



Title	The Genus Pemphredon Latreille of Japan and the Adjacent Regions (Hymenoptera, Pemphredonidae) (With 19 Text-figures)
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Citation	北海道大學理學部紀要, 10(2), 163-208
Issue Date	1951-03
Doc URL	<a href="http://hdl.handle.net/2115/27092">http://hdl.handle.net/2115/27092</a>
Type	bulletin (article)
File Information	10(2)_P163-208.pdf



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**The Genus *Pemphredon* Latreille of Japan  
and the Adjacent Regions<sup>1)</sup>  
(Hymenoptera, Pemphredonidae)**

**By**

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(With 19 Text-figures)

Incidental to the ethological study on these tiny wasps, I had to study the taxonomic work of them, because there has been published no complete report concerning the classification of the wasp group occurring in Japan. On entering upon the task, however, I found that the work is not an easy matter, because their classification and nomenclature are very complicated among the specialists in Europe. The main reason of the difficulty of the classification of this genus seems to lie in that the specific characters used as criteria for specific differences are rather slight and considerably variable. Such being the case, I collected as many examples as possible and examined statistically seemingly important characters.

The material here dealt with consists of about 800 examples which were derived from the collections of the Entomological Institute of the Hokkaido University, the Entomological Laboratory of the Kyushu University, the private collections of Mr. Shoichi Sakagami and Mr. Meiyō Munakata, both of the Hokkaido University, as well as those of my own. Nearly all the materials prepared by myself (about 600) are mounted on card points at the very apex of the triangle, so as not to harm the integument of the mesonotum, with the mandibles widely opened and with the clypeus carefully denuded of hairs. These materials are now partly possessed by the Entomological Institute of the Hokkaido University, the Entomological Laboratory of the Kyushu University and by myself. As the result it was found that no less than twelve species of *Pemphredon* (s. l.) occur in Japan and the adjacent regions, of which three seem to be new to science and seven new to the fauna<sup>2)</sup>. Out of these twelve species nine have been investigated by me on their biology, which will be treated in another paper.

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1) Contribution No. 226 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Only two species (*P. japonicus* and *P. dievillae*) have hitherto been known from Japan proper.

*Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 10, 1951.*

Before proceeding further, I wish to acknowledge my indebtedness to Dr. Tohru Uchida, Professor of Zoology of the Hokkaido University, for his kindness rendered in the course of the present study and also in reading through the manuscript. My heartiest thanks are due to Professor Chihisa Watanabe of the Hokkaido University and to Professor Keizo Yasumatsu of the Kyushu University for their kind helps given in both material and literature. Acknowledgements are especially due to Dr. J. Leclercq of the University of Liège, for copying some original descriptions. Thanks must also be extended to Messrs. Shoichi Sakagami and Meiyō Munakata for collecting material.

Fabricius (1763) formed the Genus *Pemphredon* s. l. under the name of *Crabro* and afterward Dalla Torre (1896) summarized the literature concerning the Genus in his famous work, *Catalogus Hymenopterorum*. Since that time, the reports as to the Genus have been published by the following investigators, namely, C. T. Bingham (1897), P. Cameron (1897 and 1908), O. Schmiedeknecht (1906 and 1930), S. A. Rohwer (1909, 1910, 1911, 1917 a et b), A. A. Birula (1912 and 1914), S. Matsu-mura (1912), A. C. W. Wagner (1916, 1931 a et b, 1938), L. Berland (1925), F. Chevalier (1925), G. Arnold (1929), R. C. L. Perkins (1929), L. Micheli (1930), H. Hedicke (1930), G. Harttig (1930 and 1931), J. Bondroit (1932), P. Blüthgen (1931), K. Iwata (1933), V. Gussakovskij (1933 and 1934) and A. Merisuo (1936). Among the works published by these entomologists, those of P. Blüthgen and A. C. W. Wagner (1931) seem to be especially important, but to my regret, they are confined only to the Subgenus *Dineurus* Westwood.

No less than forty species of *Pemphredon* have been on record up to date from several continents of the world, though some might be reduced. They are widely distributed over the northern parts of the temperate zone of the Northern hemisphere, including only a few from Africa and India, but none from South America and Australia. The species and their distribution are as shown in Table 1. Here, the doubtful species such as *anthracinus* Sm., *ocellaris* Gimm., *luctuosus* Shuck., *luctuosus* Dahlb., *pilosus* Gimm., *provancheri* Dalla Torre (= *provancheri* Ashm.) etc. are omitted. *fabricii* M. Müller (= *unicolor* (Fabr.) Latr.), *wesmaeli* A. Moraw. and *scoticus* Perkins have sunk to subspecies and *cresoni* Dalla Torre (= *concolor* Pack.), *dentatus* Puton, *rugifer* Dahlb. *solivagus* Bondroit, *morio* v.d. Lind., *strigatus* Chevalier etc. are omitted as synonymies of another species. Besides, *marginatus* Say is, according to Rohwer, not a member of *Pemphredon*, but of *Passalaeus* and *oraniensis* Lepeletier is also probably to belong to the same genus.

#### Genus **Pemphredon** Latreille, 1796

*Pemphredon* Latreille, Préc. car. génér. Insect., p. 128, 1796.

Type: *Pemphredon* (*Pemphredon*) *lugubris* Latreille, 1806.

Generic characters: Entirely black, occasionally partly brownish. Wings

Table 1. Species of the Genus *Pemphredon* s.l. of the world.

Species	Regions													
	Africa	Europe	India (Himalaya)	Turkestan	The Ussuri region	Manchuria	Korea	Japan			Saghalien	The Kurile islands	North America	
								Kyushu	Shikoku	Honshu	Hokkaido			
( <i>Pemphredon</i> ) <i>angularis</i> Fox, 1892														○
( <i>Pemphredon</i> ) <i>cockerelli</i> Rohwer, 1909														○
( <i>Pemphredon</i> ) <i>concolor</i> Say, 1824														○
( <i>Pemphredon</i> ) <i>confertim</i> Fox, 1892														○
( <i>Pemphredon</i> ) <i>errans</i> Rohwer, 1917														○
( <i>Pemphredon</i> ) <i>flavistigma</i> Thomson, 1874		○			○		○				○			○
( <i>Pemphredon</i> ) <i>foxi</i> Rohwer, 1917														○
( <i>Pemphredon</i> ) <i>fuscipennis</i> Cameron, 1897			○											○
( <i>Pemphredon</i> ) <i>japonicus</i> Matsumura, 1912								○	○	○	○			○
( <i>Pemphredon</i> ) <i>koreanus</i> sp. nov.								○						○
( <i>Pemphredon</i> ) <i>laeviceps</i> Gussakovskij, 1933											○	○		○
( <i>Pemphredon</i> ) <i>lugens</i> Dahlbom, 1842		○												○
( <i>Pemphredon</i> ) <i>lugubris</i> Latreille, 1806		○		○	?		?				?	?	?	○
( <i>Pemphredon</i> ) <i>mandibularis</i> sp. nov.														○
( <i>Pemphredon</i> ) <i>montanus</i> Dahlbom, 1845		○												○
( <i>Pemphredon</i> ) <i>nearcticus</i> Kohl, 1890		○												○
( <i>Pemphredon</i> ) <i>pacificus</i> Gussakovskij, 1933		○												○
( <i>Pemphredon</i> ) <i>podagricus</i> Chevrier, 1870		○												○
( <i>Pemphredon</i> ) <i>rileyi</i> Fox, 1892														○
( <i>Pemphredon</i> ) <i>shawii</i> Rohwer, 1917														○
( <i>Pemphredon</i> ) <i>tinctipennis</i> Cameron, 1908														○
( <i>Pemphredon</i> ) <i>virginianus</i> Rohwer, 1917														○
( <i>Dineurus</i> ) <i>austriacus</i> (Kohl, 1888)		○												○
( <i>Dineurus</i> ) <i>bipartitor</i> Fox, 1892														○
( <i>Dineurus</i> ) <i>diervillae</i> Iwata, 1933														○
( <i>Dineurus</i> ) <i>giffardi</i> Rohwer, 1917														○
( <i>Dineurus</i> ) <i>grinnelli</i> (Rohwer, 1910)														○
( <i>Dineurus</i> ) <i>harleeki</i> Rohwer, 1910														○
( <i>Dineurus</i> ) <i>inornatus</i> Say, 1824														○
( <i>Dineurus</i> ) <i>lethifer</i> (Shuckard, 1837)		○		○	○	○	○			○	○	○	○	○
( <i>Dineurus</i> ) <i>shuckardi</i> (A. Morawitz, 1837)		○		○	○	○	○			○	○	○	○	○
( <i>Dineurus</i> ) <i>tenax</i> Fox, 1892														○
( <i>Dineurus</i> ) <i>unicolor</i> (Panzer, 1798 nec Fabr.)														○
( <i>Ceratophorus</i> ) <i>carinatus</i> Thomson, 1870		○												○
( <i>Ceratophorus</i> ) <i>clypealis</i> Thomson, 1870		○												○
( <i>Ceratophorus</i> ) <i>intermedius</i> sp. nov.														○
(?) <i>arnoldi</i> , nom. nov. *)														○
(?) <i>bequaerti</i> Arnold, 1929														○
(?) <i>braunsi</i> Arnold (?)														○
Total number of species of each region	3	11	1	2	6	2	7	2	1	4	11	6	3	18

\*) For *luctuosus* Arnold (1929)

hyaline, with the apical portion more or less fuscous. Head, thorax, petiole and apical portion of abdomen and basal portion of legs covered with long whitish

pubescence. Head large, subquadrate, eyes well developed, ovate; ocelli distinct, antennae inserted at the base of clypeus, rather widely separated from each other, labrum large, lobiform, remarkably projecting from beneath clypeus, labial palpi 4-jointed, the 2nd and 3rd joints short, subequal in combined length to the apical joint, maxillary palpi 6-jointed, each joint subequal in length, mandibles stout, in ♀ bi- or quadridentate, in ♂ tridentate. Thorax broadly oval, with pronotum depressed below the level of mesonotum, the latter and propodeum convex, anterior and posterior borders of scutellum deeply grooved, propodeum with enclosed semicircular space (*area cordata* or *area dorsalis*) at the base, its posterior border distinctly and more or less broadly raised (=limb). Abdomen with the 1st sternite forming a slightly curved petiole, remainder of abdomen lanceolate, interval between the 1st and 2nd sternites transversely deeply impressed, apical tergite with pygidial area in ♀, without in ♂, but with a single spine in the latter. Wings with 1 radial, 2 cubital and 2 discoidal cells, the radial and the 1st cubital cells subequal, but the latter oblong, the 2nd cubital cell nearly square. Legs moderately long, slender, front and mid tibiae with 1, hind tibiae with 2 apical spurs. Head and thorax more or less distinctly punctured or sculptured. Sculptures on propodeum always distinct and very close, but always punctureless on the anterior parts of the sides, those on *area cordata* and on petiole of abdomen very coarse, on the limb variable. Abdominal tergites anteriorly practically impunctate, posteriorly with fine punctures, apical segment with somewhat coarse scattered punctures. Abdominal sternites with fine punctures more or less closely distributed, mixed usually with somewhat larger ones. Length: ♀, 5-12 mm, ♂, 4-10 mm.



