.

Mar. 27: Fukui - Manila - Cebu.
28: Matan Island. 29: Danao Bearch. 30: Is. Cebu, Montanic area.
31: Argao Bearch.
Apr. 1: Cebu - Negros. 2: Manbucal Resort and Mt. Canlaon. 3: Mambucal Resort. 4: Taytay Bearch. 5: Bacolod, river bearch near the town.
6: Taytay Bearch - Manila. 7: Manila - Fukui.

THE FOURTH RESEARCH: 1979-80, LUZON ISLAND

Period: December 24 - January 7. Participants: Murota's sole expedition.

Dec. 24: Fukui - Manila.
25-27: San Fernand (Pr. La Union). 28: Baguio-Banawe. 29-30: Bontoc. 31: Bontoc - Sabangan - Banawe.
Jan. 1-3: Baguio, Mines View Park. 3-6: Asin Hot Spring. 7: Manila - Fukui.

THE FIFTH RESEARCH: 1980, MINDANAO ISLAND

Period: July 29 - August 17. Participants: Nozaka, Kurokawa, Murota and Tano.

July 29: Fukui - Manila - Zamboanga.
30: Zamboanga. 31: Pasonanka Park.
Aug. 1-2: Zamboanga, river bearch near the city (Kurokawa and Murota); Yellow Bearch and Pasonanka Park (Tano and Nozaka). 3: Davao. 4: Matina Heights. 5: Sunraits Bearch near Davao. 6: Davao, surbs. 7: Kidapawan - Mt. Apo, areas around Agko Cabin. 8: Agko Cabin. 9: Agko Cabin - Kidapawan. 10: Davao. 11: Davao - Malaybalay. 12-13: Malaybalay. 14: Opol Bearch. 15-16: Makahambus Cave, 17: Cagayan - Manila. 18: Manila - Fukui.

THE SIXTH RESEARCH: 1982, LEYTE and SAMAR ISLAND

Period: April 13 - 24. Participant Tano's sole research.

Apr. 13: Fukui - Manila.
14: Manila - Tacloban. 15: Tacloban, suburbs. 16: Palo. 17: Tolosa. 18: Urmoc. 19: Lake Imerda. 20: Urmoc. 21: Baseg. 22: Palo. 23-24: Tacloban - Manila - Fukui.

THE SEVENTH RESEARCH: 1983, PALAWAN ISLAND

Period: March 22 - April 4. Participants: Tano and Murota.

Mar. 22: Fukui - Manila - Puerto Princesa. 23-26: Puerto Princesa. 27: Inagawan - Aborlan - Brokes Point. 28: Miniti - Quezon - Narra. 29: Estrella - Barrague. 30: Iwahig. 31: Baheli.
Apr. 1: San Rafael. 2-3: Calcuasan. 4-5: Puerto Princesa. 6: Puerto Princesa - Manila - Fukui.

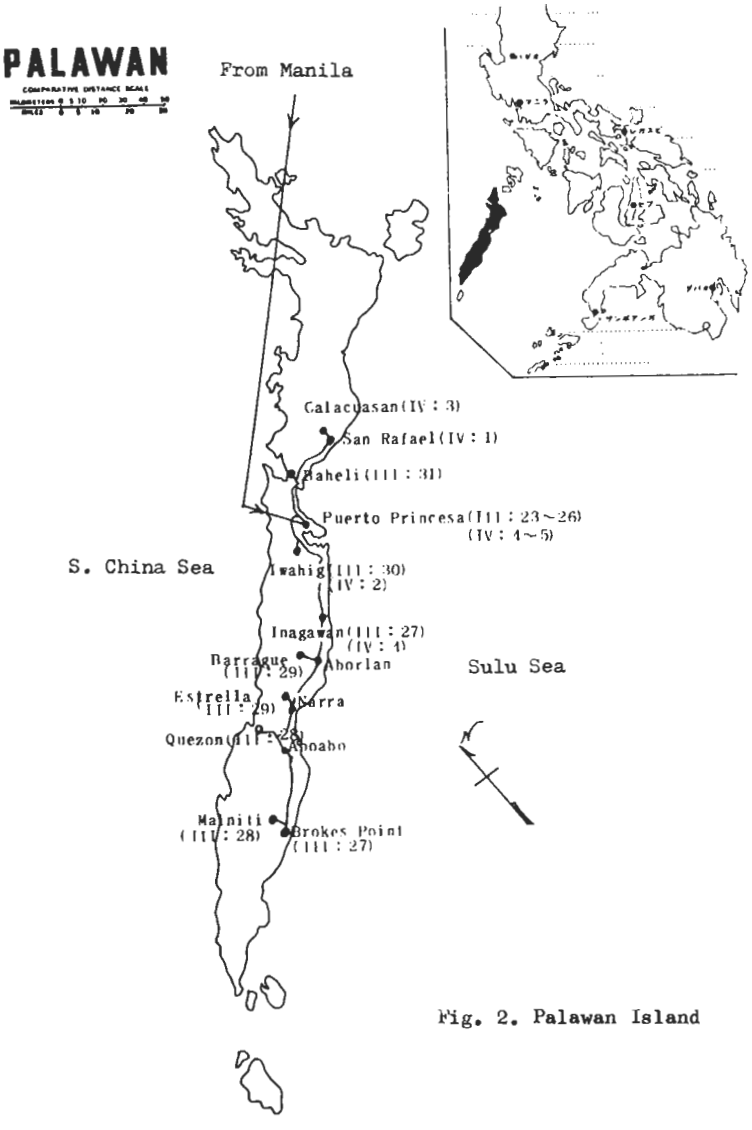


Fig. 2. Palawan Island

THE EIGHT RESEARCH: 1983, MINDANAO ISLAND

Period: July 23 - August 10. Participants: Nozaka, Kurokawa, Tano and Murota.

July 23: Fukui - Manila.
24: Tagaytay.
25: Rainy day.
26: Manila - Malaybalay.
27: Mountain View College.
28-29: Sungco.
30: Kagayan de Oro: Suburbs of Malaybalay.
31: Dalirig (Pr. Bukidnon).

Aug. 1: Malawi, 700 m.
2: Momungan.
3: Malawi, 700 m.
4: Near Iligan, Maria Cristina Fall, 500 m.
5: Talakag.
6: Cleveria.
7: Talakag.
8: Makahambus Cave.
9–10: Mindanao – Cebu – Manila.

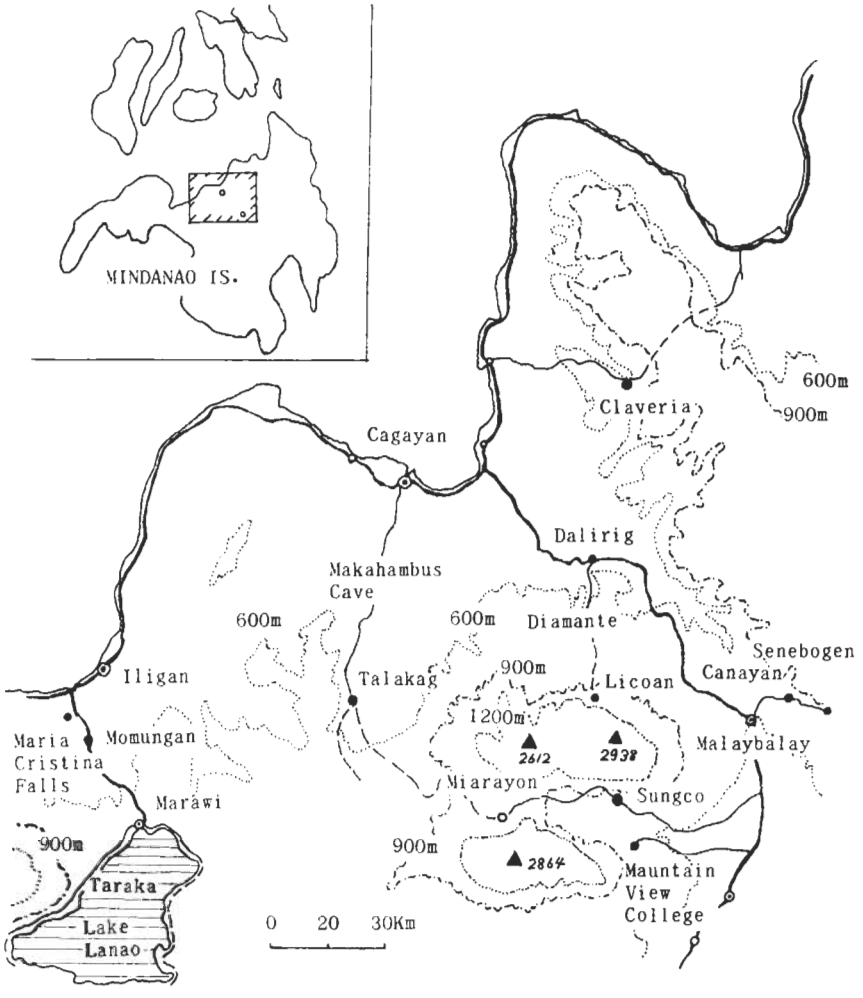


Fig. 3. Research points of Mindanao.

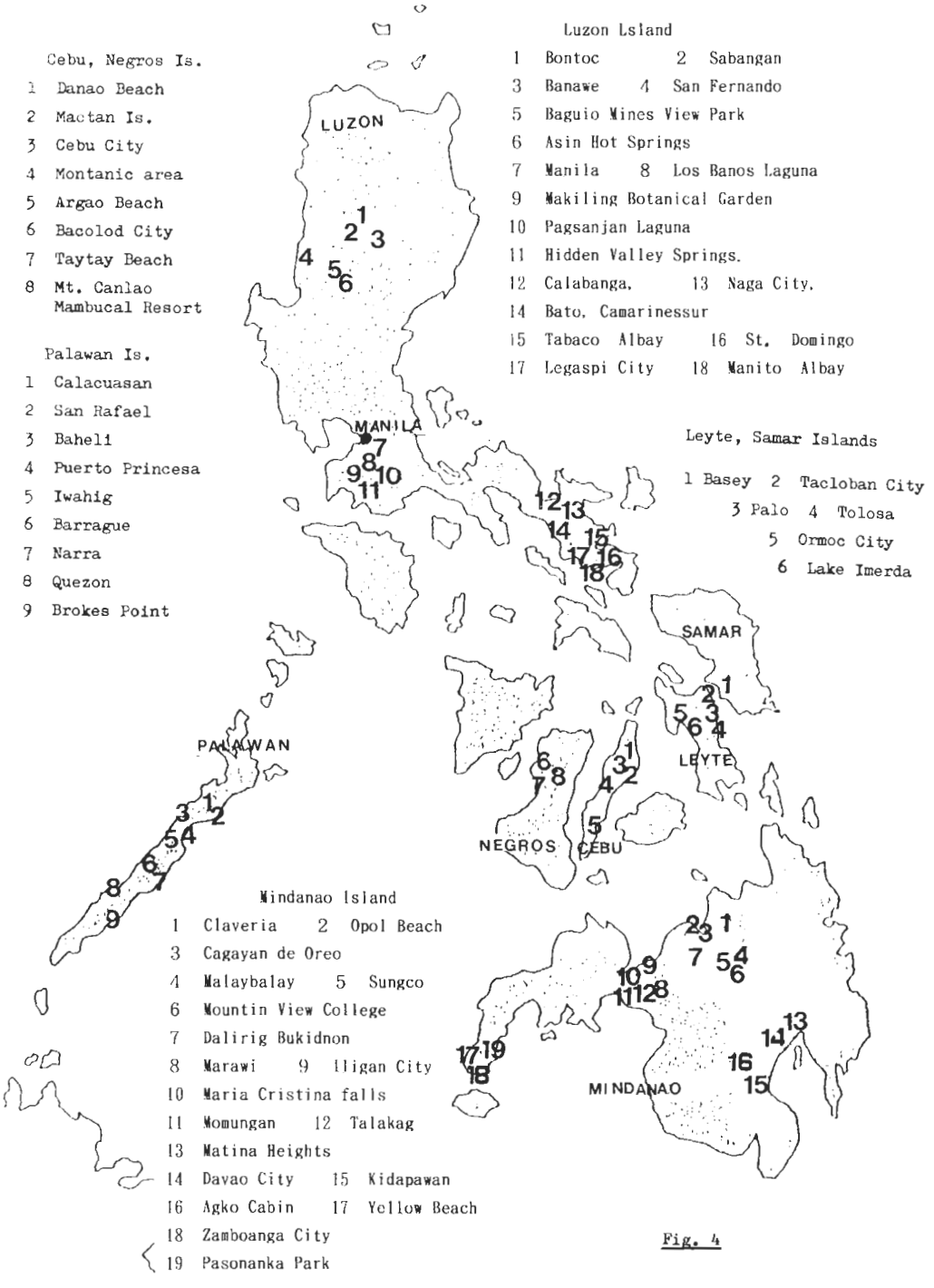

Cebu, Negros Is.
1 Danao Beach
2 Mactan Is.
3 Cebu City
4 Montanic area
5 Argao Beach
6 Bacolod City
7 Taytay Beach
8 Mt. Canlao Mambucal Resort
Palawan Is.
1 Calacuasan
2 San Rafael
3 Baheli
4 Puerto Princesa
5 Iwahig
6 Barrague
7 Narra
8 Quezon
9 Brokes Point
Luzon Lsland
1 Bontoc 2 Sabangan
3 Banawe 4 San Fernando
5 Baguio Mines View Park
6 Asin Hot Springs
7 Manila 8 Los Banos Laguna
9 Makiling Botanical Garden
10 Pagsanjan Laguna
11 Hidden Valley Springs.
12 Calabanga. 13 Naga City.
14 Bato. Camarinessur
15 Tabaco Albay 16 St. Domingo
17 Legaspi City 18 Manito Albay
Leyte, Samar Islands
1 Basey 2 Tacloban City
3 Palo 4 Tolosa
5 Ormoc City
6 Lake Imerda
Mindanao Island
1 Claveria 2 Opol Beach
3 Cagayan de Oreo
4 Malaybalay 5 Sungco
6 Mountin View College
7 Dalirig Bukidnon
8 Marawi 9 Iligan City
10 Maria Cristina falls
11 Momungan 12 Talakag
13 Matina Heights
14 Davao City 15 Kidapawan
16 Agko Cabin 17 Yellow Beach
18 Zamboanga City
19 Pasonanka Park
LUZON
MANILA
SAMAR
LEYTE
PALAWAN
NEGROS
CEBU
MINDANAO

Fig. 4

I. AMPULICIDAE*

Subfamily Dolichurinae*

Genus Dolichurus Latrelle, 1809

From the Philippine Islands only two species of this genus have been described and one species has been recorded heretofore, namely, the former are stantoni (Ashmead, 1904) and pigmaeus Tsuneki, 1976 and the latter is amamiensis Tsuneki et Iida, 1964, although Krombein (1979) suggested occurring of some further species in these Islands.

During the course of the present study we could collect fairly abundant material, including six new species and one new subspecies, and knew that the distribution of each species is considerably confined to some certain Islands, though some species were certainly very scanty in specimen numbers and further collection will be needed. For instance, stantoni was common and abundant in Luzon, Negros, Cebu and Mindanao, but none could be discovered in the Island of Palawan, while amamiensis is common and rich in Palawan, but the species could not be collected at any district of Luzon,

---

GENERAL REMARKS

I. TAXONOMIC RANK.*

As to the taxonomic ranks, in view of the balance to the prevailing ranks of other groups of Aculeata, especially of Apoidea, those adoped by the Catalog of Hymenoptera of America North of Mexico, 1979, were followed in the present and the following papers.

II. ABBREVIATIONS:

A1, A2 ...	Antennal segment 1, 2 ...	aW ...	apical Width
AOD	Antennocular Distance	bW ...	basal Width
AOL	Antennocular Line	D ...	Distance
G1, G2 ...	Gastral segment 1, 2 ...	d ...	diameter
GS1, GS2	Gastral Sternite 1, 2 ...		
GT1, GT2	Gastral Tergite 1, 2 ...	HW ...	Head Width
IAD	Interantennal Distance		
L	Length (relative L to HW=50 of the specimen concerned)		
Mx or mx	Maximum	Mi or mi	Minimum
N	Nervulus of fore wing		
OCD	Ocelloccipital Distance		
Od	Ocellar diameter		
OOD	Ocellocular Distance (=OOL of the authors)		
Pd	Puncture diameter		
PIS	Puncture Interspace		
POD	Postocellar Distance (= POL of the authors)		
T1, T2 ...	Tarsal segment 1, 2 ...		
VW	Vertex Width (=MiIOD at vertex)		
W	Width (relative W to HW=50 of the related specimen)		
WAS	W of antennal socket		

III. MEASUREMENT

Measurements of the parts of the body and appendages are always made, unless otherwise stated, under the scale, HW=50 of the related specimen.

despite that both Luzon and Palawan were visited in the same month and the difference of the emergination cycle could not be considered accordingly. This fact is also supported by the material collected by the Noona Dan Expedition in the Palawan Island in 1961 (cf. Tsuneki, 1976).

KEY TO THE SPECIES OF PHILIPPINE DOLICHURUS

♀ (Gastral segments 6, with surface smooth and shining; antenna 12-segmented, simple; frons, except median area above lamella, sparsely rugoso-punctate or simply punctate, mandible tridentate on inner margin; inner tooth of claws at about 2/3 from base) 2

♂ (Visible gastral segments 3, with apex rounded and surface usually punctured; antenna 13-segmented, from A5 apically each down-curved, often with a seta in middle beneath; clypeus with median carina till apex; frons coarsely rugoso-reticulate or rugoso-striate; mandible unidentate on inner margin; inner tooth of claws subapical) 7

2 Pronotum with anterior carina separating dorsum from anterior inclination (clypeus with median carina only on dorsal half, A3 markedly > A4=A5, on mesopleuron sternaulus present) 3

– Pronotum without anterior bordering carina (clypeus with median carina either till apical margin or lacking, A3≒4≒5, A3/aW=4.0–4.3) 4

3 A3/aW = 4.0 – 4.5, 6.0–7.5 mm, Luzon, Negros, Cebu and Mindanao
stantoni (Ashmead, 1904)

– A3/aW = 5.0–5.3, 6.2–8.8 mm, Palawan, Balabac, Tawitawi and Mindanao
amamiensis Tsuneki et Iida, 1964

4 Clypeus without median carina, with white bands at apical area, on clypeus, frons, pronotum and scutellum macrochaetae lacking (lamella thin, short, apical to lateral margins white; frons finely, densely punctate till hind ocelli, thence behind impunctate; on mesopleuron sternaulus present), 8.5 mm, Luzon
baguionis Tsuneki, sp. nov.

– Clypeus with medial carina till near apex, without white mark; macrochaetae present at normal positions (lamella thick, marginal area inclined outward; propodeum with central area depressed, without oblique carina on intermediate area).. 5

5 On mesopleuron sternaulus lacking (vertex laterally above eyes with medium-sized, close, but shallow punctures, on broad central area smooth and shining), 8.0 mm, Mindanao (Mt. Apo) aposanus Tsuneki, sp. nov.

– On mesopleuron sternaulus present (vertex postero-laterally on the verge to posterior inclination minutely closely punctured; GT1 and 2 with narrow assemblage of tiny punctures at apical margin, tending to form transverse puncture lines, in middle punctures much sparser) 6

6 Lamella whitish at apical margin (frons longitudinally, arcuately rugoso-punctate; vertex practically impunctate), 8.0 mm, Palawan
palawanensis Tsuneki, sp. nov.

– Lamella black, only slightly brownish at medio-apical margin (frons simply sparsely punctured; vertex finely, very sparsely, but distinctly punctured), 7.3 mm., Mindanao palawanensis davaonis Tsuneki, ssp. nov.