Fig. 1. *Pemphredon* (*Pemphredon*) *pacificus* Gussakovskij (?=a subspecies of *lugubris* Latreille).

This genus is usually divided into 3 subgenera, namely *Pemphredon* s. str. (1796), *Dineurus* Westwood (1837) and *Ceratophorus* Shuckard (1837), of which the last one is often treated as a good independent genus.

#### Table of Subgenera

1. Frons on the median line and just above the base of antennae with a blunt tubercle or spine. Petiole of abdomen very short, scarcely attaining the apex of hind coxa stretched backwards, seen in the lateral view, only slightly longer than high. Antennae

- as in *Dineurus*, wing venation as in *Pemphredon* s. str. .... *Ceratophorus* Shuckard
- Frons without tubercle or spine, petiole surpassing hind coxa stretched posteriorly, seen in the lateral view, at least twice as long as high. .... 2
2. The 2nd recurrent nervure of fore wing received by the 2nd cubital cell, rarely interstitially, but then the 3rd joint of antennae nearly thrice as long as broad at the apex. Large species. .... *Pemphredon* s. str.
- The 2nd recurrent nervure received by the 1st cubital cell, rarely interstitially, but then the 3rd joint of antennae nearly twice as long as broad at the apex. Rather small species. .... *Dineurus* Westwood.

Table 2. Variation of the ratio of PL : PW.

Species.	<i>japonicus</i>		<i>fauristigma</i>		<i>podagricus</i>		<i>pacificus</i>		<i>montanus</i>		<i>koreanus</i>		<i>manibularis</i>		<i>shuckardi</i>		<i>uesuanae</i>		<i>lobifer</i>		<i>diversilae</i>		
	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	
1.5																					1		
1.6																							
1.7													2	1							1	1	
1.8						1																2	
1.9																					9	7	
2.0													2	4							13	13	1
2.1						2			2					1	2						11	16	4
2.2			1		1	2			1				2	10	3		2				8	20	3
2.3					1									4	5						13	13	7
2.4			1		2	3								1	1		1				3	5	3
2.5		2	3			2	1		3	2				1	6	1				4	9	6	
2.6	1	3	2		1		1		7	1					4	3	1				4	4	3
2.7	1	1	5			2			1						2	2					4	1	
2.8		2	3	1			3		7	1				1	1		3				2		2
2.9	1	2					5		5	1							10	4					
3.0	2	3					3		6	2					1		5	5		2	2		
3.1		2		1			7		1	2		1					6	6					1
3.2		1	1				2		2								5	5					
3.3	3								2								3	3					
3.4	2	1					4										2	2					
3.5	3						3										2	2					
3.6	1						3										1	1					
3.7	4						1										2	2					
3.8	3																						
3.9	1																						
4.0	1																						
4.1	3																						
4.2																							
4.3		1																					
4.4																							
No. of Ex.	28	17	15	2	7	15	36	2	35	7	4	6	25	25	28	37	64	99	30	15			

Specific characters are found in the following points: (1) the form of clypeus, (2) characters of antennae, (3) characters of hind tibiae and mid metatarsi (*Dineurus*), (4) the nature of abdominal sternite (*Dineurus*), (5) the structure of mandibles (chiefly in ♀), (6) the structure and the sculpture of area cordata, especially of the posterior limb, (7) the form of head, seen from above and in profile, (8) location of ocelli, (9) ratio between the length of the eye and the distance between eyes at the base of clypeus, (10) the convergence degree of the inner orbits of the eyes, (11) characters of petiole, (12) characters of pygidial area, (13) punctuation on head and thorax.

Table 3. Correlation table of FL : PL and FL : PW. (*Pemphredon* s. str.)

Sp.	F.L. (mm)	Length of petiole															Width of petiole					Total
		0.6-	0.7-	0.8-	0.9-	1.0-	1.1-	1.2-	1.3-	1.4-	1.5-	1.6-	1.7-	1.8-	3.0-	3.5-	4.0-	4.5-	5.0-	5.5-		
japon. ♀	2.0													1	2	1					4	
	1.9													4	4	—	1				9	
	1.8								1	2	5	1			1	3	3	2			9	
	1.7								1	1	1				1	1	1				3	
	1.6				1	—	1	—	—		1					1	2				3	
flavis. ♀	2.1																			1	1	
	2.0													3	2	1			2	4	6	
	1.9													4	2				1	1	6	
	1.8																	1	4	1	0	
	1.7									1								1			1	
	1.6																				0	
1.5				1													1				1	
pod. ♀	1.7				1	2											1	2			3	
	1.6				2	1										1	2				3	
	1.5					1											1				1	
pod. ♂	1.6			3	4	1									1	2	4	—	1		8	
	1.5		3	1	1										3	2					5	
	1.4		1	1										1	1						2	
mont. ♀	1.8					1	3	11								4	8	3			15	
	1.7					3	5	2								4	6				10	
	1.6					1	6	2								6	1	2			9	
	1.5						1											1			1	
pacif. ♀	1.8						1										1				1	
	1.7						4	5	1	1					2	7	2				11	
	1.6				1	9	8	3							4	16	1				21	
	1.5				1										1						1	
	1.4				1	1									2						2	
mand. ♀	1.5			1											1						1	
	1.4		1	3											1	3					4	
	1.3	1													1						1	
kor. ♀	1.8												1						1		1	
	1.7											1						1			1	
	1.6								1	—	1						2				2	

Table 4. Variation of the relative length of the petiole to the hind femur (*Pemphredon* s. str.)

		FL : PL											
Species		0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
<i>japonicus</i>	♀						1	2	6	11	6	1	
<i>falvistigma</i>	♀						8	6	1				
<i>podagricus</i>	♀					2	3	2					
"	♂				4	9	2						
<i>montanus</i>	♀						5	17	11	2			
"	♂					1	2	1	3				
<i>pacificus</i>	♀						3	7	12	10	4		
<i>koreanus</i>	♀									3		1	
<i>mandibularis</i>	♀	1	—	1	3	1							

Abbreviations used in the description: OOD . . . . Oculocellar distance, POD . . . . postocellar distance, OCD . . . . ocelloccipital distance, PLE . . . . postmarginal line of the eyes, PLO . . . . postmarginal line of the ocelli (postocelli). OOD and POD are the same as OOL and POL respectively of some authors, but these symbols are also used by other entomologists as representing the lines that include the diameter of the ocellus or ocelli. In order to avoid the confusion, the new symbols were especially adopted. PLE shows the line that connects the posterior margins of the compound eyes under the condition of the vertex held horizontally and seen from above. PLO represents similarly the line that connects the posterior margins of the postocelli. Abbreviation used in the Tables: BL . . . . body length, EL . . . . eye length, EW . . . . eye width seen in profile, DEU . . . . distance between the eyes at the upper front, DEL . . . . Distance between the eyes at the lower front (at base of clypeus), FL . . . . length of the hind femur, FrL . . . . frontal length (from median ocellus till the apex of the clypeus, in case the incision is present, then till the base of the incision), HW . . . . head width (in ♂ just behind the eyes), HWE . . . . head width at the eyes, PL . . . . petiolar length, PW . . . . petiolar width at the apex (*vide* Remark), TW . . . . width of temple seen in profile.

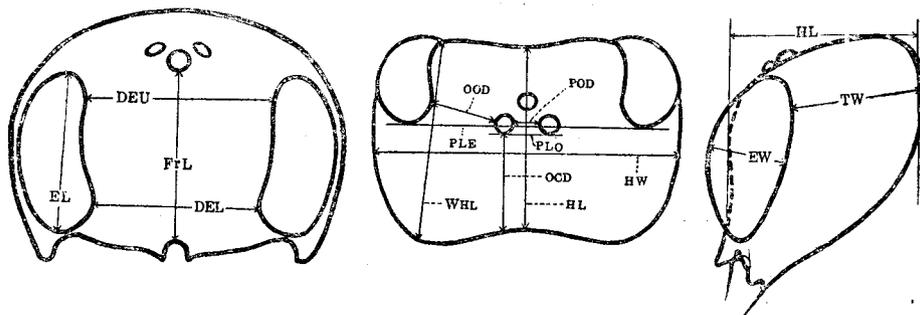


Fig. 2. Showing the parts of the head, the terms of which were abbreviated in the measurement.

*Remarks.* The slender petiole (seen from above) in general widens abruptly

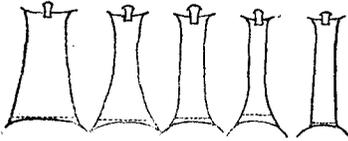


Fig. 3. Showing the width of the petiole (the dotted line).

near the 1st abdominal tergite. When measured at the extreme apex, the width becomes therefore much greater in value, and the ratio of PL:PW much smaller than the eye-measurement. Taking into account the practical application, measurements were made at the position shown by dotted lines in Figure 3.

### Subgenus *Pemphredon* Latreille, 1796.

*Pemphredon* Latreille, Préc. car. génér. insect., p. 128, 1796.

Subgeneric characters: Pubescence on frons silvery, in ♀ close but not dense, in ♂ very dense and appressed, covering completely the surface of the area. Body large, head seen from above, in ♀ subquadrate, in ♂ considerably convergent posteriorly with temples less developed. Frons unarmed with tubercle or spine (but rarely with the trace of the tubercle). Antennae with the 3rd joint nearly thrice as long as broad at the apex, but rarely 2-2.5 times as long as broad, in form simple in ♀, provided with a longitudinal keel in the middle portion of the flagella in ♂. Mandibles quadridentate in ♀, tridentate in ♂. In fore wings the 2nd recurrent nervure received by the 2nd cubital cell.