7 Pronotum with anterior bordering carina (mesopleuron with sternaulus) 8

– Pronotum without anterior bordering carina, or the carina weak and indistinct among similar parallel striae (apical margin of lamella and pronotal tubercles white) 11

8 GT1–3 very minutely and sparsely punctulate, virtually impunctate (frons rugoso-striate, mixed with scattered punctures; lamella with apical margin rounded, gently bilobed and white;pronotal tubercles and a spot on tegula also white; episternum closely rugoso-striate, mixed with punctures), 3.5–6.0 mm, Luzon, Negros, Cebu and Mindanao stantoni (Ashmead, 1904)

– GT1–3 distinctly punctured 9

9 GT1–2 uniformly, finely punctured, mostly PIS≒Pd (on GT3 punctures slightly finer and closer; otherwise very similar to stantoni), 3.5–6.0 mm, Palawan, Balabac, Tawitawi and Mindanao amamiensis Tsuneki et Iida, 1964

– GT1–2 medianly thoroughly or on posterior half and posteriorly, both broadly impunctate, remainders punctured, GT3 evenly, more closely and finely punctulate (apical margin of lamella without triangular medial incision) 10

10 Apical margin of lamella narrowly brownish white, or with a close pair of whitish spots; pronotal tubercles black; on GT1 punctures on punctured areas medium-sized, very sparse, PIS 7–10 times Pd (on disc of GT2 punctures similar in size,

but closer, with PIS mostly 1.5-2 times Pd and laterally smaller and dense, on GT3 punctures finer and closer and on apical depressed marginal area very minute and confluent, rather indistinct; at least A5-7 each with a brownish seta in middle beneath), 5.0 mm, Mindanao mindanaonis Tsuneki, sp. nov.

-- Apical margin of lamella more broadly and distinctly white; pronotal tubercles white maculated; on GT1 punctures much closer, on disc PIS≒Pd (on GT2 everywhere PIS < Pd, but laterally more strongly so and posteriorly more or less rugosely confluent, on GT3 punctures much finer and dense, more broadly rugoso-punctulate; at least A6-9 each with a brown seta in middle beneath), 4.5-4.7 mm, Palawan and Leyte rugosifrons Tsuneki, sp. nov.

11 Inner tooth of mandible subapical, short, blunt and decumbemt to short apical tooth; even when closed two apical teeth observed (frons from above lamella till inner orbits broadly, strongly and coarsely rugoso-reticulate; apical margin of lamella arcuate, white and medianly triangularly incised; A5-10 each with a brown seta in middle beneath; episternum rugoso-punctate in varying strength, but never minutely, closely so and gradually weaker anteriorly; propodeum with central area depressed, without complete medial carina, intermediate area sparsely barred and without oblique carina) 12

-- Inner tooth of mandible submedial, long, erected, curved basally and acutely pointed at apex, apical tooth also slender, long, gently curved and acute at apex, when closed apical tooth alone observed (flagellomeres without erect seta in middle beneath; apical margin of lamella gently bilobed, not triangularly incised; propodeum with median carina on central area and oblique carina on intermediate area both distinct) 13

12 On mesopleuron sternaulus present (punctures on GT1 and 2 medium-sized, subevenly firrly close, PIS on median area = and on lateral area < Pd, on GT3 punctures much smaller and closer), 6.3-7.0 mm, Palawan palawanensis Tsuneki, sp. nov.

-- Sternaulus lacking (GT1 medianly thoroughly or on posterior half impunctate and apically at verge to posterior constriction also narrowly impunctate, remainder finely and closely rugoso-punctate or simply punctate, GT2 medianly impunctate or sparsely punctate, otherwise as on GT1, GT3 more minutely and closely punctured), 7.5 mm, Mindanao aposanus Tsuneki, sp. nov.

13 On mesopleuron sternaulus present (frons minutely, weakly reticulate; GT1 finely closely and subevenly punctured, PIS on disc 1-2 times Pd and on side much narrower; cubital cell 3 in fore wing rectangular, longer than wide, with outer vein straight), 5-6 mm, Palawan clypealis Tsuneki, sp. nov.

-- Sternaulus lacking (frons weakly rugoso-reticulate or rugoso-punctate; GT1 more sparsely punctured, on disc PIS 2-4 times Pd, but laterally punctures much closer, PIS ≦ Pd; cubital cell 3 normal, outer vein sinuate), 3-4 mm, Balabac and Palawan pigmaeus Tsuneki, 1976

D E S C R I P T I O N S A N D R E C O R D S

DOLICHURUS STANTONI (ASHMEAD, 1904)

Thyreosphex stantoni Ashmead, 1904, Canad. Ent., 36 (10): 282 (♂), Luzon: Manila.
Dolichurus stantoni: Rohwer, 1910, Proc. U. S. Natl. Mus., 37 (1722): 659.
Dolichurus stantoni: Schulz, 1911, Zool. Annal., 4: 144.
Dolichurus stantoni: Williams, 1919, Bull. Hawaii. Sug. Plant. Ass., Exp. Sta. Ent. Ser., 14 (2): 111 (biol.).
Dolichurus stantoni: Baltazar, 1966, Cat. Philip. Hym., p. 326 (with ref.).
Dolichurus stantoni: Bohart and Menke, 1976, Sphecid Wasps of the World, p. 69.

Specimens collected:

7 ♀ 21 ♂, Luzon (Laguna, Baguio, La Union, Bontoc, Batangas), III, IV, VIII. 1978, Tano, Kurokawa and Murota; XII. 1979, Murota.
2 ♀ 9 ♂, Negros (Taytay, Mambucal), IV. 1979, Nozaka, Tano, Kurokawa.
7 ♂, Cebu (Cantabaco, Argao), III, IV. 1979, Kurokawa and Tano.
4 ♀ 13 ♂, Mindanao (Bukidnon, Cagayan de Oro, Lanao der Sur, Mt. Apo, Davao), IV, VII, VIII. 1980, 83, Murota, Tano, Nozaka, Kurokawa.

Some supplemental notes:

♂ Lamella from side to apex broadly white (Figs. 5-7, basal white is light reflec-

tion); palpi brown to dark brown, not white; flagellum beneath not wholly, but frequently apical part only brownish; tegula usually as given in the original description, but often without white spot anteriorly, represented only by translucent brown; pronotal tubercles sometimes with a translucent or dark white spot, rarely completely black; spurs white to yellowish white; tarsi light to dark brown.

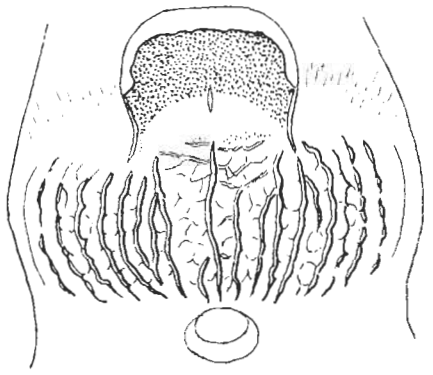
Variation in measured values of some parts of body and wings: Table 1.

Table 1. Variation in some characters (♂)

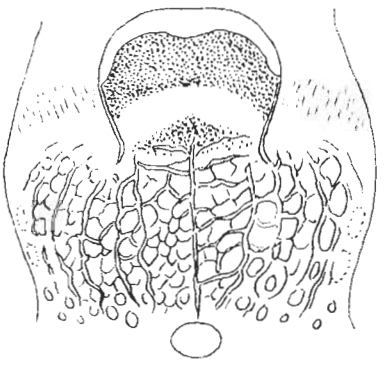
No.	Lgth	IOD			OOD	Od	POD	A3	A4	A5	Lamella					Radius				Cc.2		Cc.3	
		VW	Mx	Mi							aW	xW	bW	mL	lL	1	2	3	4	1	2	1	2
1	5.5	26	29	23	7.5	3.0	5.0	15	14	14	5	15	13	9	11	5	10	7	13	9	9	5	9
2	6.0	26	29	25	7.5	3.0	5.0	14	13	13	5	16	12	9	11	6	10	7	16	7	11	4	9
3	6.0	26	30	24	7.5	3.0	4.5	13	13	13	5	15	12	7	11	6	10	7	15	8	10	4	9
4	4.5	28	30	24	8.0	3.0	6.0	14	14	14	6	15	13	7	10	5	9	6	15	8	11	4	8
5	5.5	26	30	24	7.0	3.5	5.0	14	14	14	5	15	12	6	10	6	8	6	17	8	9	3	9
6	5.5	26	30	24	7.5	3.0	5.0	14	14	14	6	15	12	6	10	6	7	7	16	9	10	4	8
7	5.0	27	32	23	8.0	3.0	5.0	14	13	13	6	15	13	6	9	5	9	7	15	7	11	4	8
8	3.5	30	34	26	9.5	3.0	5.0	14	13	13	6	14	12	6	10	6	6	5	18	6	10	3	7
9	4.3	29	32	25	8.5	3.5	5.0	14	13	13	6	15	13	7	10	6	8	7	17	5	11	3	7
10	5.5	26	29	23	7.5	3.5	4.0	14	14	13	5	15	11	7	10	5	7	7	15	7	9	3	9
11	3.5	30	32	24	7.5	3.5	4.0	14	14	13	5	15	11	6	9	6	8	5	17	8	10	3	7
12	5.0	26	30	24	7.0	4.0	4.0	14	13	13	5	15	12	8	11	6	8	6	15	8	9	3	7
13	3.5	28	32	25	8.0	3.5	5.0	14	13	13	5	15	13	8	11	6	7	8	15	6	11	3	7
14	5.0	26	30	24	7.5	3.0	5.0	14	13	13	6	15	12	6	10	6	8	7	15	7	10	3	9
15	4.0	28	31	25	9.0	3.5	3.0	14	13	13	6	16	13	7	10	6	7	7	17	7	11	3	8
16	4.5	27	30	24	8.0	3.0	5.0	13	14	14	6	14	12	8	10	6	9	6	16	7	10	4	8
17	5.5	27	31	24	8.5	3.0	4.0	14	13	13	7	14	11	8	11	6	7	5	18	7	11	4	8
18	6.0	26	30	24	7.5	3.5	4.0	14	14	14	5	15	13	7	11	5	8	6	18	8	10	5	8
19	5.0	26	30	24	7.5	3.5	4.0	14	14	14	7	15	13	7	11	5	7	7	18	8	10	4	8
20	4.0	29	32	25	8.5	3.0	5.5	14	14	14	7	15	13	7	10	6	8	6	20	8	11	3	6
21	5.0	27	31	24	9.0	2.5	4.0	15	14	14	5	15	13	7	10	5	10	5	17	7	10	3	9
22	5.5	28	31	24	8.0	4.0	4.0	15	14	13	7	15	12	7	9	5	9	6	17	7	10	4	8
23	5.0	28	31	25	8.5	3.0	5.0	15	14	14	5	15	12	8	10	6	9	7	17	6	11	4	10
24	5.5	27	31	25	7.0	3.0	6.0	14	13	13	6	15	12	6	9	5	7	6	16	7	10	3	9
25	4.5	28	31	25	8.5	3.5	4.0	14	13	13	6	15	12	7	10	5	9	7	15	5	12	3	8
26	3.3	30	32	25	8.5	3.5	6.0	14	13	13	4	15	12	7	11	5	7	6	15	6	10	4	9
27	5.5	27	31	25	8.0	3.5	4.0	14	13	13	7	16	12	7	9	6	8	7	15	6	10	4	11
28	6.0	27	30	25	8.5	3.5	5.0	14	13	13	5	15	12	7	11	6	8	7	16	6	11	4	10

Remarks. Nos. 1-8: specimens from Luzon, Nos. 9-15: from Negros, Nos. 16-21: from Cebu and Nos. 22-28: from Mindanao. Lgth = Length (mm). In item Lamella xW=MxW, mL=median L, lL=lateral L. (Scale: IW=50)

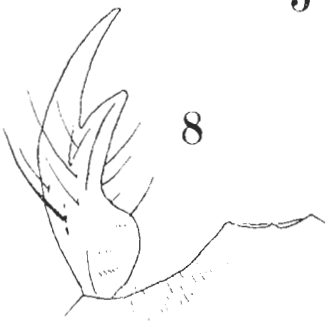
Clypeus fairly closely covered with long, stiff, silvery hairs, the hairs apically somewhat yellowish, with disc roundly raised and distinctly carinated in middle till apical margin, produced medio-apical margin bluntly tridentate; mandible: Fig. 8; L of A3, 4, 5: in Table 1, fairly constant to each IW, A3 not so long as L/aW=5, but slightly less than 4; lamella at base behind central depression (often tuberculate) broadly smooth and shining, L:W in Table 1 (mL: from centre of medial depression to apical margin, lL: from lateral base - point of its reflection from frons, in profile - to apical margin);frontal sculpture usually longitudinally rugose (Fig. 5), often strongly reticulate (Fig. 6), rarely very sparsely rugoso-striate (Fig. 7); pronotum, beside anterior carina, with blunt curved ridge connecting tubercles without median furrow and located behind middle (Figs. 9-12 and 13, lateral); scutum with notauli parallel, surface sparsely covered with comparatively large, shallow punctures; mesopleuron epimeral area longitudinally roundly raised, without marked scrobal furrow, omaulus, acetabular carina and sternaulus till above mesocoxa distinct, surface above longitudinally, below obliquely (often wholly) rugoso-striate or striate, often with punctures mixed; mesosternum with distinct median groove; metasternum: Fig. 14. Propodeum with sculpture fairly different from that of the female: Outermost carina of dorsum that usually runs from behind spiracle to medio-lateral tooth of posterior inclination is lacking, also lateral and top carinae of the inclination lacking, or very feeble, only dorso-lateral angles strongly toothed, from where anteriorly run



5

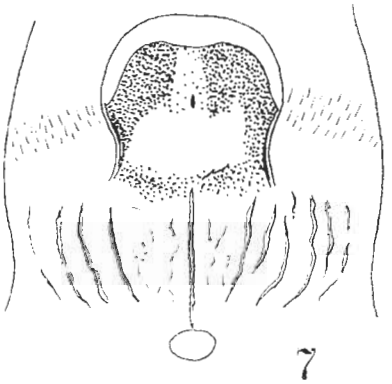


6

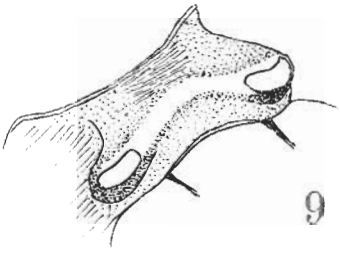


8

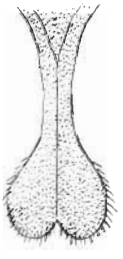
13



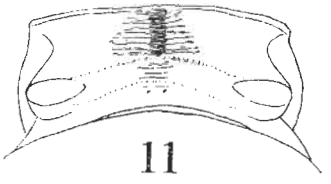
7



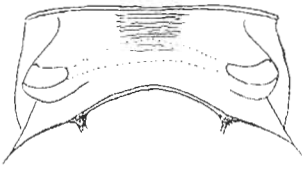
9



14



11



10

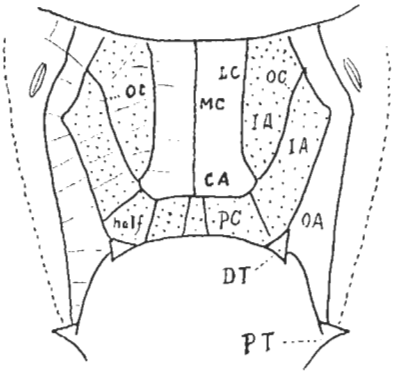
12

outer carinae of intermediate area that are also weak and less marked; while central area with three carinae distinct and posteriorly closed, outer ones of which sometimes convergent posteriorly, sometimes parallel, always with surface flat; the rugulae connecting these carinae considerably numerous, in central area weakly oblique, from outer low to median high, in intermediate area which constantly with oblique carina strongly oblique; sculpture of flat posterior inclination considerably variable, but mostly radiately rugoso-striate toward outer sides, sometimes with median carina, sometimes without, with varied density, but always not strongly so; mid-lateral tooth of this inclination also variable in development, sometimes alsomst lacking, sometimes distinctly toothed, but most usually it is less developed and small and obtuse; side of propo-

deum longitudinally strongly and closely striate, except antero-ventral area.

FUNDAMENTAL PATTERN OF SCULPTURE OF THE PROPODEAL DORSUM

Dorsal aspect of propodeum with a complicate sculpture which is considerably specific, but the descriptions of it by previous authors are mostly quite unintelligible. this is due to their disordered descriptions. Most simply and fundamentally it can be divided into three kinds of areas: Central Area (CA in Fig. 15, margined by lateral carinae, LC, and apical carina and including medial carina, MC), Intermediate Area (IA, dotted area in the Figure, encircling CA and for convenience it further trisected into two lateral IAs and posterior cells, PC, divided part to some cells in front of posterior marginal carina of dorsum, both ends of which are usually toothed; IA often including oblique carina, OC, running from latero-posterior corner of CA to latero-anterior part of IA) and Outer Area (OA, area at outer side of IA, margined outward by a carna running from slightly inside of spiracle to mid-lateral tooth of posterior inclination and posteriorly by a dorso-lateral carina of the inclination - this inclined part is often called by some authors as posterior area -, connecting the tooth with postero-lateral tooth of the dorsum. Thus, when fully developed dorsal aspect of propodeum comes to bear 7 longitudinal, 2 oblique and 2 transverse carinae to form a rough frame-work of the sculpture. These carinae are connected or half-connected with the adjacent ones by numerous transverse carinules, including more or less oblique ones, to complete the final complicate sculpture. Of the main carinae outermost ones are often overlooked by some authors, or really less developed and partly vanished in the male of some species, and OC is often specifically or sexually lacking; similarly apical part of LC and parts of MC of Central Area are also missed and in some cases apical marginal carina of this area is disappeared and the area comes to open at apex. The density of short carinules connecting main carinae is quite variable individually within a species. Postero-lateral teeth of dorsum (DT) and lateral teeth below middle of posterior inclination (PT) are also variable in development individually, especially in the male.