### Key to species

♀ ♀

1. The 3rd joint of antennae comparatively short, at most 2.5 times as long as broad at the apex; limb of area cordata smooth and shining ..... 2
- The 3rd joint of antennae long, at least thrice as long as broad at the apex; limb of area cordata rugose. .... 4
2. Clypeus with the apical margin broadly semicircularly emarginated in the middle, its surface medianly below remarkably raised, projecting, at the apical extremity, into a somewhat up-rising short tooth in the middle of the incision; limb of area cordata clearly outlined on both edges; innermost tooth of mandibles very broad, subquadrate, with the rounded apex. .... *mandibularis* Tsuneki.
- Clypeus with the apical margin bluntly tridentate in the middle; limb of area cordata not well outlined on both edges; innermost tooth of mandibles not specially broadened. .... 3.
3. The 3rd joint of antennae twice as long as broad at the apex; vertex smooth and polished, with only a few fine and very sparse punctures; mesonotum very shallowly indistinctly punctured or punctured-rugose; petiole of abdomen shorter than hind coxa and trochanter taken together; the distance between the lateral teeth of clypeus less than as long as its lateral margin. .... *laeviceps* Gussakovskij (?=*podagricus* Chevrier).
- The 3rd joint of antennae about 2.5 times as long as broad at the apex; vertex with sparse but distinct medium-sized punctures; mesonotum more or less coarsely rugoso-reticulate; petiole of abdomen distinctly longer than hind coxa and trochanter united; the distance

- between the lateral teeth of clypeus nearly as long as the lateral margin .....  
 ..... *koveanus* Tsuneki.
4. Clypeus on the anterior margin in the middle with a small semicircular emargination ;  
 wing veins and especially stigma more or less yellowish. .... *flavistigma* Thomson.  
 — Clypeus otherwise conformed ; wing veins and stigma black ..... 5
5. Clypeus on the anterior margin triangularly produced, with the apex slightly raised  
 and pointed ; pygidial area broad and usually flattened, broader than the base of hind  
 metatarsi. .... *montanus* Dahlbom.  
 — Clypeus with the anterior margin otherwise conformed ; pygidial area narrow, distinctly  
 grooved, with the well-defined lateral carinae. .... 6
6. Clypeus with the anterior margin truncated in the middle, thorax more delicately sculp-  
 tured than in the subsequent species. .... *pacificus* Gussakovskij.  
 — Clypeus with the anterior margin slightly produced and narrowly incised in the middle,  
 so as to form a median bilobular projection ; thorax slightly more coarsely sculptured  
 than in the preceding species. .... *japonicus* Matsumura.

## ♂♂

1. Metatarsi of mid legs bending, inner orbits of eyes rather strongly convergent below,  
 the distance between eyes at the base of clypeus less than as long as eye ..... 2  
 — Metatarsi of mid legs straight, inner orbits of eyes not strongly convergent below, the  
 distance between eyes at the base of clypeus as long as or slightly more than as long as  
 eye. .... 3
2. Metatarsi of mid legs remarkably bent (Fig. 6, F), with the apical one-third dilated and  
 furnished with dense pubescence on the inner margin ; the 3rd joint of antennae nearly  
 2.3 times (in the lateral view twice) as long as broad at the apex ; clypeus slightly pro-  
 duced and truncate, or obtusely tridentate or feebly emarginate, in the middle. Vertex  
 very sparsely and finely punctured and polished ; temples seen from above less strongly  
 convergent posteriorly. .... *laeviceps* Gussakovskij.  
 — Metatarsi of mid legs only slightly bent (Fig. 10, W) ; the 3rd joint of antennae thrice  
 as long as broad at the apex ; clypeus triangularly incised in the middle, with the late-  
 ral angles broadly and roundly produced anteriorly ; vertex somewhat closely punc-  
 tured, subopaque or slightly shining ; temples seen from above strongly convergent  
 backwards. .... *montanus* Dahlbom.
3. Clypeus with a tiny semicircular incision on the anterior margin in the middle ; tarsi  
 of legs brownish ; the 7th and 8th joints of antennae with the keel somewhat angulated  
 near the base (Fig. 5, H). .... *flavistigma* Thomson.  
 — Clypeus slightly and roundly produced anteriorly, with the triangular incision in the  
 middle ; the 7th and 8th joints of antennae with the keel merely roundly produced. .... 4
4. The rounded protuberance on the sides of the median incision of clypeus rather narrow,  
 not covering the whole length of the lateral margin (Fig. 4, K) ; petiole of abdomen  
 comparatively long, nearly thrice as long as broad at the apex. . . . *japonicus* Matsumura.  
 — The protuberance on the sides of the median incision of clypeus broadly rounded,  
 covering nearly the whole length of the lateral margin (Fig. 9, S) ; petiole of abdomen  
 comparatively short, only slightly more than twice as long as broad at the apex. ....  
 ..... *pacificus* Gussakovskij.

### 1. *Pemphredon (Pemphredon) japonicus* Matsumura, 1912

? *Pemphredon japonicum* Matsumura, Illust. Thous. Ins. Jap. Suppl., IV, p. 179, n. 935, 1912 ;  
 Illust. Thous. Ins. Jap. (edit. 2), Vol. II, p. 158, n. 277, 1930.

*Pemphredon (Pemphredon) japonicus* Gussakovskij, Mushi, Vol. VII, No. 2, p. 87, 1934.

*Pemphredon (Pemphredon) japonicus* Iwata, Mushi, Vol. X, No. 2, p. 136, 1937.

♀. Black. Apex of pulpi brownish, wings hyaline, Head seen from above : Fig. 4, A, seen in profile : do., B. Ocelli in an isosceles triangle, OOD : POD ≈ 2 : 1, rarely 3 : 1, PLE falls just upon PLO ; OOD : OCD ≈ 1 : 2. Frontal median carina distinct or obsolete ; clypeus on the surface convex or flattened, apical margin bilobular (Fig. 4, C), slightly raised or reflected. Mandibular teeth obtuse at the apex (do., D). The distance between eyes at the base of clypeus slightly more than as long as eye ; antennae slender, with the 3rd joint nearly 3.5 times as long as broad at the apex, relative length of the joints 1-12 :— 47 : 13 : 28 : 21 : 20 : 19 : 19 : 18 : 17 : 16 : 15 : 18 (Examp. No. 1). Pronotum with the antero-lateral angles

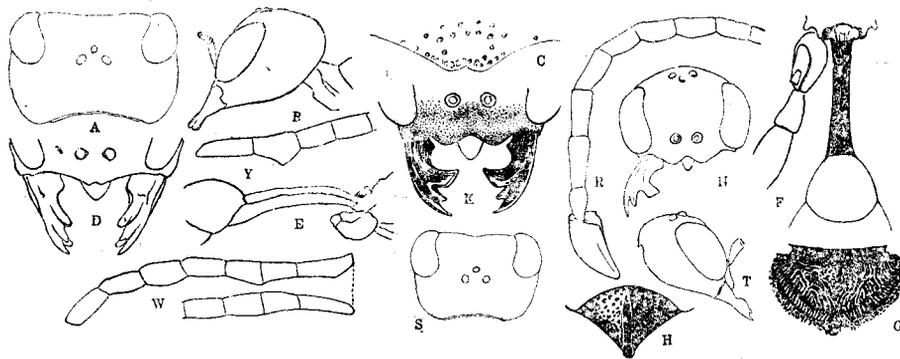


Fig. 4. *Pemphredon (Pemphredon) japonicus* Matsumura.

A....head of ♀ seen from above, B....do. seen in profile, C....clypeus (♀),  
 D....clypeus and mandibles (♀), E....petiole seen in the lateral view (♀),  
 F....do. seen from above, G....sculpture on area cordata (♀), H....pygidial  
 area (♀), I, J, K, L, M, N, S, T.... head (♂), K....clypeus and mandibles (♂), R....basal  
 9 joints of antenna (♂), W, Y....abnormal antennae (W....right-hand, Y....  
 left-hand).

rounded ; limb of area cordata on propodeum roundly incrassate and interrupted in the middle by the longitudinal groove. Petiole of abdomen long (Fig. 4, E et F), in most examples nearly 4 times as long as broad at the apex (Table 2) and longer than hind coxa and trochanter combined, relative length to hind femur nearly 4 : 5 (Table 3 et 4). Pygidial area (Fig. 4, H) narrow, with the surface distinctly canaliculated and with lateral carinae well-defined, its width in the middle slightly narrower than the base of hind metatarsus, nearly as broad as base of mid metatarsus. Vertex and temples moderately largely and moderately sparsely, ocellar region feebly and very sparsely punctured, punctures partly confluent. Frons

longitudinally arcuately punctured-striate. Clypeus highly polished, with a few somewhat large scattered punctures. Mesonotum anteriorly transversely, posteriorly longitudinally rather closely striate, with feeble crossing striae so as to form a rough mesh, the surface opaque. The sculpture stronger and somewhat larger than in *pacificus* or in *montanus*. Mesopleura finely granulate, lower portions and mesosternum transversely striate. Arca cordata very coarsely radiately sometimes irregularly, limb somewhat finely rugose-striate, remainder of the segment closely but more or less coarsely punctured-rugose. Petiole of abdomen coarsely but rather shallowly rugose-reticulate. Length 10-12 mm.

♂. Pubescence normal. Head seen from above (Fig. 4, S) with the lateral margins behind eyes slightly convergent posteriorly, with ocelli located in a broad triangle, OOD : POD : OCD = 2 : 1 : 3, PLE runs across the middle of postocelli. Head seen in profile : Fig. 4, T. Head seen in front (do., N) with the distance between eyes at the base of clypeus very slightly more than as long as the eye, inner orbits of eyes not remarkably convergent below ; clypeus : do., K ; mandibles : do., antennae : do., R ; relative length of the joints 1-13 :— 28 : 11 : 17 : 16 : 15 : 15 : 15 : 14 : 12 : 11 : 10 : 13 (Ex. No. 1), joints 4-9 with longitudinal carina on the lateral margin which is on joints 7 and 8 especially well defined and roundly produced. Area cordata semicircular, with the outer border rounded. Petiole of abdomen (Table 4) longer than hind coxa and trochanter united. Mid metatarsi nearly straight, normal. Two types of punctuation are found among the specimens examined, namely type A and type B. Type A: Vertex and temples sparsely and moderately largely punctured, with intervals shining ; punctures on temples above somewhat finer and closer, ocellular space and ocellar region without puncture and polished. Frons closely and rather feebly punctured, on the lateral portions alone the feeble striae are definable ; clypeus very finely, densely and rather feebly punctured-subcoriaceous. Punctures on mesonotum shallow and feeble, anteriorly fine and close, posteriorly slightly large and sparse, with intervals shining and without striae. Area cordata longitudinally somewhat rugosely striate, with posterior limb highly polished, rest of the segment rather coarsely but not strongly rugoso-reticulate. Petiole medianly grooved and largely but not strongly and moderately closely punctured. Type B: Punctures on vertex and temples closer and stronger, with intervals very delicately coriaceous and subopaque, without punctureless areas. Frons finely and irregularly reticulate, the sides and the upper portion including the ocellar region with distinct striae. Mesonotum more closely and more strongly punctured than in type A, with clearly definable striae on the lateral portions of the disc. Area cordata longitudinally, more closely and irregularly rugoso-striate, partly reticulate, posterior limb very closely and finely striate, rest of the segment finely but strongly reticulate. The impunctate spaces of the sides narrower than in A. Petiole more strongly punctured-reticulate. Length 6.5-8.5 mm. Genitalia : Fig. 19, A. Squama long, rather slender, somewhat sword-shaped, with the apex obtusely pointed or in some examples more or less angulated on the inner apical angle ; inner margin with a hook-like process near the middle which is very slender and acutely pointed at the apex, but behind, it connected with the body of the squama by the translucent membrane ; outer margin near the middle narrowly transparent and slightly folded into subcarina. Volcella small, rather robust, elongate oval and somewhat flattened. Penis with a translucent crown at the apex.

*Habitat* : Japan (Honshu, Shikoku, Kyushu and Hokkaido) and the Kurile islands (Kunashiri).

*Specimens examined* : 27 ♀♀ 16 ♂♂, Hokkaido (8 ♀♀ 15 ♂♂ Sapporo,

3 ♀♀ Jōzankei, 15 ♀♀ Atsubetsu, 1 ♀ Tokachi); 1 ♀, Kyushu (Hikosan); 1 ♂, the Kurile islands (Kunashiri).

*Remarks.* 1) In 1912, S. Matsumura described a species of *Pemphredon* s. str. from Honshu (Kyoto) under the name of *japonicum*, but his description was quite incomplete. On this account, in 1934, V. Gussakovskij attempted the redescription of the species, basing upon a single example from Osaka, without confirming the type. I had a chance to examine all the specimens of the genus collected by S. Matsumura. But I was unable to find not only the type of *japonicum* but also any specimens of *Pemphredon* s. str. collected from Middle Japan. But judging from the geographical distribution of the subgenus, it is presumable that the species treated by S. Matsumura must be the same as that redescribed by V. Gussakovskij.

2) It was ascertained by breeding that there were two types of punctuation in the male examples as dealt with in the description.

3) The difference of this species from *lugubris* in the male example remained unknown.

4) The difference of this species from *pacificus* in the male example was confirmed by breeding (cf. Table 5).

Table 5. Measurements of *P. japonicum* ♂ and *pacificus* ♂ (Gothic type). (mm).

No.	HWE	EUD	ELD	EL	FrL	OOD:POD	IAS	PL	PW
1	2.14	1.34	1.12	1.00	1.18	23:14	1.00	0.82	0.30
2	2.08	1.28	1.10	1.00	1.16	22:13	1.04	0.90	0.34
3	1.86	1.10	1.00	0.96	1.08	19:12	1.00	0.90	0.34
4	1.96	1.14	1.12	1.08	1.12	19:11	0.94	0.96	0.28
5	2.02	1.24	1.14	1.08	1.18	21:10	0.96	0.90	0.30
6	2.04	1.22	1.12	1.06	1.16	20:12	1.00	0.94	0.34
7	2.20	1.30	1.22	1.16	1.26	20:14	1.10	1.08	0.36
8	2.10	1.22	1.10	1.14	1.18	19:12	1.00	0.92	0.36
9	2.08	1.20	1.10	1.12	1.22	19:12	1.00	0.94	0.34
10	2.20	1.32	1.20	1.14	1.24	21:15	1.06	1.06	0.36
11	2.00	1.18	1.10	1.02	1.20	18:12	1.00	0.90	0.30
12	1.96	1.18	1.04	1.04	1.10	19:12	0.96	0.88	0.28
13	2.24	1.26	1.22	1.14	1.26	20:12	0.84	1.00	0.36
14	2.04	1.20	1.10	1.04	1.10	19:13	0.94	0.90	0.32
15	1.96	1.14	1.04	1.00	1.10	20:11	0.90	0.90	0.28
16	1.92	1.12	1.06	1.08	1.12	19:10	0.96	0.94	0.30
17	2.14	1.30	1.20	1.18	1.28	22:15	1.12	1.04	0.36
<b>1</b>	<b>1.80</b>	<b>1.06</b>	<b>0.94</b>	<b>0.92</b>	<b>1.04</b>	<b>18:11</b>	<b>0.86</b>	<b>0.64</b>	<b>0.50</b>
<b>2</b>	<b>1.76</b>	<b>1.05</b>	<b>0.94</b>	<b>0.90</b>	<b>1.02</b>	<b>16:12</b>	<b>0.90</b>	<b>0.64</b>	<b>0.30</b>

Nos. 1, 2, 3 and Nos. **1**, **2** are examples bred from the eggs of *P. japonicum* and *pacificus* respectively. IAS...1st abdominal segment.

## 2. *Pemphredon (Pemphredon) flavistigma* Thomson, 1874

*Pemphredon flavistigma* Thomson, Hymen. Scand., III, p. 19, 1874. (♀).

*Pemphredon flavistigma* André, Spec. Hymen. Europ., III, p. 198, 1886. (♀).

*Pemphredon flavistigma* Dalla Torre, Cat. Hymen. etc., VIII, p. 356, 1897.

*Pemphredon flavistigma* Schmiedeknecht, Hymen. M. Europ., p. 207, 1906. (♀); Hymen. N. M. Europ., p. 668, 1930 (♀).

*Pemphredon (Pemphredon) flavistigma* Gussakovskij, Ark. Zoolog., Bd. 24 A, No. 10, p. 8, 1933. (♀).

*Pemphredon (Pemphredon) flavistigma* Merisuo, Ann. Entom. fenn. Helsingf., II, p. 120, 1936. (♂).

♀. Black. Tibial spurs and tarsal joints beneath brown. Wings slightly clouded and more or less yellowish, stigma deep orange, its posterior vein dark brown, other veins light brown. Head, seen from above, (Fig. 5, A) similar in form to *japonicus*, with the areas along the upper inner orbits of eyes slightly elevated, with ocelli located nearly in an equilateral triangle. PLO lies slightly posterior to PLE; OOD : POD : OCD = 10 : 4 : 15. Head seen in front with eyes nearly as long as the distance between eyes at clypeus. Clypeus with the surface flattened, with the apical border narrowly and semicircularly incised in the middle, lateral angles of the incision slightly produced and somewhat incrassate (Fig. 5, B and I). Mandibles (do., B) with teeth more acutely pointed than in *japonicus*. Antennae with the 3rd joint about 3.5 times (seen in the lateral view just 3 times) as long as broad at the apex, relative length of the joints 1-12 :— 45 : 13 : 25 : 19 : 18 : 16 : 15 : 14 : 14 : 14 : 13 : 17 (Ex. No. 1). Pronotum with the lateral angles rounded. Posterior limb of area cordata only gently incrassate, with the outer border enclosed by a feeble groove. The longitudinal excavation on the posterior face of propodeum shallower than in *japonicus*. Potiole slightly less than thrice as long as broad at the apex (Table 5), slightly shorter than hind coxa and trochanter put together. Pygidial area narrow, nearly as broad as the base of hind metatarsus, the surface distinctly canaliculate and the lateral margins acutely carinated (Fig. 5, C), without the median keel at the apex. Head and thorax with microscopically delicate ground sculptures, subopaque. Vertex moderately sparsely and moderately largely punctured, with very fine feeble striae near postocelli. Frons finely, longitudinally and arcuately punctured-striate, the striae finer and closer than in *japonicus* and extending upwards to the ocellar region. The elevated areas along the upper inner orbits of eyes without sculpture. Clypeus sparsely, somewhat largely and deeply punctured. Propleural transverse striae

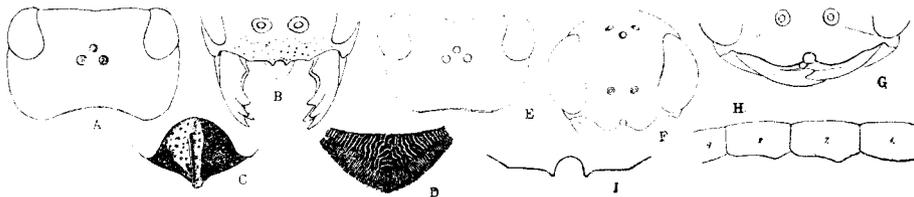


Fig. 5. *Pemphredon (Pemphredon) flavistigma* Thomson.

A...head (♀); E, F...Do. (♂), I...clypeus (♀), G...do. (♂), B...mandibles (♀), D...an instance of the sculpture on area cordata, C...pygidial area (♀), H...6th-9th joints of antenna (♂).

finer and closer than in *japonicus*. Mesonotum opaque, anteriorly finely densely punctured-rugulose, antero-laterally transversely and very finely striate, posteriorly longitudinally punctured subrugose. Mesopleura coarsely and irregularly rugose, below sparsely

punctured, posteriorly finely longitudinally subrugulose-striate. Area cordata on propodeum coarsely, radiately striate, more or less irregularly rugose, on the posterior limb the striae extraordinarily fine and close (Fig. 5, D); posterior surface of the segment near area cordata somewhat longitudinally, remaining portions irregularly and coarsely rugose-striate. Petiole irregularly and rather shallowly rugose; Length 9-12 mm.