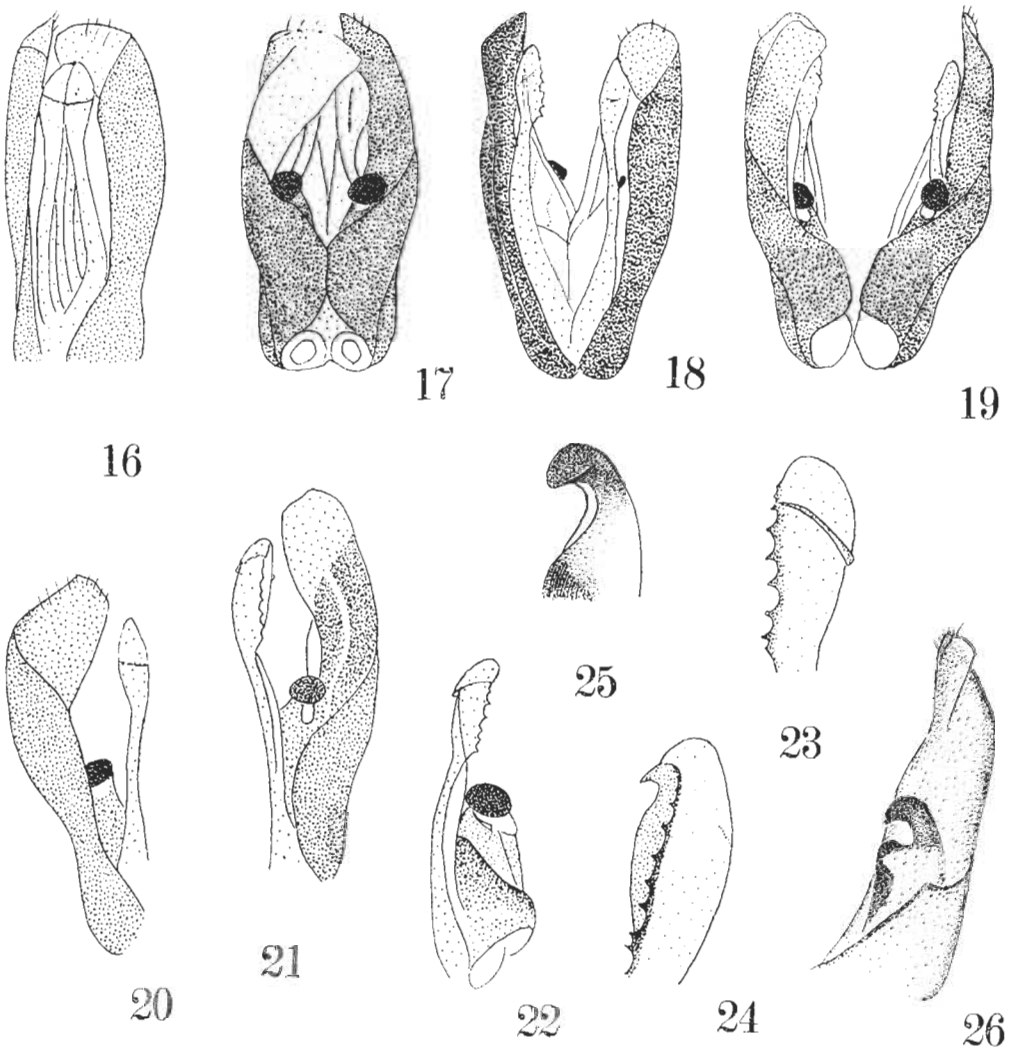
15

GT1 at anterior inclination sometimes flat, sometimes ovally shallowly depressed, variable in size, on disc very minutely, sparsely, rather indistinctly punctulate, GT 2 and 3 similarly punctulate, almost smooth and shining as in the female. The fact is quite exceptional in the male of this genus; GT3 at apical margin not abruptly depressed and not forming the broadly reflected marginal area; GS1 with a central cone-shaped process, pointed at apex, GS2 deeply inclined at base, forming a broad furrow between GS1 as usual. Punctation of GS2 and 3 same as on dorsum.

Genitalia from above: Fig. 16 (natural), from beneath: Fig. 17 (do.) and Figs. 18 and 19 (respectively opened). Fig. 20: Opened right half to see aedoeagus vertically from above, 21: same from beneath, 22: same except paramere, but to see serrate margin of aed eagus vertically, from slightly more outer side. The margin of the cap is evident on outer side of each half (Fig. 23) and lacking on inner side (Fig. 24), but as a whole constituting a complete cap (Fig. 16). Paramere at apical part broadly pale and frequently folded over, with a few short hairs at apex, digitus of volsella with top fuscous and produced vertically like a short thick bill (Figs. 25 and 26).

In fore wing abscissa 1, 2, 3, 4 of radius and those 1, 2 of cubitus within cubital cells 2 and 3 (that is to say the adjoining points of recurrent veins 1 and 2) considerably variable (Table 1), but in cubital cell 2 abscissa 1 mostly < 2, only rarely $\doteq 2$, while in cubital cell 3 always $1 < 2$; if L of abscissa 3 of radius compared with L of abscissae 1+2 of cubitus in cubital cell 3 we can roughly presume the form of cubital cell 3.

♀. Rohwer in his 1910 paper says that the female of this species agrees in general with the male. This is a quite strange account, because in this genus sexual dimorphism is well developed and the sex association is, except for the biological study very difficult. Certainly the female of stantoni has never been described up to the present, although Williams, 1919, observed the habits of this species and described

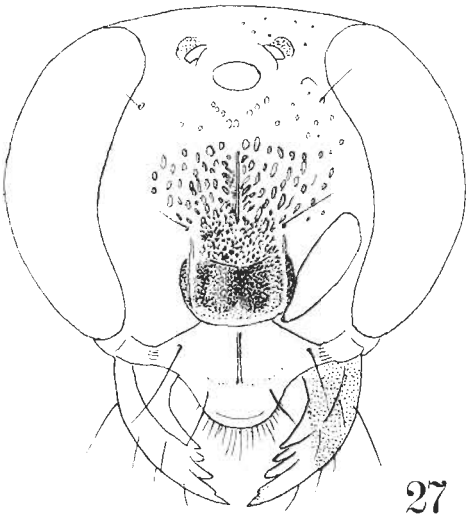


eggs, larvae and cocoons. The sex association in our case was determined by the frequent sympatric occurrence of both sexes.

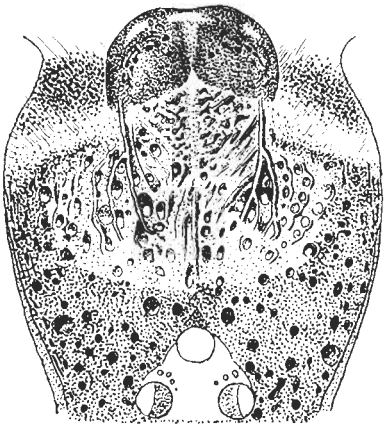
Length 6.0 – 7.5 mm. Black, madible apically light brown, palpi largely yellowish brown, often lamella apically slightly brownish and rarely rather whitish and antenna dark brown beneath, apical rings of all trochanters always yellowish, articulations of legs, all tibiae partly with spurs and tarsi more or less brownish; wings hyaline, stigma and veins light brown. Long settae or macrochaetae, normal in distribution (on clypeus 4, mandible 1, frons 4, pronotum 2 and scutellum 4), black, often those on clypeus slightly brownish; moderately curved hairs on temples, straight ones on sides and underside of thorax and propodeum white, in some light silverily glittering.

Measurements: Table 2.

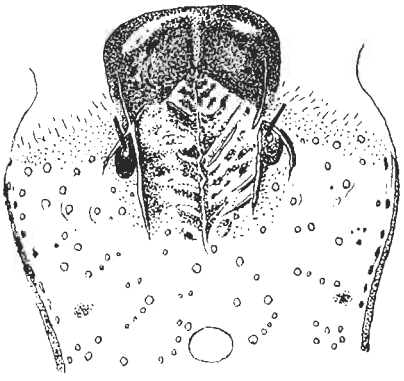
Clypeus as in Fig. 27, median carina defined only on dorsal elevated area, hairs scarce; mandible with three minute teeth on inner margin; lamella inclined toward median line, surface not completely smooth, frequently each half gently roundly raised, and arcuately punctur d, median area just above central depression, wherein usually is a minute tubercle present, obliquely closely rugulose and the area far above the place is margined on both sides by the extensions of lateral carinae of lamella and always with a rugosed medial carina and many oblique rugulae branched off from it (Figs. 28, 29 and 30); frons at outer sides of this median area sometimes longitudinally, weakly



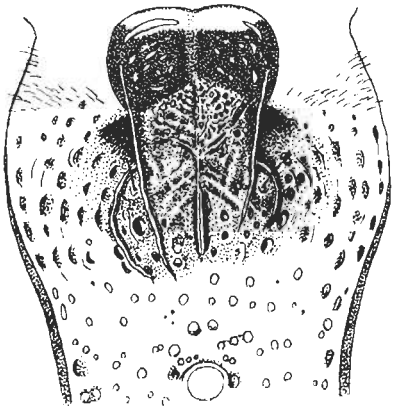
27



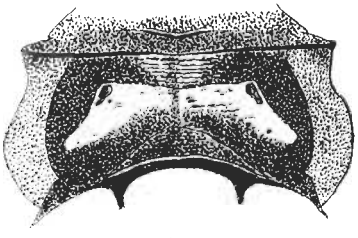
28



30

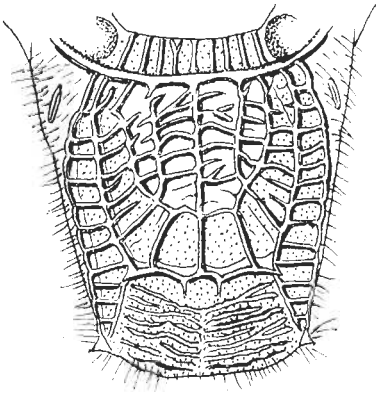


29

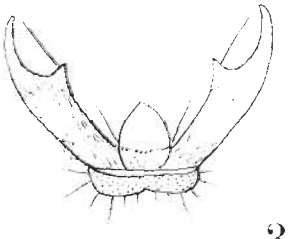


31

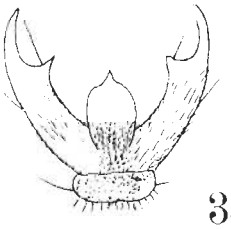
35



32



34



33

sparsely rugoso-striate, mixed with scattered shallow punctures (Fig. 28), but more usually almost without rugae (Figs. 29 and 30); pronotum always with antero-lateral corners below distinctly toothed and with median furrow well-defined (Fig. 31), but the strength of anterior bordering carina and depth of posterior depression between tubercles variable, the former in the Luzon specimens (constant?) well-defined from side to side, while in the others at about a median third weak and less distinct, due partly to the presence of similar parallel striae in front and behind and the latter sometimes shallow, letting the tubercles appear less highly elevated, but more usually fairly deeply triangularly excavated, often letting the apices of tubercles appear roundly produced; medio-anterior part of dorsum and medio-dorsal part of anterior inclination, irrespective of the developmental degrees of bordering carina, always transversely, finely and closely striate or rugoso-striate; on mesopleuron epimeral area longitudinally markedly raised, with top subcarinate, scrobal furrow shallow, but well defined; omaulus, acetabular carina (meeting point of both at mesosternum toothed), sternaulus till above mesocoxa and mesosternal groove distinct; metasternum with basal stalk part long, acutely carinate and apex bilobed as in ♂ (Fig. 14); episternum above longitudinally, below obliquely puncto-rugoso-striate; metapleuron only at upper area with a few longitudinal coarse striae; side of propodeum except antero-ventral portion longitudinally, strongly striate, with striae-intervals minutely and closely punctulate; dorsum of propodeum and posterior inclination sculptured as given in Fig. 32; GT2 and 3 very minutely and very sparsely punctulate, almost impunctate, GS 2 and 3 somewhat more clearly, but sparsely punctured; fore T5: Fig. 33, hind T5: Fig. 34, if seen vertically: Fig. 35.

Table 2. Variation in some characters in five species (♀)

No.	Loc	Lgh	IOD			OOD	Od	POD	A3	A4	A5	Lamella					Radius				Cc.2		Cc.3	
			VW	Mx	Mi							aW	xW	bW	mL	lL	1	2	3	4	1	2	1	2
1	Luz	7.0	20	29	22	5.0	3.0	4.0	15	13	13	6	12	9	4	7	5	9	6	14	8	9	4	9
2	Luz	6.5	21	29	24	6.0	3.0	3.0	16	13	13	7	13	10	5	8	6	7	6	15	8	9	4	8
*3	Luz	6.5	20	28	23	5.0	3.0	4.0	16	13	13	4	13	10	6	9	6	10	9	15	8	10	4	9
4	Neg	6.0	21	29	23	5.5	3.0	4.0	16	13	13	7	13	10	6	8	6	7	6	15	7	10	4	9
*5	Neg	5.5	21	29	23	5.5	3.0	4.0	16	13	13	5	13	10	6	8	6	7	7	15	7	10	3	9
6	Min	7.5	20	28	22	5.0	3.0	4.0	16	13	13	5	13	10	5	8	6	8	5	15	7	10	4	9
7	Min	6.5	19	27	22	5.0	3.0	3.0	16	13	13	6	12	10	6	8	6	7	6	15	7	8	4	9
8	Pal	8.0	19	27	23	4.5	3.5	3.0	18	14	14	7	12	9	4	6	5	10	3	16	6	9	4	7
9	Pal	8.2	20	28	23	5.5	3.0	3.0	18	14	14	7	12	10	4	7	6	9	6	15	6	9	3	9
10	Pal	7.5	20	28	22	6.0	3.0	2.0	17	13	13	7	12	9	4	6	6	8	5	14	7	10	3	8
11	Pal	8.0	20	28	23	5.5	3.0	3.0	18	14	14	6	12	9	5	7	5	8	5	15	7	10	4	8
12	Pal	8.0	19	28	22	4.7	3.0	3.5	18	15	14	7	13	10	4	7	5	9	5	15	8	9	3	9
13	Pal	8.8	19	26	22	5.0	3.0	3.0	17	14	13	6	12	9	5	7	5	9	5	14	7	9	4	9
14	Pal	6.5	19	28	24	5.0	3.0	3.0	17	13	13	7	11	10	6	9	5	8	5	13	6	10	3	7
15	Min	7.5	18	28	25	4.5	3.0	3.0	17	14	14	7	14	10	5	8	5	7	6	15	7	10	4	8
16	Min	7.5	19	28	24	5.0	3.0	3.0	17	14	14	10	13	10	6	8	6	8	5	16	7	10	3	10
17	Pal	8.0	21	29	6	5.0	3.5	4.0	16	16	16	6	15	12	6	9	5	10	6	16	6	10	3	9
*18	Min	7.3	21	30	25	5.0	4.0	3.5	16	16	16	3	15	12	6	9	5	10	8	16	7	10	4	9
19	Min	8.0	18	27	24	4.5	3.0	3.0	18	18	18	0	15	11	6	8	5	11	8	18	9	9	4	9
20	Luz	8.5	18	29	25	4.0	3.0	4.0	17	17	17	5	14	14	4	6	6	13	7	24	11	10	6	10

Remarks. Nos. 1-7: stantoni (Nos. with * have lamella brownish white at apical margin); Nos. 8-16: amamiensis; Nos. 17 and 18: palawanensis (18: ssp. davaonis); No. 19: aposanus; No. 20: baguionis.
Abbreviations: Loc = Locus, Lgh = Length (mm), xW = MxW, mL = medial L, lL = lateral L, Radius = Abscissae of radius, Cc2, Cc3 = Abscissae of cubital cell 2, 3.

DOLICHURUS AMAMIENSIS TSUNEKI ET IIDA, 1964

Dolichurus amamiensis Tsuneki et Iida, 1964, Akitu, XI; 41 (2♀, Is. Amami, Ryukyus).
Dolichurus amamiensis: Tsuneki, 1967, Etizenia, 21: 13 (3 ♀ 3 ♂, Taiwan, ♂ as puliensis).
Dolichurus amamiensis: Tano et Tsuneki, 1970 (Is. Iriomote, puliensis = ♂).

Dolichurus amamiensis: Tsuneki, 1974, Polsk. Pism. Ent., 44: 591 (Thailand).
Dolichurus amamiensis: Bohart and Menke, 1976, Sphecid Wasps of the World, p. 69.
Dolichurus amamiensis: Tsuneki, 1976 , Steenstrupia, 4: 34 (11♀8♂, Palawan, Balabac, Tawitawi, Suppl. Descr.).

Specimens collected:

10 ♀ 18 ♂, Palawan (Inagawan, Calacuasan, Quezon, Puerto Pricessa, Iwahig, San Rafael, Aborlan, Narra), 23.III.-3.IV.1983, Tano and Murota.
2 ♀, Mindanao (Cagayan de Oro: Makahambus Cave), 15-16.VIII.1980, Murota; (Lanao der Sur: Malawi City), 1.VIII.1983, Tano.

Some supplementary notes:

♂. Length 3.5-6.5 mm, most usually 5.5-6.0 mm. Measurements of important parts of body and wings were given in Table 3 (Nos. 1-7), with sampled specimens. Head in frontal view: Fig. 36, clypeus and mandibles: Figs. 37 and 38, lamella and frontal sculpture: Figs. 39-41, apical margin of lamella often: Figs. 42 or 43, frontal sculpture seems to be close to that of abbreviatus Strand, known from Taiwan, but in this species lamella comparatively shorter and entirely black; L of A1-13 in a larger and a smaller specimen: =14,4,15,14,14,13,12,11,10,9,8,8,10 and 15,4,16,15,15,14,13,11,10, 9,8,8,10, in the former A3/aW=4.3 and A13/bW=4.3 and in the latter =4.2 amd 4.5 respectively; A1 with a longitudinal carina at antero-inner margin, flagellomeres each weakly down-curved, strongest at A9, but none with an erect seta in middle beneath; vertex sparsely, weakly punctured, with many erect hairs; pronotum: Figs. 44 and 45, seen obliquely from above and side: Fig. 46, anterior margin transversely carinate, and along the carina finely and closely rugoso-striate in front and behind, its tubercles highly raised, with top white maculated and produced postero-laterally, maculae more often dark white (11/18), sometimes hardly defined (4/11), due to minute in size, medio-posterior lunate depression comparatively shallow, on the anterior raised area usually without median furrow, if present, broad and very weak; scutum with notauli normal; on mesopleuron epimeral area longitudinally, simply, highly and roundly raised, smooth and shining, scrobal furrow not impressed, but apparently furrow-like by the acute elevation of the epimeral area, anteriorly omaulus and acetabular carina distinct, episternum with sternaulus, evidently running from lower part of omaulus to upper side of mesocoxa, surface above longitudinally, below obliquely, strongly closely rugoso-striate, with punctures mixed at dorso-posterior portion; dorsum of propodeum with sculpture usually complete, having central, intermediate and outer areas, the first with medial carina distinct and the second always with oblique carina (Figs. 47, 48, 49), but sometimes central area with apex open and outer area with outer carna evanescent and at apical half almost disappeared, similarly lateral tooth of posterior inclination is variable in development and often practically lacking; surface of the inclination coarsely rugoso-reticulate or radiately (from medio-apical centre) rugoso-striate, side of propodeum, except for smooth antero-ventral area, longitudinally, strongly, coarsely striate.

Punctation on gaster:

GT1 on anterior inclination smooth and polished, dorsum finely (Pd as great as W of recurrent vein 2) punctured, punctures somewhat irregular in distribution, mostly PIS 1.5-2 times Pd, but where forming puncture-lines PIS less than Pd, on GT2 more regular, mostly PIS=Pd (Fig. 50), on GT3 punctures slightly finer, with distribution on disc as on GT1, but on lateral areas regul r and closer as on GT2, punctures on GS2 somewhat stronger, very frequently forming puncture-lines, on GS3 finer, sometimes on central area disturbed and indistinct.

Genitalia:

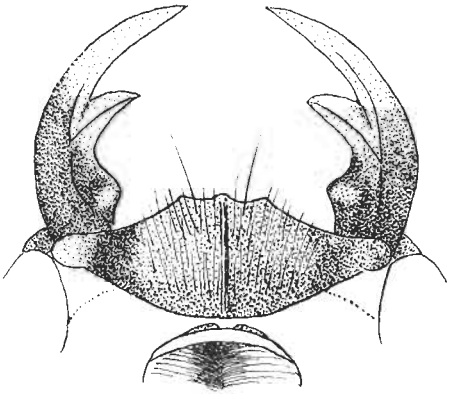
The state pulled out of the end of gaster and seen from above: Fig. 56, aedoeagus and left paramere from above: Fig. 57, dissected left half from above: Fig. 58, from beneath: Fig. 59, right half slightly obliquely from beneath: Fig. 60; paramere appears to be consisted of two layers tightly fixed, dorsal layer castaneous and the ventral layer pale and longer, producing beyond the dorsal, with top fringed with a few short hairs; digitus black, thick, bill-shape; aedoeagus at apex swollen into elongated oval and cap d at top and serrate at ventro-inner margin of each half (Figs. 57, 58, 59 and 60).

Cubital cell 3 of fore wing:

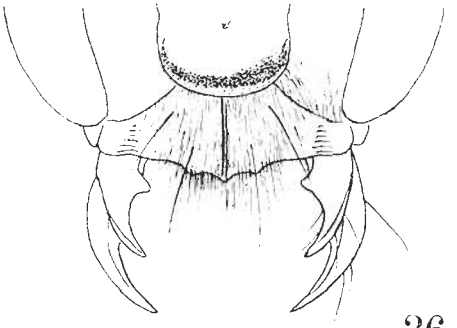
Variable in form as shown in Figs. 51-55.

♀. Length 6.5-9.0 mm, most usually 7.5-8.0 mm, very similar to stantoni ♀, only separable from it by the relative length of A3,4,5 to each width at apex.

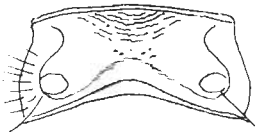
In the following mention will be made on the characters of some selected parts of the body only:



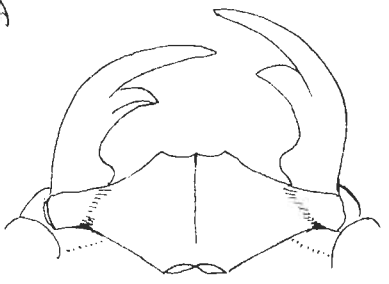
37



36

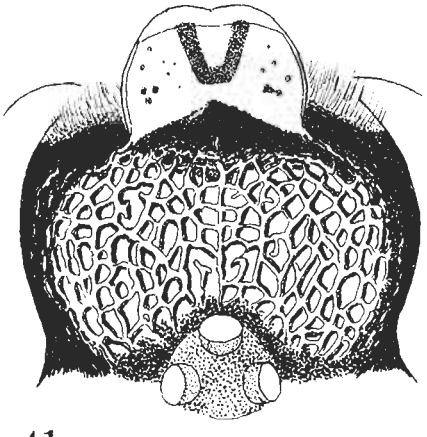


44

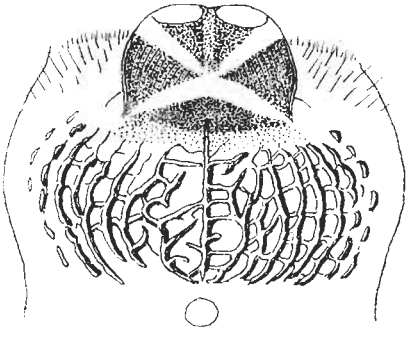


38

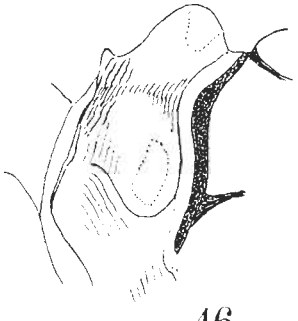
45

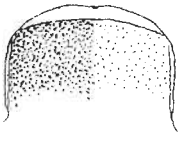


41



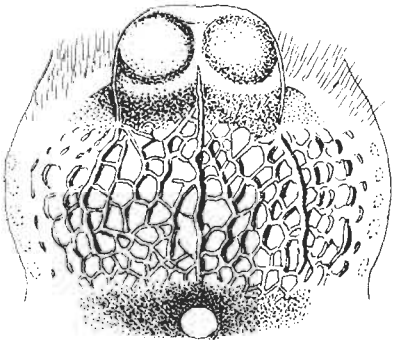
39





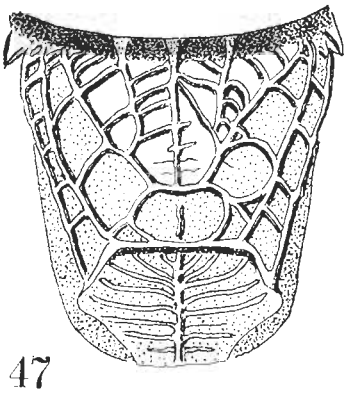
42

43

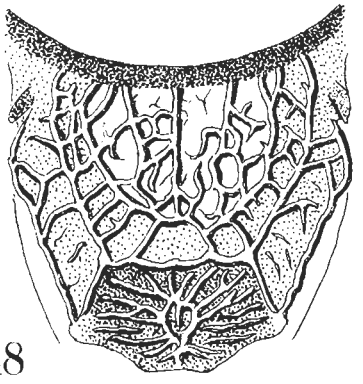


40

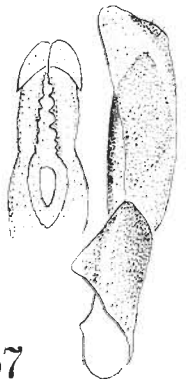
46



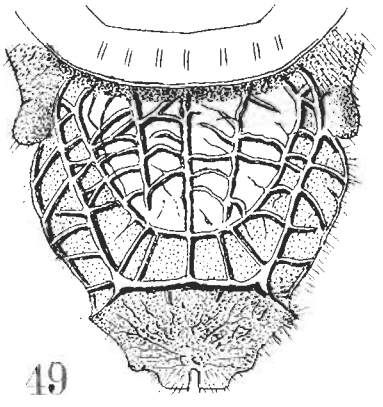
47



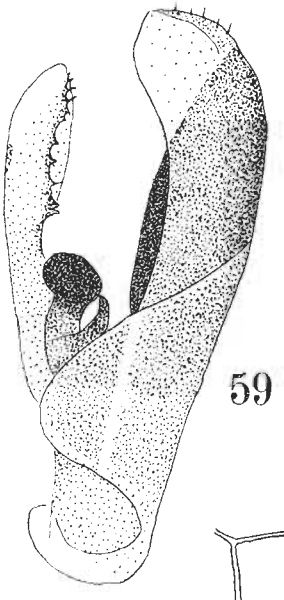
48



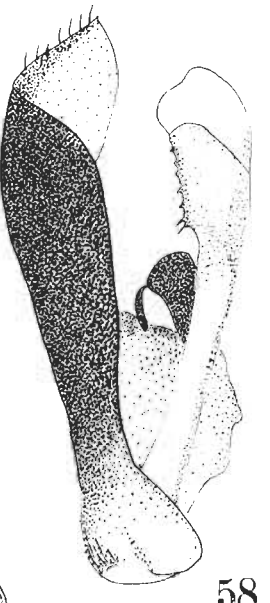
57



49



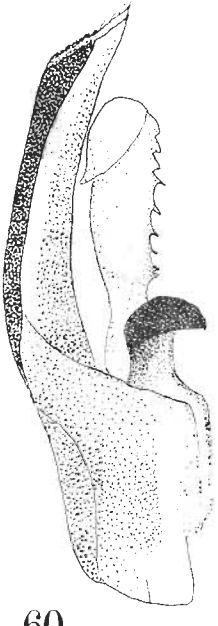
59



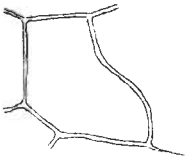
58

50

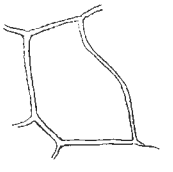
55



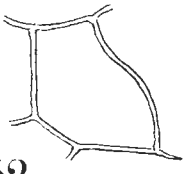
60



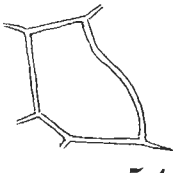
51



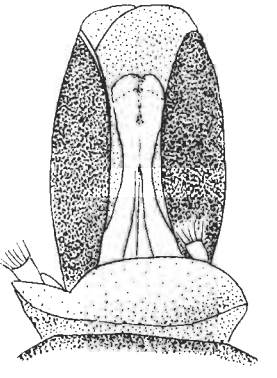
53



52



54



56

Table 3. Variation in some characters of seven species (♂) of Philippines

No.	Loc.	Lgh.	IOD			OOD	Od	POD	A3	A4	A5	Lamella				Radius				Cc.2		Cc.3	
			VW	Mx	Mi							aWxW	bWmL	1L		1	2	3	4	1	2	1	2
1	Pal	3.5	29	33	25	9.0	3.5	4.0	15	14	14	7	14	13	5	8	7	8	5	18	8	10	3	9
2	Pal	4.3	29	32	25	9.0	3.5	4.0	15	14	14	5	14	13	5	9	7	6	7	16	5	11	4	9
3	Pal	5.5	27	32	25	8.5	3.5	3.0	15	14	14	6	14	13	7	10	6	9	6	16	8	10	5	7
4	Pal	5.5	28	32	25	8.5	3.5	4.0	16	15	15	5	15	13	6	9	6	9	4	17	7	10	3	8
5	Pal	6.0	28	31	25	8.5	4.0	3.0	15	14	14	6	14	13	6	9	7	8	5	18	8	10	3	9
6	Pal	4.5	29	33	25	9.0	4.0	3.0	14	14	13	6	15	13	6	10	7	8	5	18	8	9	3	7
7	Pal	4.7	28	33	25	8.0	4.0	4.0	15	14	14	5	15	14	7	10	6	9	7	17	7	10	4	8
8	Pal	6.5	27	32	25	7.0	4.5	4.0	14	15	15	4	16	14	7	10	5	9	6	22	7	10	4	10
9	Pal	6.3	27	32	25	7.0	4.5	4.0	14	14	15	3	16	14	7	10	5	9	7	20	8	9	5	7
10	Pal	7.0	28	32	25	7.5	4.5	4.0	15	15	15	5	16	14	7	11	4	10	7	19	7	10	3	9
11	Pal	6.5	27	32	25	7.0	4.5	4.0	14	16	16	5	16	14	7	11	4	10	8	20	6	10	4	10
12	Pal	6.3	27	32	25	7.0	4.5	4.0	14	14	14	5	16	15	7	11	5	9	6	21	5	11	3	9
13	Min	7.5	24	29	25	7.0	4.0	3.0	14	15	16	3	15	12	7	14	5	11	9	22	9	10	4	10
14	Min	7.5	24	29	25	7.0	4.0	3.0	15	16	16	3	14	12	7	14	5	10	6	23	7	10	4	10
15	Pal	3.5	29	33	25	8.5	3.5	5.0	15	15	15	6	15	13	4	8	6	7	7	17	6	10	4	9
16	Pal	4.0	29	33	24	8.5	3.5	5.0	15	14	14	7	15	13	5	8	6	8	3	19	8	9	4	9
17	Pal	3.7	29	32	25	8.5	4.0	4.0	15	14	14	5	14	13	6	8	6	8	5	18	7	10	4	5
18	Pal	3.3	29	33	24	9.0	3.5	4.0	14	14	14	6	14	14	6	8	6	7	5	17	7	10	4	4
19	Pal	3.5	29	33	25	9.0	3.5	4.0	15	14	14	6	15	14	6	8	6	6	5	18	6	10	4	6
20	Pal	4.0	29	32	24	9.0	4.0	3.0	15	14	14	5	15	13	6	10	5	9	6	18	8	11	4	8
21	Luz	4.7	24	31	25	7.0	3.5	3.0	16	16	15	8	15	13	7	11	7	6	9	20	9	10	3	8
22	Ley	4.5	24	31	25	7.0	3.5	3.0	16	16	16	4	14	12	7	11	6	7	8	22	9	10	4	8
23	Min	4.5	25	30	25	7.0	3.5	5.0	16	16	16	6	15	12	6	10	6	7	6	22	7	8	3	9
24	Min	5.2	26	31	26	7.0	4.0	4.0	16	16	16	5	15	11	6	11	7	7	8	20	8	7	3	9
25	Min	4.5	26	32	27	7.0	4.0	4.0	16	16	16	5	16	12	6	11	7	7	9	21	8	10	4	10

Remarks. Locus: Pal=Palawan, Min=Mindanao, Luz=Luzon, Ley=Leyte). Lgh=Length (mm). xW=MxW, mL=median L, lL=lateral L. Radius=Abscissae of radius, Cc.2= do. of cubitus within cubital cell 2. Nos. 1-7=amamiensis, 8-12=palawanensis, 13-14=aposanus, 15-19=clypealis, 20=pigmaeus, 21-22=rugosifrons, and 23-25= mindanaonis.

Clypeus: Characteristic in that medial carina is confined to basal raised part only; this is common with stantoni ?.

Lamella: Always wider than long as given in Table 2 (Nos. 8-16); surface weakly inclined toward medial line, each side mostly gently roundly raised, but often nearly flat, usually along lateral ridge with two or three, slightly curved, parallel striae, mixed with some punctures, but often without puncture mixed and rarely the striae are replaced by rugosed punctures or a few comparatively large cattered punctures; in all the specimens the central depressed part and the area just above it closely, irregularly rugulose.

Frons: Lateral ridges of lamella extended upward and shortly above the base each splitted by the lower frontal macrochaetae into two close parallel striae, inner one of which, while they go further upward, repeats branching inward to form the irregular network of the median area of frons, often in cooperation with the separate median carina of the area; while,outer one spreads a few comparatively stronger, subequidistant, curved branches upward from near its base, each shooting minor rugosed twigs on both sides to form rough rugoso-reticulation at outer sides of median area, but the reticulation not spreading broadly over the frons as in ♂, but restricted to narrow adjacent part of median area; rest of frons sparsely punctured, often partly forming sparse arcuate puncture rows (Fig. 63, in No. 2 specimen).

Vertex: Postero-lateral areas and posterior inclination minutely and closely punctulate, remaining dorsal broad part irregularly (PlS i-3 times Pd) scattered with tiny, medium or large punctures.

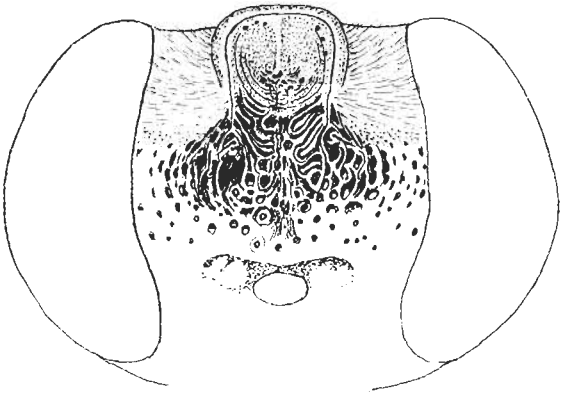
Pronotum: Measurements of main W and L are given in Table 4 (aW=anterior W, between tips of antero-lateral teeth below; xW=MxW, between tops of lateral arcuate expansions below; tW=tubercular W, between postero-lateral apices of tubercles; mL=

median L, from anterior carina to median apex; lL= lateral L, from antero-lateral tooth to postero-lateral end of lower expansion). The form is comparatively constant (Fig. 64, in No. 2 specimen), tubercle obliquely ovoid, but with surface evenly flat, horizontal with medio-anterior connecting erea, except median furrow which is shallow, but always present, anterior bordering carina also constantly present, often, however, from above medianly obscure, due to presence of similar striae in front and behind.

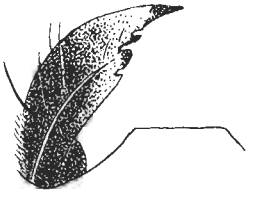
Table 4. Pronotum

No.	aW	xW	tW	mL	lL
1	29	32	24	12	15
2	30	33	25	11	15
3	29	32	25	11	15
4	30	33	25	11	15
5	30	32	26	12	16
6	29	32	26	11	16
7	29	32	25	11	15
8	28	31	24	11	17
9	30	33	27	12	16

Propodeum: Dorsal sculpture typical and complete, bearing complete CA, IA and OA (cf. Fig. 15), only variable in the numbers and states of bars within each and of posterior cells (Fig. 66 in No. 2 specimen); postero-lateral teeth of dorsum gradually lowered toward apical middle till mere carina (do.), length of which is more or less variable, lateral teeth of posterior declivity moderately large and acute in the Palawan specimens, and much larger and strongly acute in the Mindanao specimens. Central area of this decli-

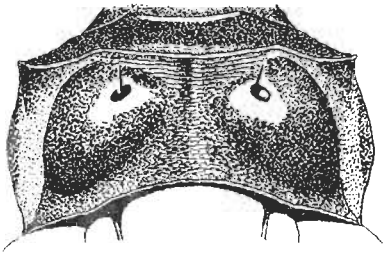


63

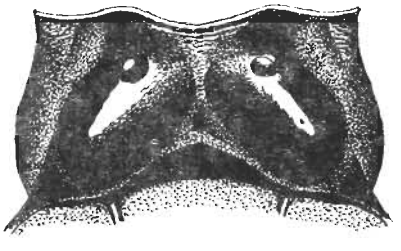


61

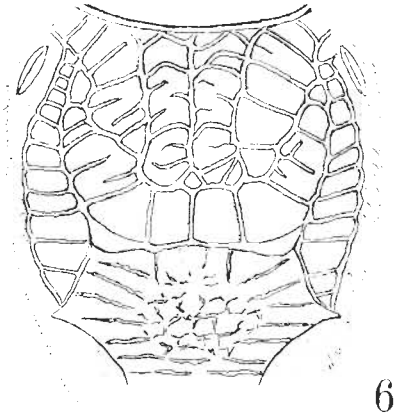
62



64



65



66

vity narrowly reticulated with small meshes, whence rugosed striae run radiately upward and sideward.

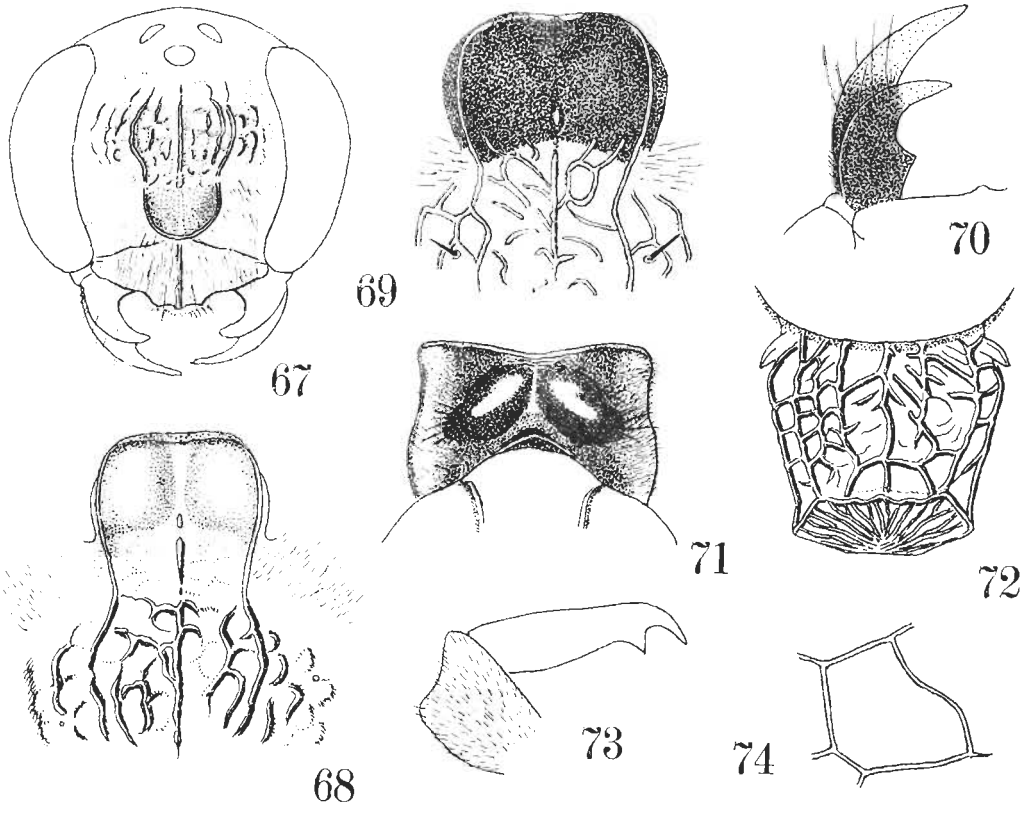
An aberrant specimen.