♂. Apex of tibiae and all tarsi brownish, in one example antennal flagella also brown and the tarsi ferruginous. Head seen from above: Fig. 5, E. OOD:POD:OCD=4:2:7, ocelli located in a nearly equilateral triangle, slightly more flattened than in ♀. Head seen in front (Fig. 5, F) with inner orbits of eyes not remarkably convergent below, with the distance between eyes at the base of clypeus nearly as long as eye. Clypeus broadly produced in the middle, with a median tiny semicircular emargination (Fig. 5, G). Relative length of the antennal joints:— 25:9:22:17:15:14:13:12:11:11:10:13; the 3rd joint nearly three times as long as broad at the apex, joints 4-9 with a longitudinal carina on the lateral margin, of which those on the 7th and 8th somewhat angulated near the base (do., H). Area cordata with the posterior limb distinctly incrassate in one example, but rather obsoletely so in the other. Petiole slightly longer than hind coxa and trochanter united. Metatarsi of mid legs straight. Vertex in one example subopaque, in the other shining, with punctures somewhat more closely distributed than in ♀, temples more finely, more closely punctured. Frons longitudinally, finely and closely striate, with fine punctures scattered between the striae, on the anterior portion minutely and somewhat irregularly punctured-subreticulate. Mesonotum finely closely punctured, anteriorly subrugose; scutellum longitudinally finely punctured-striate. Area cordata coarsely and radiately rugose or striate, the striae much finer and closer on the posterior limb, remaining portions of propodeum anteriorly subrugoso-striate, posteriorly rugoso-reticulate. Length 9.0 mm. Genitalia: Fig. 19, B. General aspect is very similar to that of *japonicus*, but squama is broader and the hook-like process on the inner margin is more robust and broader. Volcella and penis longer than in *japonicus*. Measurements of the two examples are as shown below.

Table 6. Measurements of *P. flavistigma* ♂ (mm).

No.	BL	HWE	HL	DEU	DEL	FrL	EL	TW	EW	OOD:POD:OCD	FL	PL	PW	PL:PW
1	9.0	2.30	1.25	1.25	1.10	1.25	1.25	0.65	0.75	20:12:40	1.55	1.10	0.35	3.1
2	9.0	2.35	1.25	1.30	1.20	1.25	1.30	0.65	0.75	20:11:40	1.55	1.05	0.38	2.8

*Habitat*: North Europe, the Amur and the Ussuri regions, Korea and Hokkaido.

*Specimens examined*: 14 ♀♀, Hokkaido (Jozankei); 2 ♂♂ Korea (Mt. Hakuto).

### 3. *Pemphredon* (*Pemphredon*) *laeviceps* Gussakovskij, 1933

(?=*Pemphredon* (*Pemphredon*) *podagricus* Chevrier, 1870).

*Pemphredon* (*Pemphredon*) *laeviceps* Gussakovskij, Ark. Zool., Bd. 24 A, No. 10, p. 7, 1933.

♀. Black. Palpi and tarsi of legs dark brown, the former apically paler, wings hyaline, apical half slightly brownish, stigma and veins dark brown. Head from above (Fig. 6, A)

subquadrate, comparatively less broad than in allied species, but with temples well developed, slightly roundly produced behind eyes. Ocelli in a broad triangle,  $OOD : POD \approx 5 : 3$ ,  $OOD : OCD \approx 2 : 3$ , PLE runs across postocelli. Head in profile: Fig. 6, B. Head in front with the distance between eyes at the base of clypeus slightly less than as long as eye (Table 7). Clypeus with the anterior border slightly produced and obtusely tridentate in the middle (Fig. 6, C), mandibles with the short and dull teeth (do., D). The 3rd joints of antennae short, only 2.3 times (in the lateral view only twice) as long as broad at the apex, relative length of the joints:— 35 : 13 : 15 : 11 : 11 : 11 : 11 : 11 : 10 : 10 : 16 (Ex. No. 1). Pronotum comparatively well developed, with transverse subsacuate carina across the middle. Posterior limb of area cordata slightly incrassate, not sharply outlined on both edges. Petiole (Fig. 6, E) short, rather robust, 2.0-2.5 times as long as broad at the apex, nearly two-thirds as long as hind femur and not reaching the apex of hind trochanter stretched backward, seen in the lateral view, somewhat strongly curved upwards, its dorsal surface flattened and bordered on both sides by well-defined edges, with or without the longitudinal groove on

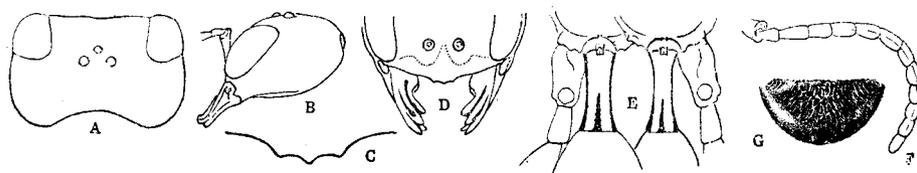


Fig. 6. *Pemphredon (Pempherdon) laeviceps* Gussakovskij (♀).

A, B....head, C....clypeus, D....clypeus and mandibles, E....petiole of abdomen and the basal portion of hind leg. F....antenna, G....area cordata.

the posterior portion in the middle. Pygidial area, at least the posterior portion, bordered well by the carinae, with the surface grooved, but its form is very variable as shown in Fig. 8. Head and thorax shining. Vertex very finely and very sparsely punctured and highly polished; frons finely but densely, partly subrugosely punctured, punctures rather sparse upward; clypeus somewhat closely punctured, but with distinct intervals between. Mesonotum anteriorly finely and closely subrugose-punctate, on the disc and posterior portion punctures very sparse, shallow and indistinctly outlined, with intervals longitudinally irregularly and remotely but rather feebly rugose. Mesopleura on the greater part longitudinally striate, with fine scattered punctures, below and mesosternum sparsely punctured. Area cordata (Fig. 6, G) coarsely radiately striate, in some examples subreticulate in the middle, with posterior limb without sculpture and highly polished, rest of the propodeum rather finely punctured-rugose, petiole of abdomen coarsely punctured-rugose. Length 10-11 mm.

♂. Pubescence on sternites 3-5 longer in the allied species and somewhat appressed. Head seen from above (Fig. 7, A) with eyes well developed and large, with the frontal margin slightly curved backward, with temples gently convergent posteriorly. Ocelli in a broad triangle,  $OOD : POD \approx 5 : 3-4$ ,  $OOD : OCD \approx 5 : 7$ . Head in front (Fig. 7, B) with eyes fairly strongly convergent below, the distance between eyes at the base of clypeus distinctly less than as long as eye (Table 7). Clypeus: Fig. 7, C; mandibles: do., D. Relative length of the antennal joints:— 28 : 10 : 14 : 11 : 11 : 11 : 10 : 10 : 10 : 10 : 9 : 9 : 14 (Ex. No. 12); joints 4-11 with a longitudinal feeble carina on the lateral margin, on joints 7-10 it is slightly roundly produced. Pronotum and petiole as in ♀. Mid legs with the metatarsi distinctly crooked and apically dilated, having a fringe of short pubescence on the inner margin of the

dilated portion (do., E); hind metatarsi slightly incrassate (do., F). Head and thorax highly polished, in general punctured as in ♀, but in some examples somewhat more closely so.

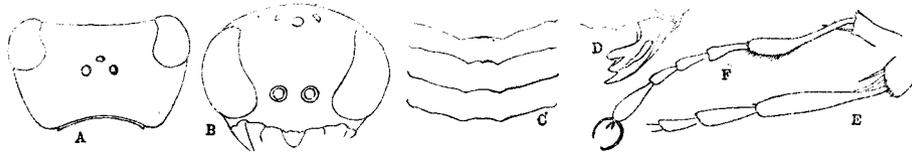


Fig. 7. *Pemphredon (Pemphredon) laeviceps* Guassakovskij (♂).

A, B... head, C... variation of the anterior border of clypeus, D... mandible, E... hind tarsi, F... mid tarsi.

Frons finely punctured-subreticulate. Mesonotum finely and very sparsely punctured, subrugose in part. Sculptures on propodeum as in ♀. Length 8-10 mm. Genitalia: Fig. 19, C. Squama very broad, rounded at the apex, with subcarinate fringe of translucent membrane in the middle of the outer margin, without hook-like process on the inner margin. Penis long, with the apex somewhat hook-shaped. Volcella small, attenuating apically, with somewhat curved inner border. Measurements of the examples are as follows:

Table 7. Measurements of *P. laeviceps*. (mm).  
(1-7..... ♀, 8-22..... ♂)

No.	BL	HW	HWE	EUD	ELD	EL	TW	EW	FL	PL	PW
1	10.5	2.55	2.45	1.45	1.30	1.38	1.10	0.60	1.63	1.15	0.45
2	10.7	2.60	2.45	1.45	1.30	1.38	1.10	0.60	1.73	1.10	0.50
3	10.5	2.50	2.40	1.42	1.25	1.28	1.10	0.60	1.70	1.03	0.50
4	11.0	2.58	2.45	1.50	1.33	1.40	1.10	0.58	1.70	1.13	0.48
5	10.0	2.55	2.40	1.45	1.25	1.35	1.08	0.58	1.55	1.10	0.45
6	10.0	2.53	2.45	1.48	1.30	1.40	1.00	0.60	1.60	1.05	0.45
7	10.3	2.48	2.40	1.50	1.25	1.35	1.08	0.60	1.60	1.05	0.43
8	9.5		2.30	1.30	0.90	1.27	0.75	0.70	1.60	1.10	0.43
9	9.3		2.30	1.30	0.93	1.25	0.75	0.70	1.60	1.00	0.40
10	9.2		2.35	1.30	1.00	1.35	0.75	0.65	1.65	1.00	0.45
11	9.0		2.17	1.20	0.90	1.25	0.73	0.70	1.55	0.95	0.35
12	9.5		2.35	1.45	1.00	1.30	0.85	0.65	1.60	0.90	0.45
13	10.3		2.45	1.43	1.00	1.30	0.85	0.78	1.65	0.98	0.45
14	8.8		2.20	1.25	0.95	1.19	0.73	0.60	1.50	0.85	0.35
15	10.5		2.55	1.50	1.10	1.30	0.85	0.70	1.65	1.00	0.55
16	8.5		2.25	1.25	0.95	1.20	0.75	0.70	1.50	0.85	0.35
17	8.7		2.25	1.30	0.90	1.20	0.75	0.73	1.55	0.85	0.40
18	10.7		2.40	1.40	1.05	1.33	0.80	0.75	1.65	1.00	0.45
19	8.4		2.15	1.25	0.90	1.15	0.75	0.60	1.40	0.80	0.30
20	8.6		2.05	1.23	0.95	1.15	0.65	0.65	1.40	0.90	0.35
21	10.0		2.30	1.35	0.95	1.25	0.75	0.65	1.60	0.90	0.38
22	9.0		2.30	1.35	0.98	1.18	0.80	0.65	1.55	1.00	0.40

*Habitat*: The Ussuri region and Hokkaido.