A female specimen (No. 8 in Table 4) from Mindanao (Cagayan de Oro: Makahambus cave, 15-16.VIII.1980, Murota) has some exceptional characters that let me doubt at first as to whether it is really amamiensis or not.

In this specimen median carina of clypeus farther extended than usual till near middle of anterior inclination, mandible with central tooth on inner margin slenderer and longer than usual (Fig. 62, cf. Fig. 61), pronotum with tubercles comparatively narrower and longer, having dorsal flat ridge not inclined till near apex (Fig. 65, cf. Fig. 64), with medio-posterior emargination markedly deep and median furrow much deeper than in usual specimens and, furthermore, sculpture of propodeum also much more complicate than usual. However, in other important characters, viz. relative length of A3, 4, 5, A3/aW, presence of anterior bordering carina of pronotum and of sternaulus of mesopleuron and general colouration and punctation, it well agrees with amamiensis, so that it was determined to be treated as an aberratio of this species.

DOLICHURUS MINDANAONIS TSUNEKI, SP. NOV.

♂. Length 4.5 mm. Black, pronotal tubercles without white spot, lamella apically brownish white (in one of the paratypes with a close pair of minute white spots), mandibular teeth light brown, antenna dark brown beneath, palpi brown, apically paler, apices of tibiae with spurs brown, tarsi slightly brownish beneath, wings h aline and apicalll slightly clouded, costa and subcosta black, other veins dark brown; hairs silky white, rich, on lower frons and side and underside of thorax short and appressed, on clypeus half erected and long, on temples and vertex erected, on sides of GT2 and whole of GT3 (and on GT4–7 if pulled out) and GSs short, hairs on apical margin of



labrum long, stiff and slightly yellowish.

Head in frontal view: Fig. 67, mandible: Fig. 70, lamella vertically seen with its upper area: Fig. 68 (in the exceptionally maculated paratype: Fig. 69), lamella thick, outer sides of marginal ridge roundly inclined outward, whence inward weakly inclined toward median line, with surface gently roundly raised and along lateral ridge arcuately, minutely punctulate where rather dull, on other area smooth and shining; median area of frons always with median carina, but with rugosed striae inside not close, frons at outer sides of median area obscurely, longitudinally and arcuately punctato-striate, striae rather sparse and restricted to narrow part adjacent to median area; vertex shining, with sparse weak punctures scattered, VW:MxIOD: MiIOD=25:30:26, OOD:Od:POD=7:3.5:5 (Table 2); L of A1-13=15,4,16,16,16,15,13,11,10, 9,9,8,9, A3/aW=4.6, A13/bW=4.5; head in profile with W of eye:temple=14:11; pronotum: Fig. 71, with anterior transverse carina distinct, tubercles highly raised, completely black, but smooth and polished and produced postero-laterally, median furrow well defined, reaching anterior margin; sculpture of propodeum in holotype: Fig. 72 (notice that on the left IA OC present, on the right not), disc of CA flat, not depressed; mesopleuron with epimeral area longitudinally roundly raised, smooth and shining, scrobal furrow fairly deep, omaulus and acetabular carina well defined, episternum with distinct sternaulus, mesosternum with median groove, metasternum as in amamiensis, ♂; Gl with anterior inclination ovally impressed, intersegmental constrictions normal, form of femora also as usual, claws: Fig. 73; fore wing venation normal, abscissae 1,2,3,4 of radius in the right wing: 6,7,6,22 (ref. Table 2) (in the left 6, 7,7,22), rest till wing tip: 15(17), abscissae 1 and 2 of cubitus within cubital cell 2 and 3 = 7,8(8,8) and 3,9(3,10: Fig. 74), rest till wing tip: 25(25), nervulus and its antefurcal distance: 4.5:7(5:6.5).

Vertex smooth and shining, with sparse fine punctures scattered (fairly abundant erect fine hairs present without noticeable basal pits), side of pronotum polished, without a series of striae below the humeral angles, episternum anteriorly feebly obscurely, posteriorly more or less strongly and distinctly punctato-rugoso-striate, especially at dorso-posterior area without rugae, fairly strongly and closely punctured; metapleuron smooth and polished, side of propodeum at dorso-posterior area alone longitudinally striate; disc of GT1 smooth and polished, with fine punctures very sparsely scattered except apical area, GT2 medianly from before middle posteriorly very broadly and apical marginal area fairly broadly impunctate, remainder closely (PID=Pd), laterally more densely covered with medium-sized punctures, GT3, except depressed and closely rugulosed broad marginal area, more uniformly, more minutely and closely punctulate as on side of GT2, but laterally punctules much weaker, GS2 and 3 basally obscurely, apically distinctly, finely and closely punctulate.

♀, unknown.

Holotype: ♂, Mindanao (Malaybalay, 700 m), 12.VIII.1980, T.Murota leg (will be donated to U.S. Natl. Mus.).

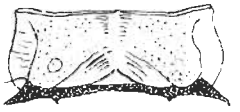
Paratypes: 2 ♂, Mindanao (Bukidnon, near Malaybalay), 29-30.VII,1983, T.Murota leg, in Murota's Collection).

DOLICHURUS RUGOSIFRONS TSUNEKI, SP. NOV.

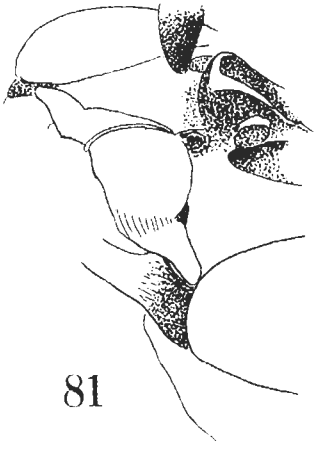
The present species is similar to stantoni and amamiensis (♂) in having the frontal lamella white banded at apex and pronotal tubercles white spotted on top (+ presence of median carina of clypeus till apex, anterior bordering carina of pronotum and sternaulus of mesopleuron), but differs from these in the uneven sculpture of GT1 and 2; in this respect it rather closely resembles preceding mindanaonis, but is different from it in the coloration of lamella and pronotum and in the detailed pattern of punctation of GT1.

In the following by comparing further characters of the present species with those of the species mentioned its distinctive features will be clarified (ref. Table 3, p. 18 and Figs 75-80 in holotype and 81-85 in paratype, p. 21):

1. IOD: VW and MxIOD much smaller than any species; accordingly,
   a. head in front with inner orbits more strongly convergent upward,
   b. emargination of inner orbit much shallower.
2. Frons much less reticulate than in stantoni or amamiensis and much more widely and closely rugoso-striate than in mindanaonis (Figs. 76 and 82).
3. Pronotum appears to have the tubercles much more highly raised than in compared species, because the median furrow deeper, reaching anterior margin (Figs. 77,

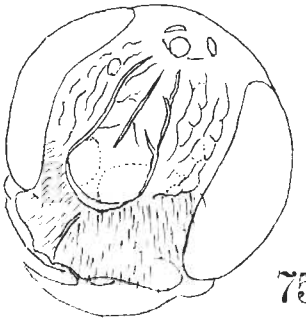


77

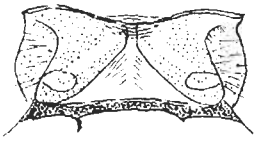


81

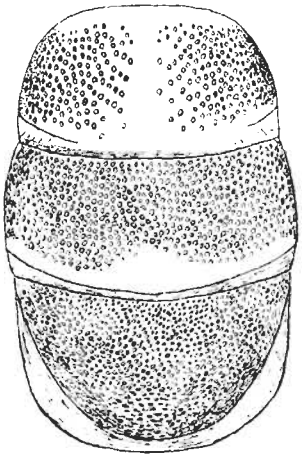
78



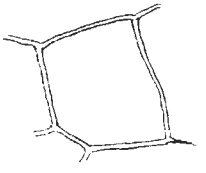
75



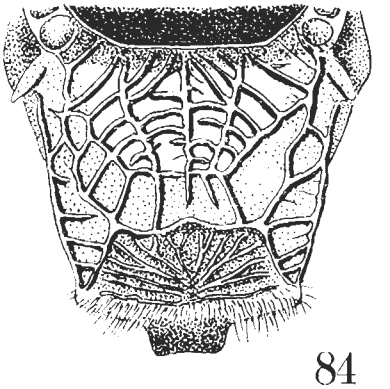
83



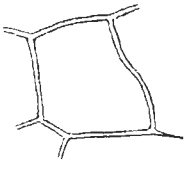
79



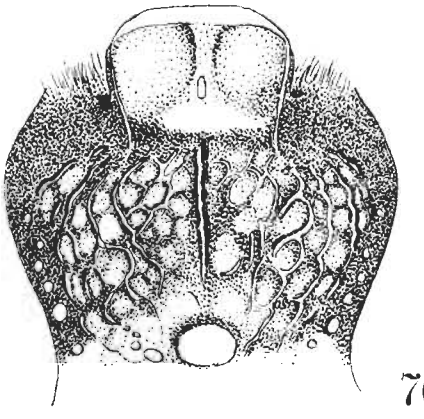
80



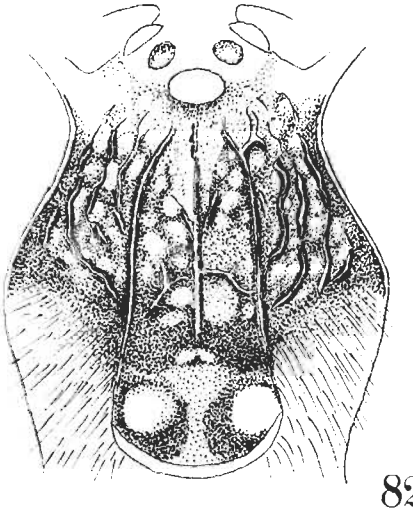
84



85



76



82

78 and 83).

4. Propodeum: All the areas complete, outer carina of OA defined till PT, bars closer than in the compared species (Fig. 81).

5. Gastral punctation: Pattern is similar to that of mindanaonis, but the punctured parts of GT1 much more strongly (Pd is as large as the thickness of basal vein of fore wing) and closely (PIS≒Pd) punctured, punctures laterally much closer, PIS Pd, on GT2, except medio-apical and apical marginal broad impunctate area, everywhere PIS < Pd, punctures slightly smaller than on GT1 and much closer laterally, on GT3 punctures very fine and dense, partly confluent to form puncture-rows (Fig. 79); on GS2 at median area punctures longitudinally slightly elongate and rugosely confluent and at sides moderate and small punctures mixed and dense, on GS3 punctules minute and very dense.

6. Cubital cell 3 of fore wing: Subquadrate, in holotype: Fig. 80 and in paratype: Fig. 85.

♀, unknown.

Holotype: ♂, Luzon (Baguio: Mines View Park), 26.III.1978, T.Tano leg. (will be donated to U. S. Natl. Mus.

Paratype: 1 ♂, Leyte (Tacloban), 15-22.IV.1982, T.Tano (Tano's Coll.).

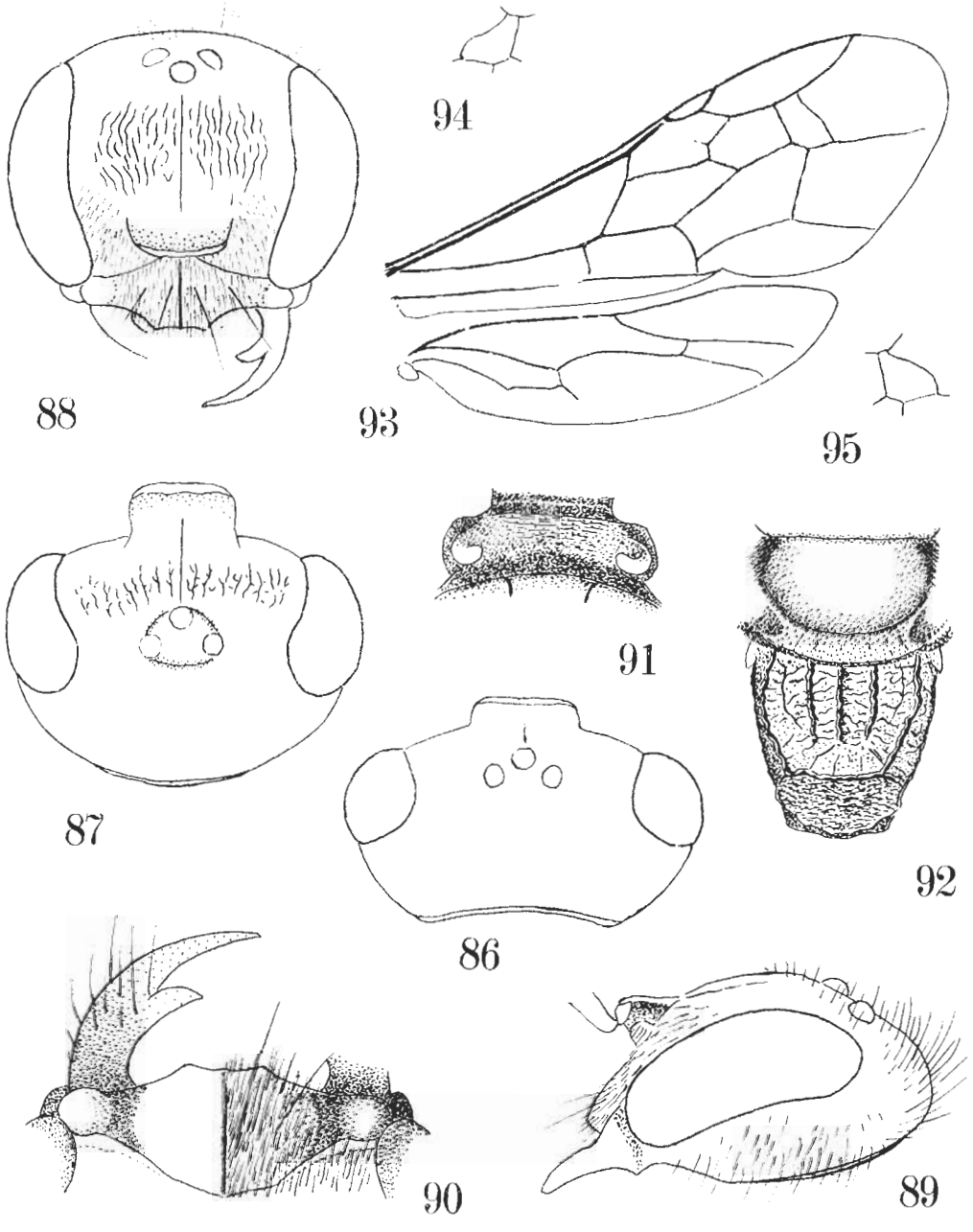
Remarks. Paratype from Leyte shows considerable differences in the sculpture of mesopleuron and GT1:

In holotype from Luzon episternum of mesopleuron above along scrobal furrow finely and closely striate, whence below, however, rugae and striae with mixed punctures defined from posterior part along mesopleural suture till central raised part alone, remaining antero-ventral area broadly smooth, with only scattered weak small punctures, including some indistinct larger ones. While in paratype rugoso-punctate part is confined to the narrow posterior area along mesopleural suture alone, remaining broad area almost without rugae or striae or distinct punctures, especially antero-ventral portion above sternaulus smooth and shining. In paratype, GT1 even on median smooth area sparsely punctured, punctures generally slightly smaller than in holotype but otherwise, including GT2 and 3, as in holotype.

DOLICHURUS CLYPEALIS TSUNEKI, SP. NOV.

♂. Length 3.5-4.0 mm. Black, apical margin of supraantennal lamella and a spot on top of pronotal tubercles white, the former not reaching middle of lateral margin and rarely interrupted in middle into two elongate spots and the latter often dark white and rarely completely black; mandible except darker base light brown, palpi brown, but apically pale brownish yellow; articulations of legs, tibiae and tarsi more or less brownish, especially marked on fore legs, wings hyaline, stigma light brown and veins brown. Hairs on head and thorax long, rather sparse, slightly stiff and silky white, on lower frons and clypeus closer, yet ground surface well visible and shining.

Measurements of important parts of body and appendages are given in Table 3, Nos. 15-19. Head from above through occiput: Fig. 86, perpendicular to lamella: Fig. 87, in front: Fig. 88, supraantennal lamella broader than long, from baso-medial depressed centre which is situated slightly before lateral base (Table 3, mL and lL of lamella) the depression obliquely expanded anteriorly, shallowing, with apical margin weakly bilobed, with postero-lateral area obliquely, gently raised toward lateral margin that are shortly carinated at base and parallel to each other; Al curved up dorsally, in the case of specimen No. 16, with MxL=15, bW=4.7, aW=4.2, bearing a longitudinal carina inside, L of A2-13=4.5,15,14,14,14,13,11,10,9,8,7,8, A3/aW=4.7 (apparently 4.5, due to short hairs covering), Al3/bW=4, A3-12 gently down curved in lateral view, curvature slightly stronger apically, with base and apex constricted weakly; clypeus and mandibles: Fig. 90, clypeus with a distinct carina in middle, that runs till apex, apical margin medianly produced and bluntly tridentate, at sides obliquely in front of lower ends of eyes roundly swollen, hairless and shining; mandible strongly inidentate on inner margin as usual; pronotum: Fig. 91, tubercles distinctly produced postero-laterally, with intermediate area roundly, fairly deeply inclined medio-posteriorly, but medio-anterior area without median furrow or depression, but with transverse rugulosed striae or sparse puncture rows, varied in density individually, but without the distinct carina separating dorsum from anterior inclination, on sides, however, a blunt carina defined, running down along antero-lateral corner, but not produced into a tooth at each apex; scutellum-prop9deum: Fig. 92, scutellum round-



ly raised, without median furrow, metanotum sometimes longitudinally, sparsely and weakly striate, propodeum (ref. Fig. 15, p. 11) at CA with surface flat and open at apex, but with distinct MC and LC, LC more or less convergent apically, IA with or without OC, but OC if present incomplete or obscure, always without distinct posteor cells (PC), outer carina of OA at posterior half evanescent, but reaching below middle of lateral margin of posterior inclination where in this species not markedly dentate, posterior inclination comparatively finely, transversely or obliquely, reticulo-striate, rarely with a short median carina at posterior portion. Gaster with intersegmental constriction defined, GT1 on anterior inclination with an oval

depression. Venation generally as in Fig. 93, but the adjoining points of recurrent veins 1 and 2 to cubital cell 2 and 3 are considerably variable (Table 3), characteristic is the form of cubital cell 3 in which L of L of abscissa of radius and of cubitus not markedly different, hence the form becomes oblong, but in specimen 16 is an exception in which: Figs. 94 (left) and 95 (right).

Vertex smooth and polished, only with very minute hair pits; frons always with a distinct median carina and longitudinally, more or less closely rugoso-striate, often mixed with large feeble punctures, usually rugae becoming arcuate and weaker laterally; clypeus, though closely covered with long stiff hairs, smooth and polished, if denuded of hairs; pronotum with tubercles smooth and shining; scutum on the median area anteriorly and scutellum with scattered punctures, metanotum mat, often crossed with a few striae, side of pronotum with its humeral tubercle smooth and shining, mesopleuron with epimeral area polished, scrobal furrow indistinct, but sternaulus well defined, episternum above longitudinally, below obliquely puncto-rugoso-striate, metapleuron smooth, side of propodeum longitudinally, closely striate, striae anteriorly weaker; dorsum of GT1 anteriorly very sparsely, finely punctulate, punctules posteriorly gradually slightly larger and closer, yet average PtS much larger than Pd which is slightly less than as wide as posterior part of basal vein of fore wing, only at the parts forming puncture rows PtS=Pd, at the constriction between GT1 and 2 without the puncture, disc of GT2 with punctation as on main part of GT1, on 3 punctures slightly finer and closer, PtS mostly as wide as Pd, only partly more than, or less than, Pd, on posterior depressed marginal area punctures much finer, sparser, weaker and rather indistinct, punctures on GS2 and 3 as larger as on GT2, but somewhat closer.

♀, unknown.

Holotype: ♂, Palawan: Puerto Princesa, 23-26.III.1983, T. Tano leg. (to be donated to U. S. Natl. Mus.)

Paratypes: 4 ♂, Palawan (Iwahig, San Rafael, Puerto Princesa), 23.III.-2.IV.1983, all leg. T. Tano (Coll. Tano).

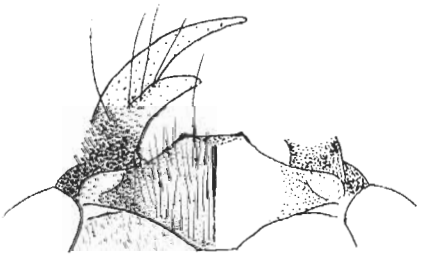
DOLICHURUS PIGMAEUS TSUNEKI, 1976

Dolichurus pigmaeus Tsuneki, 1976, Steenstrupia, 4 (6): 35 (♂, Balabac).

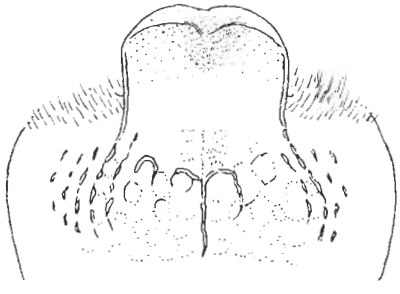
Specimen collected: 1 ♂, Palawan: Iwahig, 2.IV.1983, T. Tano leg.

Some supplementary notes:

Clypeus subtriangularly produced, with apical margin broadly truncate (Fig. 96), disc at baso-median area roundly, highly raised, with a weak carina in middle, reaching close to apical margin, but the carina hardly defined unless the long, stiff and whitish hairs closely covering the surface are denuded off; lamella (Fig. 97) with apical margin gently bilobate, but the area not covered with transparent membrane, surface from central depression laterally gently roundly raised, as a result medio-apical area appears to be depressed in the form of inverted triangle; frons coarsely but very weakly reticulo-rugoso-punctate, but median carina well defined (Fig. 97); pronotum (Fig. 98) at anterior margin without distinct bordering carina, with tuber-

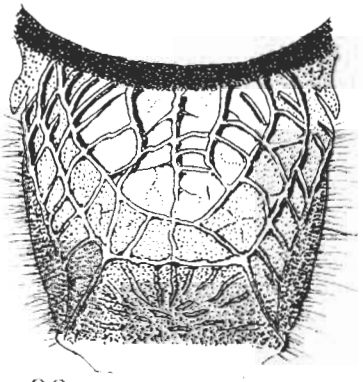


96



97

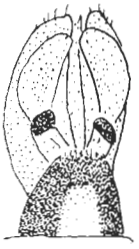
cles strongly produced postero-laterally, reaching lateral corners of the segment from above (Fig. 98); on mesopleuron epimeral area longitudinally highly raised, with surface smooth and polished, scrobal furrow not evident, anteriorly omaulus and antero-ventrally acetabular carina well defined, episternum above longitudinally, below obliquely strongly and closely rugoso-striate, but sternaulus not defined; propodeum: Fig. 99, with MC and LC strong, but apically finer and obscure, apical carina of CA also weak, thus CA appears incomplete, surface flat, LA with OC, also its posterior carinae weak, outer carinae of OA at posterior half evanescent, rather obscure, their reaching points, PT, almost not toothed, sides of propodeum, except smooth antero-ventral portion, longitudinally, strongly and closely striate; GT1 with anterior inclination with shallow oval depression, smooth and polished, dorsum finely, sparsely punctured, with Pd less than as wide as posterior part of basal vein of fore wing, with PIS mostly 2-4 times Pd, only at puncture rows and on lateral areas =Pd, on GT2 punctation generally simil r, but with a tendency of PIS slightly smaller, on GT3 punctures finer and closer, yet on disc PIS Pd and on depressed marginal area impunctate; GS1 with a strong conical process in middle, GS2 deeply inclined at base, GS3 abruptly depressed at apical marginal area, but not folded at its anterior border, surface of the GSs punctured as on GT2; genitalia from above: Fig. 100, aedoeagus at apex elongated oval, each half on inner ventral margin serrate, from beneath: Fig. 101, digitus at apex black and produced in a bill-shape; in fore wing cubital cell 3 normal: Fig. 102.



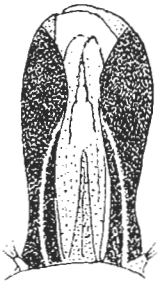
99

98

102



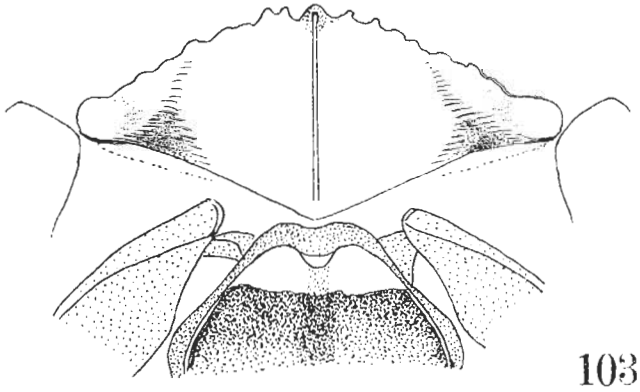
101



100

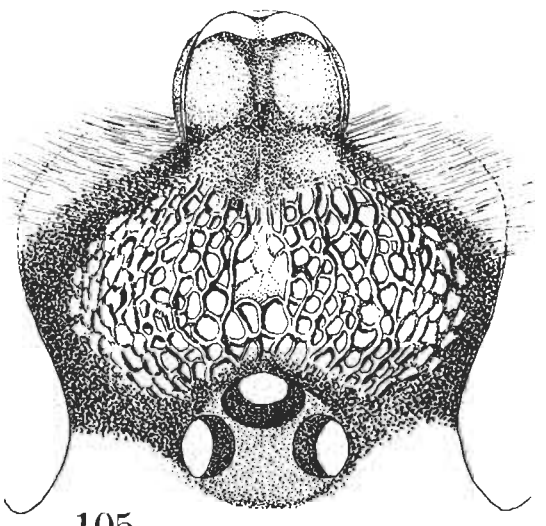
DOLICHURUS PALAWANENSIS TSUNEKI, SP. NOV.

The male of the present species seems to be close to doromedarius Nagy, 1971, based on one male from Taiwan, as far as the description goes (apical form and colour of lamella, frontal sculpture and gastral punctation), but it is too brief and simple and we can not compare both in detail. At least in the punctation of vertex, in the striation of pronotum and in the body size the present species clearly different from this species and to take the safe way both were treated here to represent a different species respectively.



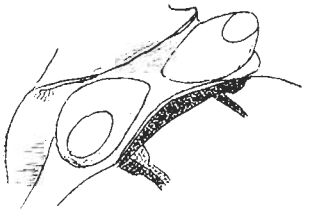
103

♂. Length 6.3-7.0 mm, (in doromedarius 4.5 mm), black, pure white is apical margin of supraantennal lamella alone, tubercles of pronotum slightly darkened

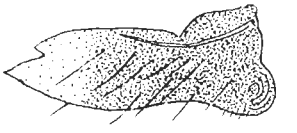


105

107



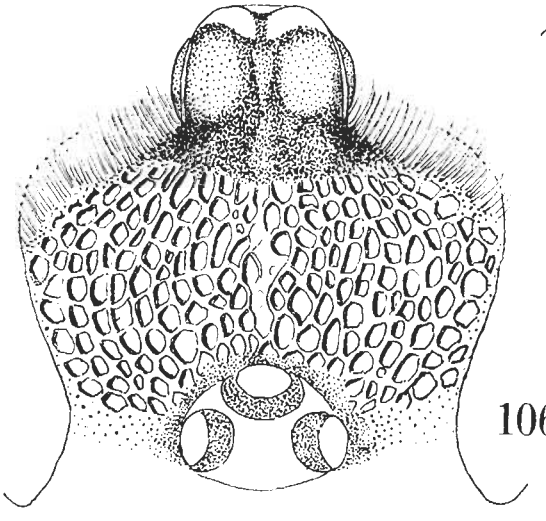
108



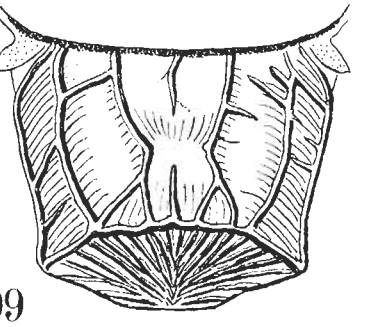
104

113

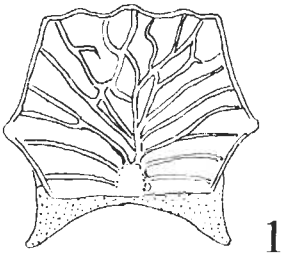
114



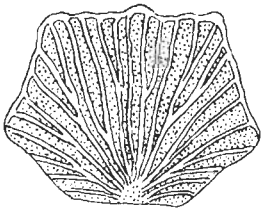
106



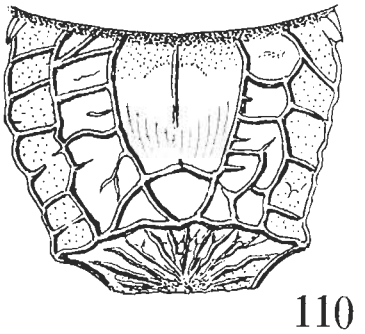
109



111



112



110

and semitransparent, apical part of mandible, palpi, articulations of legs, fore tibia and tarsus, all spurs and apical margin of GT3 brown; wings hyaline, stigma and veins dark brown. Hairs on head and thorax long, erected, moderately close, silky white, in some light silverily glittering, on lower frons and clypeus appressed, dense, somewhat stiff, on the former curved and on the latter straight and produced

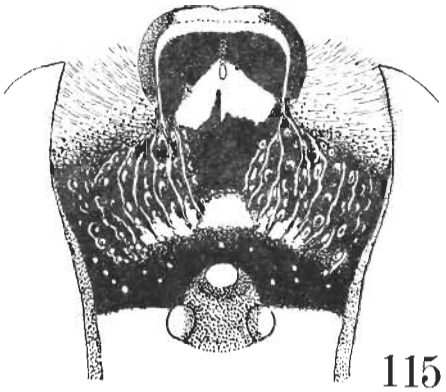
anteriorly beyond apical margin, on mandible sparse setae slightly brownish, on gaster short, sparse and whitish.

Measurements of some parts of body and wing are shown in Table 3 (Nos. 8–12, p. 18), in this species comparatively constant, except adjoining points of recurrent vein 1 and 2; clypeus (hairs denuded off), with lamella and bases of Al, seen perpendicularly: Fig. 103, at base in middle roundly, highly raised as usual and medianly distinctly carinated, carina reaching apical margin which is subuniformly crenate; lamella seen vertically: Figs. 105, 106, with apical margin medianly triangularly incised and the margin appears to be bilobed, under high magnification, however, the place is covered with transparent membrane and the margin of which is truncate, inside the lamella medianly depressed and each side gently roundly raised as usual; frons broadly, coarsely rugoso-reticulate (do.); ocelli with yellowish pupil and black corneal part well separated, but inner margin of the latter quite indistinct; pronotum from above: Fig. 107, obliquely from side: Fig. 108; L of A1–13: 16,4,15,15,15,13.5, 12,12,12,11, 9,9,11, A4–13 each gently curved down, strongest at A8 and 9 and, when fully developed, A5–9 each with a brown seta in middle beneath; mandible with a tooth on inner marmargin subapical, short and appressed to apical tooth which is also short and the two teeth can be observed even when mandibles are closed; pronotum with tubercles highly raised, produced postero-laterally, in posterior view each higher than semicircular, with apical margin deeply emarginate and the area in front of the emargination deeply depressed, the depression expanded anteriorly shallowing and narrowing till top of median dorsum where extensions of both tubercles meet with each other on the same level and transversely, finely and closely rugoso-striate, thence dorsum gradually inclined to anterior aspect, without interrupted by the bordering carina; scutum and scutellum normal; on mesopleuron epimeral area longitudinally roundly raised, smooth and polished, with a blunt carina on top, scrobal furrow not deep, episternum with sternaulus distinctly running from lower part of omaulus to above base of mesocoxa. Dorsum of propodeum very sparsely sculptured (Figs. 109, 110), central area always depressed, with apical carina often lacking, LC apically finer and weaker, MC short, always not reaching apex, often very short or indistinct, intermediate area constantly without OC, carinules forming apical cells usually very weak and indistinct, but outer carina of outer area runs till PT which is variable in development; while posterior inclination with lateral carinae distinct and surface much more closely than on dorsum, radiately rugoso-striate (Figs. 111 and 112); intersegmental areas of gaster constricted as usual, anterior inclination of GT1 not hollowed, fore tarsal claw: Fig. 113, hind one: Fig. 114.

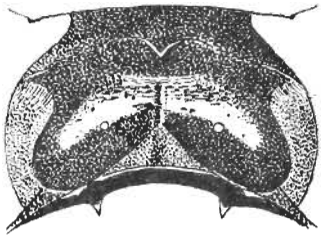
Vertex smooth and shining, except sparse indistinct hair pits, frons without median carina, longitudinally, laterally arcuately reticulo-rugoso-striate, episternum of mesopleuron above longitudinally, below obliquely, weakly puncto-striate, metapleuron smooth, side of propodeum obliquely, strongly, coarsely striate; disc of GT1, 2,3 finely, densely punctured, strictly punctures not uniform in size, larger ones with Pd nearly as wide as basal vein of fore wing, PIS mostly equal to, or less than Pd, only on central area slightly sparser; at any rate punctures generally much larger, closer and more uniformly distributed than in clypealis ♂; on GS2 and 3 slightly larger, stronger and closer.

♀. About 9 mm. Black, apical margin of lamella irregularly dirty yellowish white, mandible except base light reddish brown, antenna completely black, palpi dirty yellow, but most segments more or less fuscous above, tegula light castaneous, anteriorly translucent, fore tibia on inner side pale brown, dusting hair of fore T1 and opposite spur beneath with basal membraneous appendage yellow, tarsi more or less brownish, wings hyaline, costal cell and central part of stigma yellowish, rest of stigma and veins dark brown.

Measurements: Table 2, No. 17 (p. 14); VW greater than in closely allied aposanus, ocellar location slightly different accordingly (do.), frontal sculpture is here mainly longitudinal rugosed striae, with scattered shallow, indistinctly outlined punctures between (Fig. 115); clypeus as in Fig. 120, median carina runs near apex, there gently swollen and flatly expanded to apical margin; closed mandible from outer side: Fig. 116; head in profile with W of eye : temple =15:7 (in aposanus 17:5); flagellar segments simple, with L of A3,4,5,10.11.12=16,16,16,10,9,10, A3/aW=4.0, and A12/bW=6.5, L of maxillary palpal segments 3–6=8,12,14,13; pronotum: Fig. 117, with tubercles gradually raised postero-laterally (Fig. 118, posterior view) and the anterior bordering carina lacking; L in middle of pronotal dorsum, scutum, scutellum, metanotum and dorsum of propodeum =10,19,14,4.5,17, notauli normal, scutellum at base with a broad, deep, coarsely crenate furrow; on mesopleuron epimeral area longitudinally roundly raised, with top subcarinate, surface smooth and shining, but with a few fine striae at baso-posterior portion, scrobal line not impressed, omaulus and

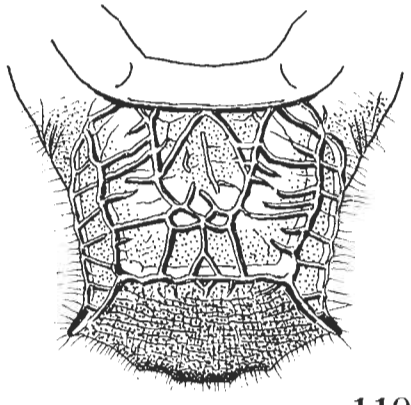


115



117

116



118

119

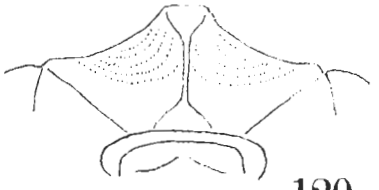
sternaulus running from omaulu to above mesocoxa well defined, mesosternum medianly finely grooved, metasternum as in aposanus (figured), episternum above longitudinally, below obliquely puncto-rugoso-striate, metapleuron at upper swelling weakly and sparsely striolate, rest smooth and polished; Propodeum: Fig. 119, sculpture generally sparse as in ♂, central area distinctly depressed and without MC, intermediate area without OC as in ♂, posterior aspect with lateral teeth below middle well developed, but postero-lateral teeth lacking, surface at top with a few longitudinal strioles, but remaining broad area transversely ruguroso-striate, with interspaces not smooth, but minutely, irregularly and weakly punctulate; gastral structure normal, but characteristic is that apical margin of GT1 and 2 with an assemblage of tiny punctules, tending to form transverse or oblique puncture-rows, just as in the female of taprobanae Smith, occurring in Ceylon, Burma, Sikkim, India etc.; in fore wing abscissae of radius and cubitus: Table 2, L of nervulus and its distance to antefurcal point =5:5.

Holotype: ♂, Palawan: Iwahig, 2.IV.1983, T. Tano (to be donated to U.S.N.M.).
Paratypes 5 ♂, same as holotype; 1 ♂, same locality, 30.III.1983, T.Tano;
1 ♀, Palawan (Inagawan), 27.III.1983, T. Murota; 1 ♀ 5 ♂, Palawan (San Rafael, near Brookes Point, Maheli), 28.III.-1.IV.1983, T.Murota.
(Paratypes preserved in the collections of each collector).

DOLICHURUS PALAWANENSIS DAVAONIS TSUNEKI, SSP. NOV.

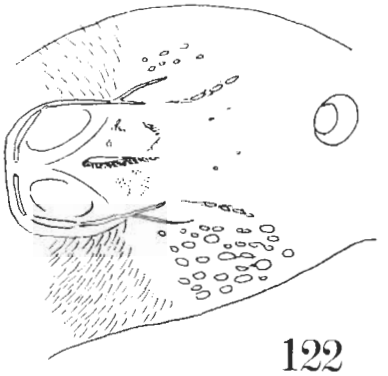
♀. Length 7.5 mm. Differs from the typical race mainly in that lamella black at apical margin,(constant?), frons simply sparsely punctured and vertex finely, sparsely, but distinctly punctured.