*Specimens examined*: 7 ♀♀ 15 ♂♂, Hokkaido (Sapporo and Teshio).

*Remarks*. When V. Gussakovskij first described this species basing upon a single specimen from the Ussuri region he gave the following remarks: "Inter

speciebus palaeartcticis solummodo *P. podagricus* Chevr. affinis, sed area pygidiali angusta differt". But so far as 7 female examples from Hokkaido which was referred to *laeviceps* were examined, it was made clear that the form of the pygidial area of this species is very variable, sometimes broader and sometimes narrower than the base of hind metatarsi (Fig. 8). So I can not agree with Gussekovskij for separating *laeviceps* from *podagricus*. Moreover, according to Schmiedeknecht, *podagricus* seems to be similar in the antennal character to *laeviceps*. Besides, the male of this

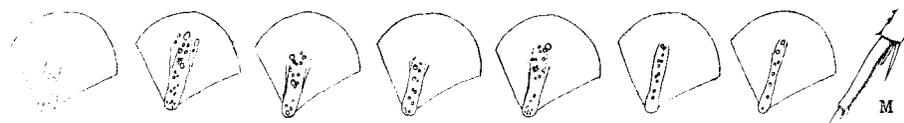


Fig. 8. Variation of the form of pygidial area in *P. laeviceps* Gussak.  
M. . . . hind metatarsi.

species unknown to the original author agrees very well in characters with *podagricus*. All these reasons seem to indicate that *laeviceps* is a synonymy of *podagricus* Chevr. (= *luctuosus* Shuck.). On the other hand, the form of the clypeus of *podagricus*, according to Berland, Hedicke and Schmiedeknecht, seems to be different from that of *laeviceps*, although not reliable on the descriptions of these authors (*vide* Remarks on the form of the clypeus of *montanus* Dahlbom). So that I have provisionally adopted the name *laeviceps*.

This species is very characteristic of possessing the exceptional length-relation of the antennal joints among the members of *Pemphredon* s. str., namely the 3rd joint is nearly twice as long as broad at the apex. According to Harttig, the species belonging to *Pemphredon* s. str. bear comparatively long antennae and the 3rd joint is nearly thrice as long as broad at the apex, while members of *Dineurus* possess comparatively short antennae and the 3rd joint is nearly twice as long as broad. Since it has been known that the difference of the venation which was long considered as a good distinguishing key between the two subgenera can not be always utilized, this character of antennae has become the sole definite feature for them. But the present species is exceptional in the genus. The similar instances are also found in another species (*koreanus* and *mandibularis*) which will be described later on.

#### 4. *Pemphredon (Pemphredon) pacificus* Gussakovskij, 1933.

*Pemphredon (Pemphredon) pacificus* Gussakovskij, Ark. Zool., Bd. 24A, No. 10, p. 8, 1933.

♀. Normally pubescent and pilose. Head seen from above (Fig. 9, H) with temples developed, but less so than in *laeviceps*. OOD : POD = 2 : 1 ~ 5 : 3, OOD : OCD = 1 : 2 (Table 8) ; PLE runs just on or slightly behind PLO. Head seen in front with the distance between eyes at the base of clypeus nearly as long as eye. Clypeus slightly produced, with the lateral

margins gently sinuately convergent anteriorly, with the apical margin rather broadly truncate (Fig. 9, M.); mandibular teeth very obtuse (do.). Antennae with the 3rd joint slightly more than thrice as long as broad at the apex (in the lateral view just thrice as long as broad), with the 6 joint nearly twice as long as broad; relative length of the joints 1-12:—38:11:21:16:15:15:14:13:13:12:11:14 (Ex. No. 1). Pronotum not well developed, with only a low transverse ridge, and its lateral angles rounded. Posterior limb of area cordata on propodeum rather gently incrassate. Petiole of abdomen comparatively long, always longer than hind coxa and trochanter united and 2.6-3.7 times as long as broad at the apex (Table 2), with or without the median longitudinal groove. Pygidial area comparatively

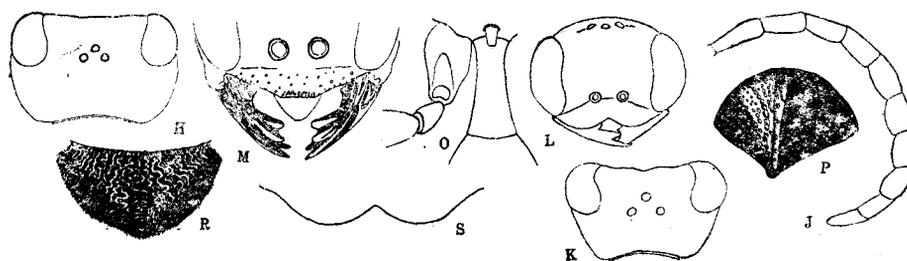


Fig. 9. *Pemphredon (Pemphredon) pacificus* Gussakovskij.

H...head (♀), K, L...do. (♂), M...clypeus and mandibles (♀), J...antenna (♂), O...petiole and hind coxa and trochanter, P...pygidial area (♀), R...sculpture on area cordata, S...anterior margin of clypeus (♂).

narrow (Fig. 9, P), in most examples slightly narrower than the base of hind metatarsi, but in some nearly as broad as or even broader than the compared portion. Vertex subopaque, moderately and rather closely punctured and partly subrugose, temples more sparsely punctured, frons longitudinally finely and closely punctured-striate. Mesonotum anteriorly transversely, posteriorly longitudinally striate, with indistinct punctures scattered between, its general aspect very similar to that of *japonicus*, but the scale is finer and more delicate. Mesosternum with transverse striae. Area cordata coarsely radiately and remarkably rugosely striate (Fig. 9, R), but occasionally very finely and closely so, or, on the contrary, very sparsely and less rugosely striate. Posterior limb radiately finely and closely striate, remainder of propodeum rather finely rugoso-subreticulate. Length 8.0-10.7 mm.

♂. Very closely resembles *japonicus* ♂, differing only in the shorter petiole, in the form of clypeus and in the smaller body. Measurements of the antennal joints (Ex. No. 1):—22:6:14:13:12:12:11:11:10:10:9:8:11. Length 5.7-6.0 mm. Genitalia, very similar to that of *japonicus*, only the squamae seem to be slightly shorter and more acutely pointed at the apex.

*Habitat*: The Ussuri region, Korea, Hokkaido, Saghalien and the Kurile Islands.

*Specimens examined*: 30 ♀♀ 2 ♂♂, Hokkaido (Sapporo, Jōzankei, Atsubetsu and Tokachi); 1 ♀, the Kurile Islands (Etorof); 2 ♀♀, Saghalien; 3 ♀♀, Korea (Hakutozan).

*Remarks.* In his original description, Gussakovskij noted that *pacificus* differs from *lugubris* Latr. in the closer punctuation on the thorax and propodeum and in the shorter petiolé. But the characters being very variable, it is quite doubtful whether such differences merit to a good species or not. Probably *pacificus* is a synonym or at best a subspecies of *lugubris* Latr.

### 5. *Pemphredon (Pemphredon) montanus* Dahlbom, 1845

- Pemphredon montanus* Dahlbom, Hymen. Europ., I, p. 262 et 508, 1845.  
*Pemphredon montanus* Smith, Cat. Hymen. Brit. Mus., IV, p. 428, 1856.  
*Cemonus (Pemphredon) montanus* A. Morawitz, Bull. acad. sc. St. Pétersb., VII, p. 460, 1864.  
*Pemphredon montanus* Thomson, Opusc. entom., II, p. 235, 1870; Hymen. Scandin., III, p. 191, 1874.  
*Pemphredon montanus* A. Costa, Ann. mus. zool. Napoli, VI, p. 38, 1871.  
*Pemphredon montanus* Ed. André, Spec. Hymen. Europ., III, p. 197, 1888.  
*Pemphredon (Cemonus) montanus* Kohl, Ann. nat. Hofmus. Wien, V, p. 54, 1890.  
*Pemphredon montanus* Fox, Trans. Amer. Entom. Soc., XIX, p. 314, 1892.  
*Pemphredon montanus* Dalla Torre, Cat. Hymen. etc., VIII, p. 385, 1897.  
*Pemphredon (s. str.) montanus* Schmiedeknecht, Hymen. M. Europ., p. 207 et 208, 1907; Hymen. N. M. Europ., p. 668 et 669, 1930.  
*Pemphredon (Pemphredon) montanus* Birula, Rev. Russ. d'Entom., XII, 3, p. 537, 1912; ibid., XVI, 4, p. 380, 1914.  
*Pemphredon (Pemphredon) montanus* Berland, Faune de France, X, 10, p. 141, 1925.  
*Pemphredon (Pemphredon) montanus* Hedicke, Tierw. M.-Europ., V, 1, Ins. 2, p. 134, 1930.  
*Pemphredon (Pemphredon) montanus* Gussakovskij, Mushi, VII, 2, p. 83, 1934.  
*Pemphredon montanus* Merisuo, Ann. Entom. Fenn., II, 3, p. 123, fig. 4, 1936.

♀. Head seen from above: Fig. 10, H; ocelli in an isosceles triangle, much widest at the base, OOD:POD:OCD=2:1:4, PLE falls just upon PLO. Frontal median longitudinal carina in some examples well-defined, but in others rather obsolete. Head seen in front, with the distance between eyes at the base of clypeus subequal to the length of eye: clypeus with the anterior margin produced in a broad triangle with the apex sharply pointed

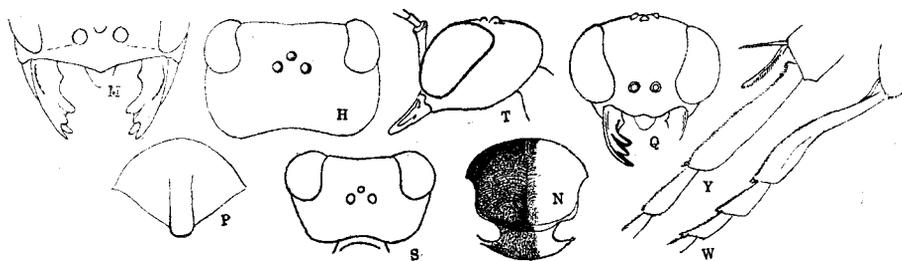


Fig. 10. *Pemphredon (Pemphredon) montanus* Dahlbom.