Black and shining, lamella at medio-apical area narrowly slightly brownish, palpi, tibial spurs and tarsi more or less brownish; wings hyaline. Measurement: Table 2 (p. 18). Head from above strongly and roundly convergent behind eyes, W of occipital margin =29, OOD:Od:POD:OCD=5:4:3:13 (if measured by the glittering pupil =6:3:4.5:13),

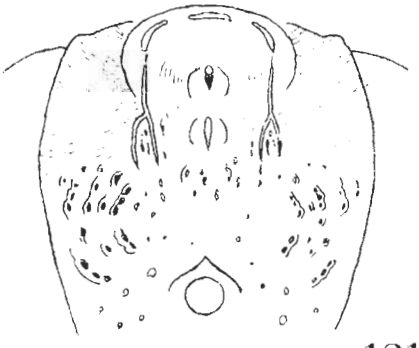


120

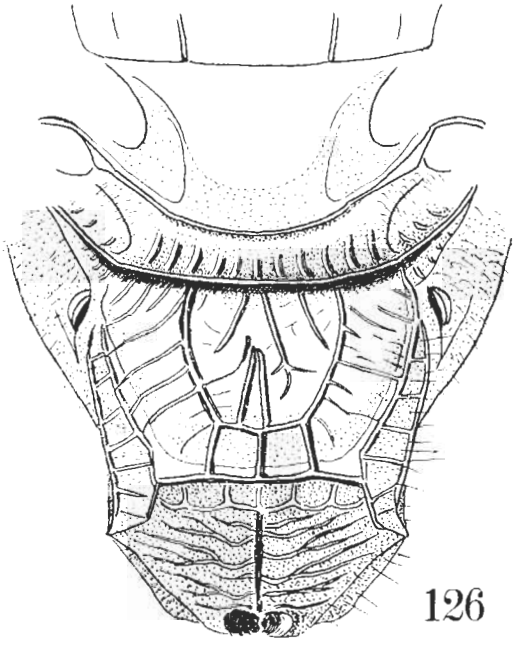
123



122

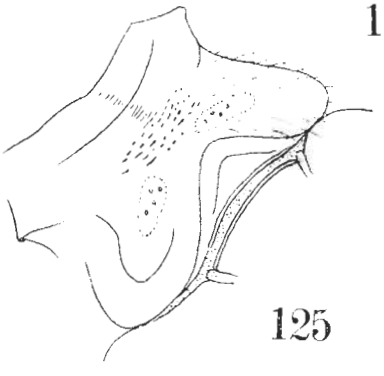


121



126

124



125

VW=20.5, head seen from in front with maximum IOD at above lamella 30 and minimum IOD 25, ocellar area raised and each ocellus markedly inclined outward, lamella vertically seen: Fig. 121, MxW=15, W between lateral ridges =11, obliquelly seen from left side and above: Fig. 122; clypeus subrhombic, medio-apical area narrowly truncate (strictly slightly rounded out) and strongly keeled in middle, the keel near apex slightly swollen and thence triangularly, flatly enlarged to apical margin, disc at basal half roundly raised toward the keel, while at apical half on both sides of the keel deeply roundly depressed, in lateral view the keel at middle distinctly bent down; mandible on inner margin tridentate, but the innermost tooth very minute and apparently bidentate (Fig. 123); L of A3,4,5,10,11,12=15,15,15,11, 10,10, A3/aW=4.3 and A12/bW=7; pronotum with median furrow interrupting the curved ridge of lateral tubercles narrow and fairly deep, but without bordering carina that separates the dorsum from anterior inclination, medio-posterior depression very deep, seen from above: Fig. 124, obliquely from left side: Fig. 125; scutellum-propodeum: Fig. 126, the teeth at postero-lateral corners of dorsum and latero-median part of

posterior declivity strong and acute; on mesopleuron epimeral area highly raised and polished, scrobal furrow deep and acute, episternal area longitudinally, slightly obliquely rugoso-punctate, sternaulus distinct; GT1 and 2 at apical margin with dense assemblage of tiny punctules (medianly slightly sparse) as in typical race; in fore wing intercubitus 1 medianly produced and bent, with anterior half slightly sinuate.

♂, unknown.

Holotype: ♀, Mindanao: Davao, Matina Height, 4.VIII.1980, C.Nozaka leg. (to be donated to U. S. N. M.).

DOLICHURUS APOSANUS TSUNEKI, SP. NOV.

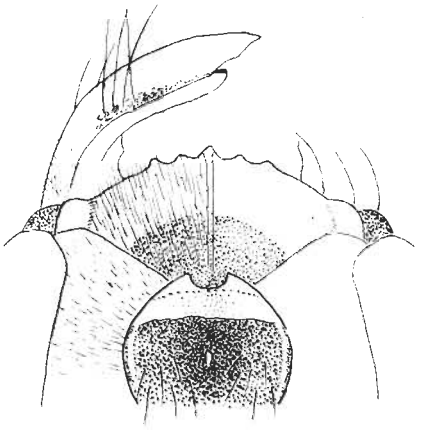
♂. Closely resembles preceding palawanensis, differing from this, however, in some detailed characters as follows:

Supraantennal lamella longer, more deeply excavated, with ridge of lateral margins more strongly curved up (in Fig. 129), clypeus with apical margin less numerously crenate (Fig. 127, cf. Fig. 103), rugoso-reticulate sculpture on frons comparatively coarser (Fig. 128, cf. Fig. 105), mesopleuron without sternaulus and sculpture on episternum much weaker and broadly smooth and punctures on GT1 and 2 medianly much sparser (Fig. 132).

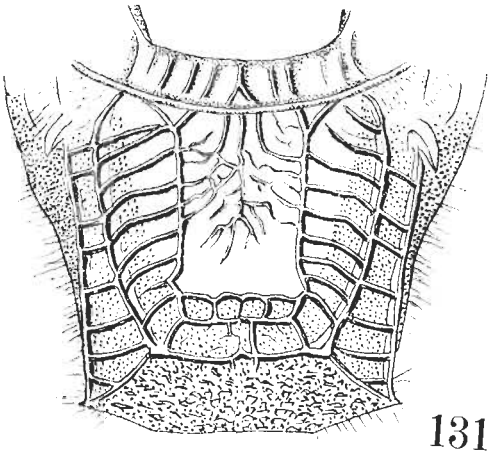
Length 7.5 mm. Black, apical margin of lamella, tip of pronotal tubercles and apical rings of trochanters white, mandible at apical half light brown, palpi brown, apically paler, tegula castaneous to black, without pale spot anteriorly, fore tibial spur brownish yellow, the tibia and other spurs brown. Hairs normal, silvery.

Measurements: Table 3 (Nos. 13 and 14); clypeus, mandible and apical part of lamella: Fig. 127, inner tooth of mandible subapical, appressed to apical tooth, both short and not acute, markedly contrasted to that of other groups(cf. Figs. 8, 37, 70, 90); frons and lamella: Fig. 128, lamella at apex in middle triangularly incised as in palawanensis, surface deeply hollowed, especially from central tubercle anteriorly in form of inverted triangle; L of A1-13: 17,4,15,16,16,16,15,14,12,11,11,11,12, from A4 apically each gently down-curved and when fully present A4-10 with a brownis seta beneath in middle, A3/aW=3.7 and A13/bW=10; pronotum: Fig. 130, without anterior carina separating dorsum from anterior inclination, but antero-lateral angles below are present, though weak and not toothed (in palawanensis no angles), tubercles less strongly raised than in the compared species and blant ridge connecting both tubercles nearly horizontal, except shallow median furrow; scutum and scutellum sparsely punctured, metanotum longitudinally, sparsely striate; on mesopleuron epimeral area highly raised as usual, with top longitudinally subcarinate, scrobal furrow not impressed, episternum posteriorly along mesopleural suture sparsely punctured, but remainder broadly smooth and polished, without rugae, striae or punctures, moreover, in this species sternaulus lacking, though omaulus and acetabular carina well defined; propodeum: Fig. 131, central area markedly depressed, without distinct median carina, intermediate area without oblique carinae, but from usual position of them to outer side (dotted in the Figure) roundly inclined and posterior part of the area (usually represented by a single row of posterior cells) with two rows of cells (in both specimens), quite exceptional among the species, posterior decrivity minutely rugulosoreticulate at the centre, but at lateral and dorsal areas radiately rugoso-striate, mid-lateral teeth strongly produced; side of propodeum obliquely, very weakly and sparsely striate, except postero-ventral smooth and shining area; punctures on GT1-3 slightly larger than in palawanensis, but slightly sparser, mostly with PIS$\frac{+}{}$Pd, only at sides and puncture-rows less than Pd and on GT1 and 2 at median area markedly sparser (Fig. 132), on GS2 and 3 similar in size as on dorsum, but much denser as in palawanensis and laterally finer and weaker; abscissae of radius and cubitus: Table 3; tarsal claws: Fig. 133.

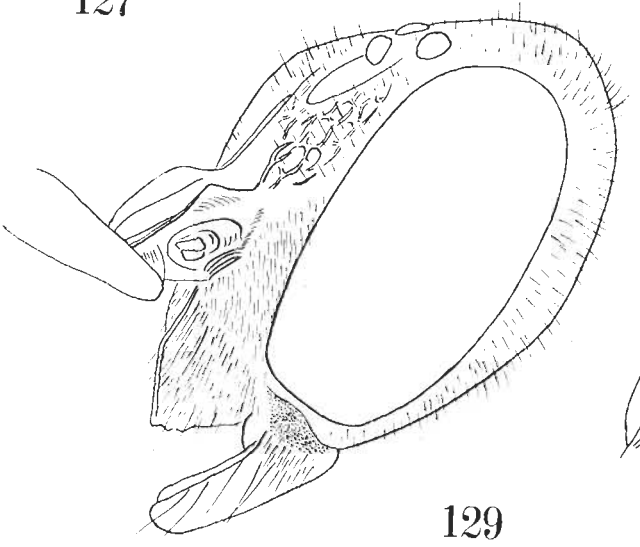
♀. Length about 8.5 mm. Black, mandible at apical area light castaneous, palpi slightly brownish yellow, but weakly fuscous above, antennal flagellum dark brown beneath, tegula black, without brownish patch, fore tibia apically slightly brownish, its spur at apex yellowish, membraneous procedures beneath before middle of this spur pale yellow, short dusting brush at basc beneath of hind T1 and of opposite longer spur and spines of all legs bright coppery, remaining spurs dark brown, wings hyaline, costal cell and central part of stigma light brownish, rest of stigma and vein dark brown to black; long macrochaetae normal in position and black, moderate setae on mandible and shorter ones on labrum brownish yellow, comparatively long, somewhat stiff hairs on clypeus greyish white, hairs on temples, pro- and mesopleura,



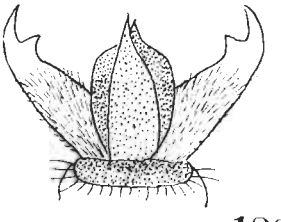
127



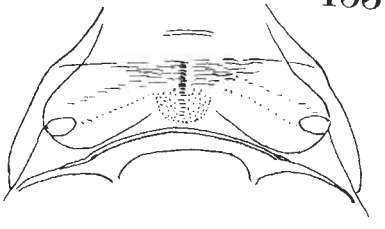
131



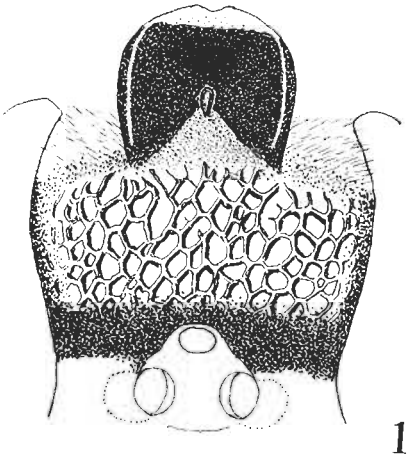
129



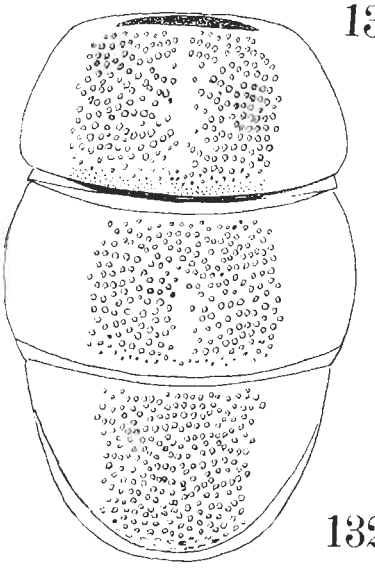
133



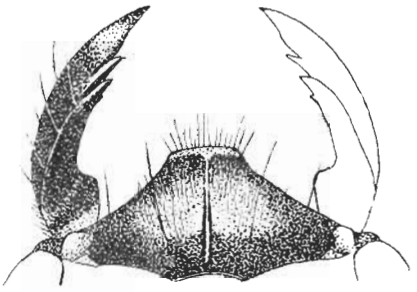
130



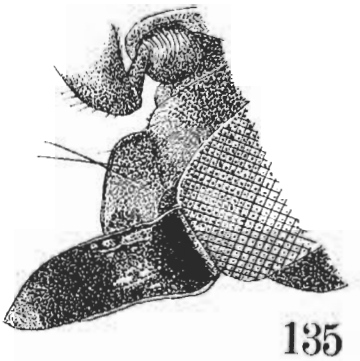
128



132

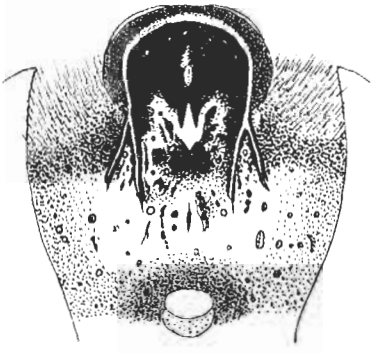


134

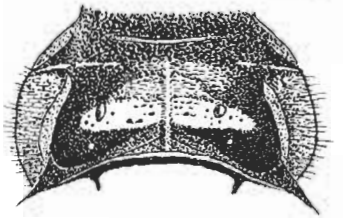


135

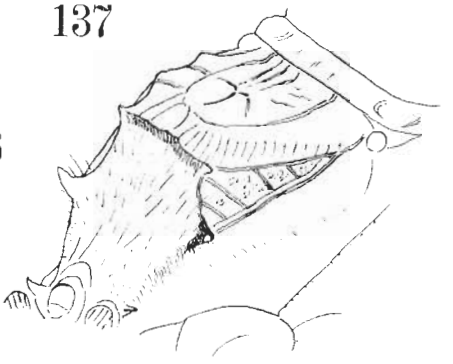
142



136

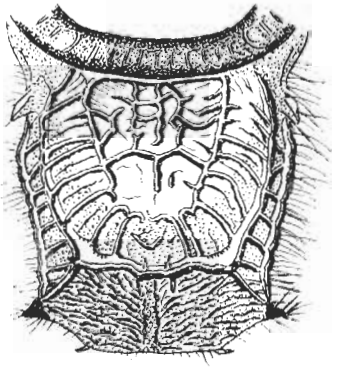


137



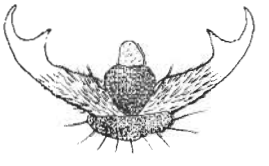
141

139



140

138



143

side of propodeum and fore coxae and femora beneath, pubescence on lower frons and at posterior margin of humeral tubercle silky white, in some light silverily glittering.

Measurements of parts of body and wing: Table 2, No. 19 (P. 14); clypeus and mandibles: Fig. 134, in profile: Fig. 135, median carina of clypeus reaching smooth swelling in middle of apical margin, it is on basal half thick and high, but on apical half fine and low; mandible with three teeth on inner margin, but as the basalmost one is very small and indistinct apparently bidentate; head in profile with W of eye and temple =17:5; L of A1-12=19,4,18,18,18,17,16,15,13,12,11,11, A3/aW=4.5, A12/bW= 6.0; L of segments 2-6 of maxillary palpus =9,11,15,17,16; supraantennal lamella, frons with fore ocellus seen vertically to lamella from obliquely behind: Fig. 136, lamella incrassate at marginal areas and toped with fine ridge, the ridge slightly above base of lateral margins and just beneath lower frontal macrochaetae separated into two

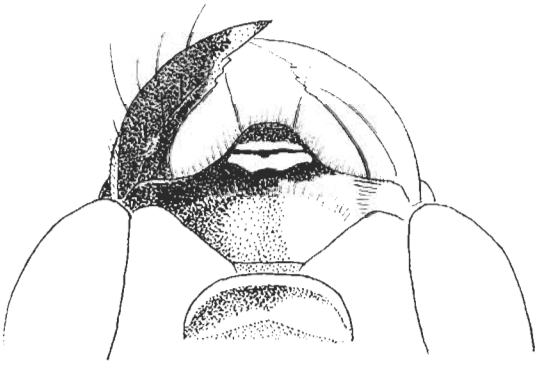
branches and go shortly upward to frons, lamella at antero-lateral corners of extreme margin fringed with translucent membrane and at centre of inside depression elongate tubercle present; frons without median carina and simply sparsely punctured, not rugoso-reticulate, nor rugoso-striate; pronotum from above: Fig. 137, without transverse carina separating dorsum from anterior inclination, also antero-lateral teeth below lacking, median furrow distinct, but seen from behind (Fig. 138) both tubercles horizontally connected with each other at medio-anterior area, not inclined there as in palawanensis, ♀ (cf. Fig. 118); on scutum notauli at posterior half parallel and anteriorly divergent, on mesopleuron epimeral area longitudinally swollen, smooth and shining, with top subcarinate, scrobal line not furrowed, omaulus and acetabular carina well defined, but sternaulus not clear, episternum obliquely puncto-rugoso-striate metapleuron smooth and shining, metasternum: Fig. 139, basal stalk part medianly furrowed, apical lobiformed part slightly reflected; propodeum: Fig. 140, central area not completely closed at apex and more complicately sculptured than usual, with its apical half distinctly depressed and MC cut into two, intermediale area without OC, but at postero-lateral corners acutely toothed (DT), posterior inclination with well-developed PT, the segment in oblique postero-lateral view: Fig. 141, the teeth at postero-lateral corners well visible, side of propodeum obliquely striate, striae antero-ventrally weaker; GT1 with a large, shallow, oval depression on anterior inclination, GS1 without central conical process, GS2 at base perpendicularly inclined, GT1-3 at each apical margin with an assemblage of tiny punctures that tends to form puncture rows, sparser at median area, just as in palawanensis, GS2 and 3 sparsely scattered with very minute punctules; fore tibial spur: Fig. 142, basal and submedial processes beneath largely membraneous, translucent and pale yellow, all claws widely open with a subapical tooth perpendicular (Fig. 143); in fore wing Lof nervulus and antefurcal distance =5:7, L of abscissae of radius and cubitus within cubital cells 2 and 3: Table 2.

Holotype: ♂, Mindanao, North Cotabato, Mt. Apo, 1000-1500 m, 9.VIII.1980, H. Kyrokawa leg. (Coll. U. S. N. M.)
Paratypes: 1 ♀, same as above, but leg. T. Tano (Coll. Tano).
1 ♂, same as holotype (Coll. Kurokawa).

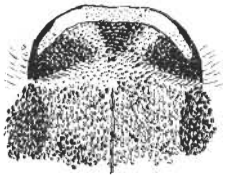
DOLICHURUS BAGUIONIS TSUNEKI, SP. NOV.

The present species belongs to the group including Taiwanese ombrodes Nagy, apiciornatus Tsuneki and Ceylonese albifacies Krombein, in which clypeus white maculated and usual macrochaetae lacking in the female. The existence of one species of this group in the Philippines was suggested by Krombein (1979) and the present one may be that species.