H....head (♀); Q, S, T....do. (♂), M....clypeus and mandibles (♀), N.... mesonotum (♀), P....pygidial area (♀), Y....hind tarsi, W....mid tarsi.

and slightly reflected (Fig. 10, M). Antennae with the 3rd joint thrice as long as broad at the apex, with the 6th joints twice as long as broad, relative length of the joints 1-12:— 37 : 12 : 21 : 16 : 16 : 15 : 14 : 13 : 13 : 12 : 11 : 15. Mandibular teeth obtuse at apex, especially so the innermost one (do.). Pronotum comparatively developed, with the lateral angles rounded, the transverse groove at the posterior margin broader than in *pacificus*; area cordata on propodeum with the posterior limb gently and roundly elevated. Petiole of abdomen nearly as long as hind coxa and trochanter taken together. Its relative length to other parts of body: Table 2. Pygidial area (Fig. 10, P) very broad, always broader than the base of hind metatarsus, with, in most examples, lateral carinae indistinct and the surface flattened. Vertex rather finely and moderately sparsely punctured, punctures laterally finer and close, on temples somewhat large and sparse. Frons longitudinally finely and closely punctured-striate, more delicately so than in *pacificus* or in *japonicus*. Mesonotum anteriorly transversely, posteriorly longitudinally striate (do., N), with less strong punctures scattered between the striae. In general, the sculptures on this area is feebler than in the two species mentioned above. Mesosternum without distinct striae. Area cordata coarsely, radiately rugoso-striate, the striae posteriorly finer and increasing in number, on the limb very close and very fine, closer and finer than in *pacificus*. Length 9.5-12.0 mm.

♂. Pubescence as usual. Abdominal sternites 3-6 with yellowish somewhat long appressed pubescence at the base, but often worn out and absent. Head from above with the sides behind eyes rather remarkably convergent backwards (Fig. 10, S); ocelli in an isosceles triangle, PLE passes across the middle of postocelli, OOD:POD; OCD÷2:1:3. Frons just anterior to median ocellus sometimes slightly depressed. Head in profile: Fig. 10, T, with temple nearly as wide as eye, in the larger examples, however, slightly broader than eye (Table 8). Head in front (do., Q) with inner orbits of eyes remarkably convergent below, with the distance between eyes at clypeus distinctly less than as long as eye (Table 8). Clypeus and mandible: Fig. 10, Q. Relative length of antennal joints:— 32 : 12 : 21 : 16 : 15 : 15 : 14 : 13 : 13 : 12 : 12 : 11 : 14; joints 4-11 with a slight carina on the lateral margin which is somewhat roundly produced on 8-11. Pronotum comparatively more developed than in ♀, with a deeper transverse furrow on the posterior margin. Area cordata with the posterior limb slightly incrassate. Petiole nearly as long as hind coxa and trochanter united, 2.5-3.0 times as long as broad at the apex. Mid metatarsi slightly sinuately bending, with the slightly dilated apical half (Fig. 10, W), without the special pubescence on the inner margin. Vertex rather sparsely and moderately largely punctured, oculocellar space impunctate but with feeble striae, temples above more finely and closely, below more sparsely punctured. Frons longitudinally finely and closely punctured or punctured-striate. Pronotum transversely feebly striate, the striae on propleura very distinct, mesonotum finely and closely punctured, punctures anteriorly and laterally finer and closer, greater part of mesopleura

Table 8. Measurements of *P. montanus* ♂ (mm).

No.	BL	DEU	DEL	EL	TW	EW	OOD:POD;OCD	FL	PL	PW	PL:PW	PL:FL
1	10.2	2.05	1.20	1.38	0.85	0.75	10 : 5 : 15	1.65	1.25	0.45	2.8	0.76
2	10.0	2.03	1.15	1.38	0.85	0.80	10 : 6 : 16	1.60	1.25	0.42	3.0	0.76
3	10.0	2.05	1.13	1.40	0.85	0.77	10 : 5 : 15	1.65	1.25	0.50	2.5	0.76
4	8.5	1.35	1.00	1.20	0.65	0.70	9 : 5 : 12	1.50	1.05	0.36	2.9	0.70
5	10.0	1.45	1.10	1.33	0.77	0.80	10 : 5 : 13	1.75	1.18	0.45	2.6	0.67
6	9.0	1.40	1.00	1.30	0.68	0.75	9 : 5 : 12	1.65	1.00	0.40	2.5	0.63
7	9.0	1.40	1.00	1.25	0.72	0.75	10 : 5 : 12	1.62	1.10	0.35	3.0	0.68

punctured-striate. Area cordata longitudinally, rather finely and closely striate, the striae on the basal portion coarse and on the limb very fine and very close, rest of the segment closely rugose-subreticulate. Petiole irregularly and rather shallowly punctured. Length 8.5-10.2 mm. Genitalia : Fig. 19, E. Squamae broadly elongate, with the apex rounded, with a small and slight emargination on the inner margin in the middle, inner apical area rather broadly scarious, outer margin provided with a longitudinally standing scarious edge in the middle. Volcella sublunate rounded at the apex. Penis with a translucent membranous crown at the apex.

*Habitat* : Europe, North America (British Columbia), the Amur and the Ussuri regions, Sagahalien, Kamtchatka, Korea and Hokkaido.

*Specimens examined* : 24 ♀♀ 7 ♂♂, Hokkaido (22 ♀♀ 5 ♂♂ Jôzankei, 1 ♀ Garugawa, 1 ♀ 2 ♂♂ Sounkyô) ; 5 ♀♀, Korea (Nansetsurei) ; 6 ♀♀, Saghalien (3 ♀♀ Ichinosawa, 2 ♀♀ Kiminai, 1 ♀ Motodomari).

*Remarks*. Descriptions given by previous authors, André (1886), Schmiedeknecht (1930), Berland (1925) and Hedicke (1930), regarding the clypeal form of this species are all incorrect. A. Merisuo (1936) recorded the feature of the portion correctly.

### 6. *Pemphredon* (*Pemphredon*) *koreanus* sp. nov.

♀. Normally pubescent and pilose. Stigma and veins of wings dark brown. Head large, relatively wider than in *laeviceps* to which this species is very similar (the ratio of width to length is in this species nearly 30 : 17, while in *laeviceps* 25 : 17), temples well developed ; seen from above, swollen out laterally beyond the eyes (Fig. 11) ; ocelli in an isosceles triangle, OOD : POD : OCD = 2 : 1 : 4 ; PLE runs distinctly posterior to PLO. Head seen in front (Fig. 11, G) with the distance between the inner margins of eyes at the base of clypeus distinctly less than as long as eye (nearly 7 : 8 . . Table 9), clypeus with the surface flattened and without the distinct hollow just in front of the sockets of antennae, its anterior border slightly produced and somewhat raised in the middle, with the apical border obtusely tridentate (Fig. 11, K), with the distance between the lateral teeth nearly as long as the lateral margin (in *laeviceps* less than as long as the lateral margin). Antennae short and comparatively thick, the 3rd joint 2.5 times (in the lateral view only 2.2 times), the 4th 1.5 times as long as broad

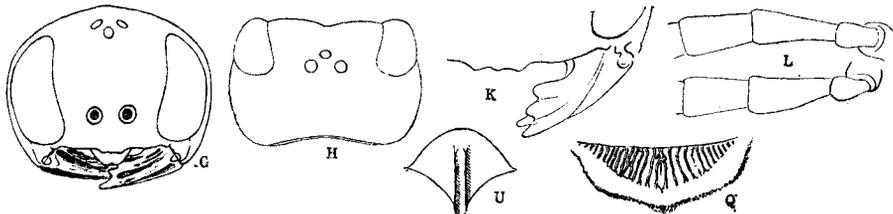


Fig. 11. *Pemphredon* (*Pemphredon*) *koreanus* sp. nov. (♀).

H, G...head, K...clypeus and mandibel, Q...area cordate, U...pygidial area, L...basal 4 joints of antenna. (lower cut...lateral view)

at the apex (do., L); relative length of the joints:— 41 : 12 : 20 : 16 : 15 : 14 : 13 : 13 : 12 : 12 : 12 : 16 (Ex. No. 2). Pronotum less developed, but with the antero-lateral angles obtusely pointed. Area cordata on propodeum (do., Q) broad and short, distinctly shorter than the posterior slope of the segment, with the limb broadly incrassate, but not sharply outlined on the outer margin. Petiole of abdomen comparatively short slightly shorter than the hind coxa and trochanter taken together. Pygidial area (do., U) narrow, nearly as wide as or slightly narrower than the base of hind metatarsi, with the surface deeply grooved and distinctly carinated on the lateral margins. Vertex sparsely but comparatively largely and strongly punctured, with intervals highly polished; frons very closely and finely punctured-subreticulate, on the upper portion longitudinally punctured-striate. Funtures on clypeus sparse and deep, but irregular in size. Mesonotum closely and rather coarsely punctured-subreticulate, in part subrugose, the punctures anteriorly somewhat fine and closer; scutellum strongly, closely and longitudinally subrugoso-punctate, mesopleura more finely and closely punctured, with posterior portions longitudinally closely striate, mesosternum distinctly and rather sparsely punctured. Area cordata on propodeum coarsely radiately striate, with posterior limb smooth and highly polished, remainder of the segment strongly and closely punctured, partly subrugose. Abdominal sternites with sparse punctures, posterior portion of each segment impunctate. Length 11.0-12.5 mm. ♂. Unknown. Measurements:

Table 9. Measurements of *P. koreanus* (mm).

No.	BL	HW	HL	DEU	DEL	EL	TW	EW	FL	PL	PW
1	12.5	3.1	1.7	1.70	1.45	1.70	1.20	0.75	1.80	1.50	0.50
2	11.3	2.9	1.6	1.60	1.40	1.63	1.15	0.70	1.65	1.38	0.48
3	11.0	2.9	1.6	1.65	1.43	1.60	1.20	0.70	1.65	1.50	0.48
4	12.0	2.9	1.7	1.65	1.45	1.68	1.20	0.72	1.75	1.40	0.48

*Holotype*: ♀, Korea (Shôyôzan), 30. V. 1943, K. Tsuneki leg.

*Paratypes*: 1 ♀, 13. VII. 1941, 1 ♀, 15. VI. 1941, Korea (Shôyôzan), 1 ♀, 7. VI. 1943, Korea (Keijô).