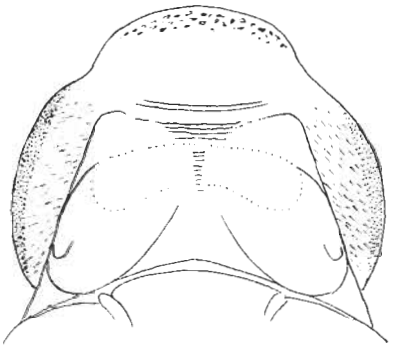
♀. Length when fully stretched 8.5 mm. Black, apical and lateral margins of lamella and two short parallel bands behind apex of clypeus (Fig. 145) white, toothed area of mandible shining brown, inner side of fore tibia dull brown (due to covering short hair), apical rings of trochanters slightly pale, tibial spurs of mid leg completely and those of fore and hind ones, except basal brownish brush, nearly white; wings hyaline, stigma yellowish brown, veins black. Hairs on temple, mesosternum, side posteriorly of propodeum moderately long and silvery, those of anterior margin of clypeus medianly yellowish, on its disc scarce, long and



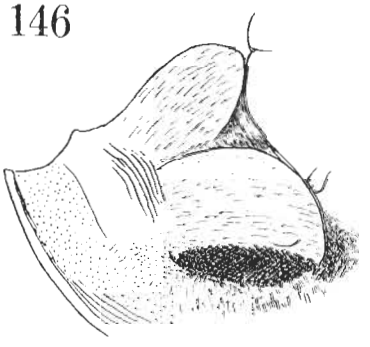
145



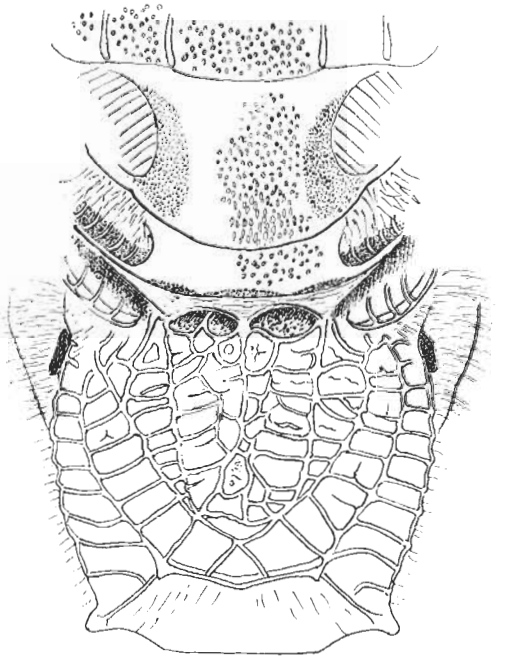
144



146



147



148

whitish, on mandible very long, stiff, sparse and brownish, on lower face at antennoocular area short, appressed and silky white; on clypeus, frons, pronotum and scutellum without usual macrochaetae.

Head from above with occipital margin gently roundly emarginate, medial L till apex of lamella 30, VW=18, ocelli in nearly equilateral triangle, similar in size to each other, OOD:Od:POD:OOD=4:3:4:12, lamella thin, without marginal inclination and very short, vertically seen: Fig. 144, surface minutely and closely punctulate and medianly shallowly furrowed, the furrow expanded anteriorly and each side gently roundly elevated, as a result apical margin appearing somewhat bilobed, blunt lateral ridge of lamella not extended upward; frons densely punctured, punctures medium-sized and at broad central area longitudinally confluent to form fine, close rugulae by PlS, one of which at middle slightly broader, becoming the shining median carina of frons, dense punctation expanded upward till level of anterior margins of hind ocelli, but thence behind till occipital carina practically impunctate and smooth and shining; L of A3, 4,5,10,11,12=17,17,16.5,10,10,10, A3/aW=5.0, A12/bW=4.3; clypeus and mandibles: Fig. 145; pronotum: Fig. 146, without anterior bordering carina, but finely closely striate medio-posterior depression fairly deep, seen obliquely in front and above: Fig. 147, surface closely clothed with short whitish pubescence, mat; scutum, scutellum and metanotum shining, but surface minutely, closely punctulate, mostly P1S=Pd, noteworthy is that metanotum without a series of longitudinal striae; propodeum: Fig. 148, on central area MC present, but posteriorly disturbed, intermediate area each with OC; gaster practically impunctate, polished; measueements: Table 2 (p. 14), in fore wing L of nervulus : antefurcal D =5:7.

♂, unknown.

Holotype: Luzon, Baguio City, Mines View Park, 1500 m, 3.I.1980, T.Murota leg. (to be donated to U.S.N.M.).

COMPARATIVE NOTES ON SOME CHARACTERS

1. Median carina of clypeus:

♀: a. Confined to basal raised part only: stantoni and amamiensis.
b. Runs till near apex and flatly enlarged to apical margin: palawanensis (including ssp. davaonis) and aposanus.
c. Lacking: baguionis.
♂: a. Complete till apical margin: stantoni, amamiensis, mindanaonis, rugosifrons, pigmaeus, palawanensis, aposanus and clypealis.
b. Lacking: As yet unknown, but baguionis?

2. Antennal seta in ♂:

a. Lacking: stantoni, amamiensis, clypealis, pigmaeus
b. Present: mindanaonis, on A6,7,8, often basal tubercle only.
palawanensis, in the maximum case, on A5,6,7,8,9,10.
aposanus, in the maximum instance, on A4,5,6,7,8,9,10.

3. Punctures on vertex:

stantoni: On sides above eyes close, PIS=Pd, on broad central area irregularly sparse, PIS mostly 1-2 times Pd, punctures large and moderate or moderate and small mixed (♀).
♂: Punctures mostly moderate and small mixed, on sides and at puncture-rows PIS less than Pd, on central broad area irregularly sparser, PIS 1-4 times, but mostly 2-3 times Pd.
amamiensis: ♀. At postero-lateral area fine and close, on the remainder punctures large, moderate and small mixed, PIS irregularly 1-3 times Pd.
♂. Moderate and small, shallow and clear mixed, generally closer than in ♀, puncture-rows frequent where PIS less than Pd, between rows PIS mostly 1-2 times Pd.
mindanaonis, ♂: Surface well shining; anteriorly several large, shallow, indistinctly outlined punctures arranged, with PIS 1-2 times Pd, remaining broad area with irregularly scattered fine, weak punctures, PIS mostly 2-4 times Pd.
rugosifrons, ♂: Large and moderate strong punctures irregularly close, PIS 0.5-1 times Pd, on the verge to posterior inclination fine and closer.
clypealis, ♂: Small and close, mostly with PIS=Pd, but often on the central area weaker and somewhat sparser.
pigmaeus, ♂: Moderate and small mixed, all weak and indistinctly outlined, on sides mostly moderate and close, with PIS 0.5-1 times Pd, on central area, except at puncture-rows, PIS 1-2 times Pd.
palawanensis, ♀: Postero-lateral verge with minute, close punctules, otherwise virtually impunctate.
♂: Moderate and small mixed, all weak, small much more than moderate, among the moderate PIS mostly 1.5-2 times Pd, in some specimens 1-3 times so.
palawanensis davaonis, ♀: At postero-lateral areas fine and close, on the rest moderate and clear, with PIS 2-5 times, mostly 3-4 times Pd.
aposanus, ♀: On both sides above eyes moderate, weak, but close, on central area widely impunctate.
♂: Medium-sized, clear, but sparse, PIS 1-4 times, mostly 3-4 times Pd.
baguionis, ♀: Weak, minute, piliferous punctules dense, frequenly forming puncture-rows, where PIS less than Pd, even between rows PIS=Pd.

4. Anterior bordering carina of pronotum:

♀ Present: stantoni and amamiensis.
Lacking: palawanensis (including ssp. davaonis), aposanus and baguionis.
♂ Present: stantoni, amamiensis, mindanaonis and rugosifrons.
Lacking: clypealis, pigmaeus, palawanensis and aposanus.

5. Sternaulus on mesopleuron:

♀ Present: stantoni, amamiensis, palawanensis (with ssp. davaonis), baguionis.
Lacking: aposanus.
♂ Present: stantoni, amamiensis, mindanaonis, rugosifrons, clypealis, palawanensis.
Lacking: pigmaeus, aposanus.

6. Sculpture on episternum of mesopleuron:

stantoni: Above longitudinally, strongly, coarsely, below obliquely, less strongly and closely punctate-striate, punctures posteriorly larger, stronger, elongate,

appearing rugoso-punctate; in small ♂ wholly obliquely, more closely striate.

amamiensis: Similar to stantoni, but generally puncto-striae much stronger and coarser upward.

mindanaonis, ♂: At postero-ventral area above mesocoxa a narrow smooth and shining patch present, with a few minute punctures, posterior area above there along mesopleural suture raised anteriorly and strongly, closely punctured, thence forward punctures obliquely elongate and on gently rounded central area they become weak, sparse, rounded and indistinct in outline and surface shows oblique, sparse, weak shadows only and generally well shining.

rugosifrons, ♂: In holotype from Luzon, above longitudinally, finely and closely striate, below obliquely, somewhat sparsely rugoso-striate, striae posteriorly along mesopleural suture and dorsally below scrobal furrow, both for some extent, strong and evident, but on antero-ventral part from central area till above sternaulus almost completely disappeared and the surface scattered sparsely with weak tiny punctules, including some indistinct larger ones.

In paratype from Leyte, surface for a short extent from mesopleural suture forward, above longitudinally, below obliquely, strongly and coarsely striate, mixed with some large elongate punctures and many small irregular ones, whole the surface without evident striae, only with sparse, weak, indistinct rugae and shallow, indistinct punctures, especially at antero-ventral part smooth and well shining.

In both specimens at postero-ventral part above mesocoxa almost without smooth shining area.

clypealis, ♂: Surface above longitudinally, below obliquely, finely and comparatively closely striate, mixed with minute punctures in between, without postero-ventral smooth area above mesocoxa, striae crossed sternaulus, but not extended further.

pigmaeus, ♂: Smooth area at postero-ventral part above mesocoxa very narrow and somewhat impressed; surface above longitudinally, below obliquely, fairly closely striate, with fine punctures scattered between, on central gently rounded area striae become sparser and weaker and punctures also weaker, indistinct in outline and larger, but anteriorly again striae stronger and closer and punctures smaller and clearer, but sparser.

palawanensis, ♀: Postero-ventrally along mesopleural suture narrowly polished, from there large punctures with rugae between arranged obliquely below; postero-dorsally also strongly and coarsely rugoso-punctate, on central area finely and closely ruguloso-striate, with a few small punctures scattered between, anteriorly above coarsely puncto-rugoso-striate, striae curved upward, below obliquely coarsely rugoso-striate, mixed with some small punctured scattered.

♂: Postero-ventrally with a small smooth area, thence above along mesopleural suture large strong punctures arranged obliquely for some extent, but at central area small shallow punctures sparsely scattered and surface well shining till anterior margin.

palawanensis davaonis, ♀: Postero-ventral smooth and shining area extended narrowly upward along mesopleural suture, including a few micropoints scattered, thence anteriorly, above longitudinally and below obliquely puncto-rugoso-striate, the sculpture posteriorly strong and coarse, but anteriorly punctures gradually more elongate and weaker, while striae stronger and more evident and finally the elongate punctures missed and sparse striae alone well defined, with minute and rounded punctules scattered; but upward below scrobal furrow longitudinally and closely rugoso-striate.

aposanus, ♀: Postero-ventral smooth area present, but not extended upward, surface obliquely, somewhat irregularly, very coarsely puncto-rugoso-striate, rugosed striae above short, close and irregular, below long, sparse, sinuate, mixed with minute, round punctures between.

♂: Surface mostly simply punctured, punctures posteriorly large and strong, with PIS≒Pd, but anteriorly gradually smaller, weaker and sparser, only partly confluent obliquely to give rise to short rugulae between.

baguionis, ♀: Episternal area more roundly raised than usual, but posterior gentle inclination nearly flat and surface well shining, without striae, only with minute, weak punctules somewhat closely on anterior portion and medium-sized, but weak, piliferous punctures more sparsely scattered all over the surface, the larger ones often shallowly confluent with nearest one, forming short oblique shadow in some light.

7. Sculpture on dorsum of propodeum:

As to the pattern of sculpture of each species typical instance(s) was already

shown by illustration. They can roughly be divided into four groups:

a. All the species except the following four:

All the three areas are, as a rule, complete: Central area closed, with MC and LC reaching apical margin, though often individually MC is disturbed on the way and LC becoming feeble and obscure apically; intermediate area always with OC and posterior cells; but the states and density of carinules connecting or half connecting the main carinae considerably variable individually. In the male, however, outer carina of outer area frequently feeble and not well defind on posterior half and its reaching point, PT, is also less developed than in the female and often almost lacking.

b. palawanensis and aposanus:

Central area frequently, apically not completely closed, surface distinctly depressed and usually MC not clear; intermediate area always without OC, within both areas bars and carinules much sparser than usual and surface appears more shining than in others.

c. clypealis, ♂:

Central area always open at apex, with surface flat and MC short; intermediate area usually without OC, if present very feeble and indistinct, area of posterior cells disturbed by close irregular rugulae and surface half mat, but DT distinct and inclined gradually toward inner middle to form the dorsal carina of posterior inclination; bars within central and intermediate areas fine and weak, variable in dencity individually; outer carina of outer area feeble at posterior half and its final reaching point, PT, is less developed, often rather indistinct.

d. baguionis, ♀:

Characteristic in that posterior cells of intermediate area are not in the state of a single row.

8. Gastral punctation:

♀, a. palawanensis (with ssp. davaonis):

GT1 and 2 at posterior marginal area with an assemblage of tiny punctules (in middle sparse), tending to form puncture-rows. This character is common with South Asiatic taprobanae Smith, showing a relationships with it.

b. All other species:

Without such an assemblage of tiny punctules.

♂: rugosifrons, holotype: GT1 medianly broadly and apical margin also broadly impunctate and polished, remainder with comparatively large, close punctures, PIS on disc = and on side < Pd; on GT2 medio-apical half and posterior margin broadly impunctate, punctures on remaining areas slightly smaller than on GT1 and everywhere PIS < Pd, especially on sides much closer and on posterior portion more or less rugoso-punctate; on GT3 punctures finer and dense, more frequently rugoso-punctulate. In paratype: GT1 with sparse punctures on median smooth area, much sparser posteriorly, punctures generally slightly smaller than in holotype, but otherwise as in holotype.

mindanaonis: Median and posterior areas broadly impunctate and polished, remaining areas very sparsely punctured, punctures medium-sized, PIS 2-10 times, mostly 7-10 times Pd; GT2 medianly narrowly, posteriorly broadly impunctate, remainder toward sides, first sparsely, gradually closely and more finely punctured, on mid-lateral area PIS=Pd and at side PIS< Pd; GT3, on disc more finely, more closely and evenly punctulate, punctures mostly transversely rugosely confluent, PIS<Pd, marginal area medianly very finely and sparsely, laterally much more minutely, indistinctly punctulate.

aposanus, holotype: GT1: Medio-anteriorly finely, closely rugulose, mixed sparsely with irregular-sized punctures, some of which transversely elongate, rugae transversely extended to sides, gradually slightly sparser, including more numerous, round, distinct punctures between, median area from middle posteriorly impunctate, polished, but gradually punctured and rugosed sideways, with PIS till mid lateral area broader than Pd and surface well shining, thence laterally similar antero-lateral area; posteriorly at verge to constriction linearly impunctate, but constricted part finely, closely punctulate; most punctures medium-sized, as large as the thickness of basal vein of fore wing; GT2 simply closely punctured, punctures slightly larger than on GT1, mostly PIS Pd, but on central area partly slightly PIS < Pd, at verge to posterior constriction very sparse or impunctate, on constricted surface similar to GT1; GT3, same as on 2, except that punctures posteriorly smaller, mixed with transverse rugae and at extreme marginal part very finely and closely rugulose. Paratype: Rugosity almost undeveloped, medianly a thorough impunctate stripe till posterior verge which is impunctate as in

holotype; alongside the medial smooth area mostly PIS much larger than Pd, but partly 4–5 puncture transversely, closely arranged and along these puncture-rows delicate short rugulae defined in certain light, especially on anterior half, laterally mostly PIS < Pd; GT2, median narrow impunctate area present on posterior 2/3 which is enlarged to marginal sparsely punctate area, otherwise as in holotype; GT3, posteriorly transverse puncture-rows frequent that finally turning to transverse rugae, but the rugae not so fine and close as in holotype.

stantoni: GT1 and 2 very finely and very sparsely punctulate, PIS 3—5 times Pd, even on GT3 PIS 2–3 times Pd and punctures much finer; thus in the male of this spespecies gaster is practically impunctate as in the female.

amamiensis: Punctures far larger than in stantoni and distinct, but smaller than in aposanus; on disc of GT1 PIS≒Pd, but at medio-posterior part PIS slightly greater than Pd, while at transverse puncture-rows less than Pd, at sides punctures smaller and closer; GT2 closely, evenly punctured, PIS=Pd, but punctures slightly smaller; GT 3 similar to GT2, but as punctures much smaller apparently much closer.

pigmaeus: Except punctures slightly smaller and weaker, similar to amamiensis, with surface more glossy.

clypealis: GT1 at central area PIS slightly larger than Pd, but laterally gradually = and < Pd, punctures small and smaller posteriorly and gradually so on GT2 and 3, on 2 and 3 PIS nearly evenly =Pd, apparently, however, gradually closer.

palawanensis: Punctures moderately large, on GT1 and 2 close, mostly PIS < Pd, at posterior marginal area frequently transversely rugoso-punctate; on GT3 in holotype medianly slightly sparse, PIS≒Pd, in some other specimens at base in middle narrowly impunctate.

REFERENCES

Ashmead, W. H. 1904. A new genus and some new species of hymenoptera from the Philippine Islands. Canad. Ent., 36 (10): 282–283.

Baltazar, C. R. 1966. A Catalogue of Philippine Hymenoptera (With a Bibliography, 1758–1963). Pacific Insects Monograph 8 (ref. p. 326).

Bohart, R. M. and A. S. Menke. 1976. Sphecid Wasps of the World: A Generic Revision (ref. p. 66–69).

Krombein, K. V. 1979. Biosystematic studies of Ceylonese wasps, V. A monograph of the Ampulicidae (Hymenoptera: Sphecoidea). Smithonian Contr. to Zool., No. 298: 1–25 (24 figs.).

Nagy, C. G. 1971. Studies on the Ampulicidae (Hymenoptera). Boll. Soc. Ent. Ital., 103: 103–107.

Tano, T. and K. Tsuneki. 1970. Dolichurus puliensis Tsuneki, 1967, is the male of Dolichurus amamiensis Tsuneki et Iida, 1964 (Hym., Ampulicidae). Life Study, 14: 40.

Tsuneki, K. 1967. On some Ampulicidae from Formosa (Hymenoptera). Etizenia, 21: 1–13 (70 figs.).

Tsuneki, K. 1972. Studies on the Formosan Sphecidae, XIV. Notes on some specimens newly examined, with a description of a related Japanese subspecies (Hymenoptera). Ibid., 60: 1–13 (25 figs.).

Tsuneki, K. 1974. A contribution to the knowledge of Sphecidae occurring in Southeast Asia (Hym.). Polsk. Pism. Ent., 44: 585–660 (176 fig .).

Tsuneki, K. 1976. Sphecoidea taken by the Noona Dan Expedition in the Philippine Islands. Steenstrupia, 4: 33–120 (184 figs.).

Williams, F. X. 1919. Philippine Wasp Studies. Pt. 2. Descriptions of new species and life history studies. Bull. hawaii Sug. Plant. Assn. Exp. Sta. Ent. Ser., 14; 19–186 (106 figs., ref. p. 111–117).

Tsuneki, K. et T. Iida. 1964. The first record of the genus Dolichurus in Japan, with the description of a new species (Hymenoptera, Sphecoidea, Ampulicidae). Akitu, 11, 41–44 (13 figs.).

Rohwer, S. A.* 1910. Some new Hymenopterous insects from the Philippine Islands. U. S. Natl. Mus. Proc., 37: 657–660 (ref. 669).