*Habitat*: Korea.

*Comparative notes*. This species is closely allied to *Pemphredon* (s. str.) *laeviceps* Gussakovskij, but can easily be distinguished from the latter by the form of head, of clypeus and by the general punctuation on head and thorax.

### 7. *Pemphredon* (*Pemphredon*) *mandibularis* sp. nov.

♀. Relatively small and normally pubescent and pilose. Entirely black. Head from above with temples not so developed as in other members of the subgenus, slightly and roundly convergent posteriorly (Fig. 12, A). Ocelli in a flattened isosceles triangle, OOD : POD  $\div$  2 : 1, OOD : OCD  $\div$  3 : 5, PLE runs slightly posterior to PLO. Head in front with the distance between eyes at the base of clypeus nearly as long as eye (Table 10). Clypeus (Fig. 12, B) similar in form to that of subgenus *Ceratophorus*, namely the anterior border broadly and semicircularly emarginated in the middle, bearing in the middle of the emargination a small triangular tooth produced which is raised apically and well defined seen obliquely from above (do., C). Labrum pitchy black, shining, comparatively thick, with a distinct, posteriorly

divergent rather deep median groove — a feature that is characteristic of the subgenus *Ceratophorus*. Mandibles (do., B) very robust, the innermost tooth especially broadened and rounded at the apex. Antennae (do., J) comparatively short, with the 3rd joint 2.5 times as long as broad at the apex, relative length of the joints:— 34 : 12 : 15 : 12 : 12 : 11 : 11 : 11 : 11 : 10 : 10 : 12. (Ex. No. 1). Frons without any tubercle or spine between the antennae. Pronotum developed, without transverse carina across the middle. Area cordata on propodeum (do., D) also very much alike in structure to that of *Ceratophorus*, namely the posterior limb distinctly elevated and sharply outlined on both edges, with the surface highly polished.

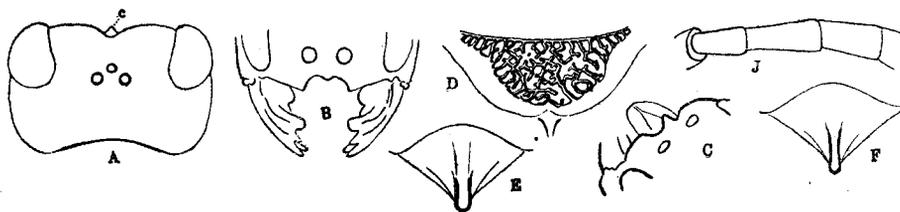


Fig. 12. *Pemphredon (Pemphredon) mandibularis* sp. nov. (♀).

A...head (c...medial protuberance of clypeus), B...clypeus and mandibles seen in front, C...clypeus and labrum seen obliquely from above, D...area cordata; E, F...pygidial area, J...the 2nd, 3rd and 4th joints of antenna.

Petiole of abdomen short, relative length to width at the apex varies from 1.7-2.2 (Table 10), but always distinctly longer than the hind coxa. Pygidial area variable in form (Fig. 12, E and F), slightly wider than or as wide as the base of hind metatarsi. Hind tibiae, in most examples, provided with **only** 3 distinct spines on the outer margin. Vertex moderately sparsely, moderately largely and rather strongly punctured, frons more finely and closely punctured, with the intervals finely, longitudinally somewhat arcuately striate (in one exceptional example — No. 6 — the punctures on frons are very feeble and the striae indistinct). Mesonotum somewhat coarsely punctured-subreticulate, with the intervals microscopically sculptured and opaque (in Ex. No. 6, this delicate sculpture is absent). Area cordata on propodeum very coarsely and longitudinally rugoso-striate, in some examples irregularly subreticulate (Fig. 12, D), posterior limb highly polished, rest of the segment moderately largely and strongly punctured-rugose. Petiole of abdomen rather coarsely punctured-subreticulate, apical segment strongly irregularly punctured. Length 7.0-9.0 mm. ♂. Unknown. Measurement of the examples:

Table 10. Measurements of *P. mandibularis* (mm).

No.	BL	HW	HL	DEU	DEL	BL	FrL	TW	EW	FL	PL	PW
1	8.3	2.40	1.38	1.48	1.25	1.23	1.25	0.80	0.55	1.45	0.80	0.40
2	8.1	2.35	1.35	1.48	1.25	1.23	1.30	0.80	0.55	1.45	0.80	0.40
3	8.2	2.40	1.35	1.45	1.30	1.30	1.25	0.80	0.60	1.45	0.83	0.38
4	9.0	2.40	1.35	1.48	1.28	1.25	1.30	0.85	0.60	1.45	0.75	0.43
5	8.5	2.40	1.33	1.45	1.33	1.33	1.30	0.80	0.60	1.50	0.85	0.38
6	7.0	2.15	1.20	1.25	1.15	1.15	1.20	0.73	0.50	1.35	0.60	0.35

*Holotype*: ♀, Hokkaido (Sapporo), 1. VII. 1947, K. Tsuneki leg.

*Paratypes*: 5 ♀♀, Hokkaido (Sapporo), 10. X. 1946, 14. VI; 18. VI, 20. IX. 1947.

*Habitat*: Japan (Hokkaido)

*Comparative notes*. This species is quite distinct from all the other species of the subgenus, especially in the form of the clypeus, of the head seen from above, of the mandibular teeth, in the relative length of the petiole and in the sculpture of the area cordata.

*Remarks*. It seems to me of interest that this species possesses intermediate characters between the subgenera *Ceratophorus* and *Pemphredon*

### Subgenus *Ceratophorus* Shuckard, 1837

*Ceratophorus* Shuckard, Essay indig. Fossor. Hymen., p. 198, 1837.

Subgeneric characters:-- Fore wings with the 1st and 2nd recurrent nervures received by the 1st and 2nd cubital cells respectively\*. Head seen from above with the sides behind eyes roundly and considerably strongly convergent posteriorly in both sexes. Frons on each side, between antennae and eye somewhat angularly raised and excavated between the projections; in the middle of the excavation, just above the insertion of antennae is a short blunt spine or tubercle. Clypeus with the anterior border broadly and semicircularly or subsquarely incised in the middle, without dense appressed silvery hairs on the surface in both sexes. Mandibles bidentate in ♀, tridentate in ♂. Antennae short, rather incrassate, with the 2nd, 3rd and 4th joints nearly equal in length with one another, 1.7-2.2 times as long as broad at the apex, without the keel on the flagella even in ♂. Area cordata on propodeum with the posterior limb distinctly elevated and sharply bordered on both edges, with the surface highly polished. Petiole of abdomen very short, less than as long as hind coxa; seen in the lateral view only slightly longer than high. Hind tibiae without spine.

### 8. *Pemphredon (Ceratophorus) intermedius* sp. nov.

♀. Pubescence not abundant, normally long. Black, highly polished. Head seen from above: Fig. 13, A. Head seen in profile with upper frons well developed, with frontal angle (formed between vertex and frons) nearly 90°. Ocelli in a flattened isosceles triangle, OOD : POD = 2 : 1, OCD slightly longer than OOD, PLE lies across the middle of postocelli, frontal longitudinal groove in some examples well-defined, but in others obsolete. Frontal process variable in both length and form, in the extreme case it turns into nothing but a slight tubercle (Fig. 13, B). Inner orbits of eyes slightly convergent below, the distance between eyes at the base of clypeus distinctly more than as long as eye (ratio nearly 11 : 9). Clypeus deeply and semicircularly or subsquarely notched in the middle (do., C and D),

\* Wagner (1931) says "Geäder wie bei *Dineurus*", but it is incorrect.

the distance between the sides of the incision nearly as long as the lateral margin. Labrum somewhat incrassate and thick, pitchy black, with the distinct median longitudinal furrow which is gradually broadened backwards. Antennae short and comparatively thick, with the 3rd joint twice (in the lateral view only 1.7 times) as long as broad at the apex, relative length of the antennal joints:— 22 : 10 : 10 : 9 : 8 : 8 : 8 : 8 : 8 : 8 : 7 : 10. Prothorax less developed, mesothorax very well developed and large, slightly broader than head, mesonotum broader than long and very convex, with a feeble longitudinal furrow anteriorly in the middle, area cordata normal. Petiole of abdomen very short, nearly as long as or only slightly longer than broad; in most examples it reaches somewhat beyond the apex of hind coxa stretched backwards, but in some, hardly so. Pygidial area broad, always broader than the base of hind metatarsi, with the surface flattened, apical portion somewhat hollowed and distinctly bordered by the carinae. Hind tibiae without spine on the outer margin. In fore wings the 2nd recurrent nervure received rarely just at the junction of the transverse cubital nervure.

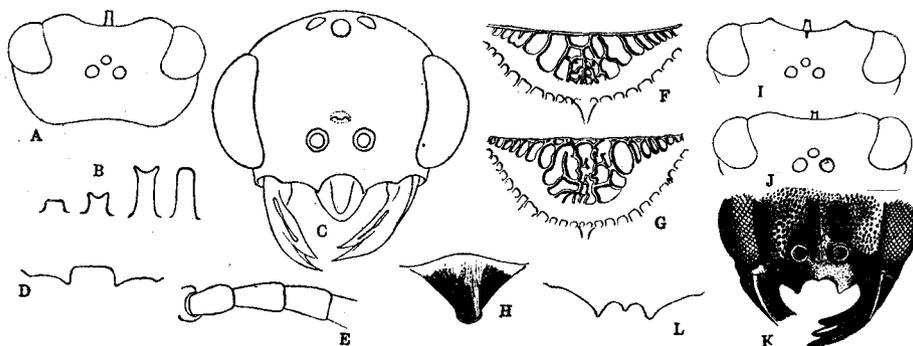


Fig. 13. *Pemphredon (Ceratophorus) intermedius* sp. nov.

A, C... head (♀), B... variation of the frontal process between the antennae, D... variation of the form of the emargination on the anterior margin of clypeus, E... basal portion of antenna; F, G... area cordata, H... pygidial area (♀); K... clypeus and mandible (♂), L... variation of the form of the clypeus (♂); I, J... variation of the anterior margin of head seen from above.

Vertex sparsely, finely and feebly punctured, in part subrugose, frons more closely punctured, in some examples subrugose or rugose or punctured-striate. Mesonotum anteriorly finely and closely, posteriorly very sparsely punctured; scutellum smooth and polished, sometimes with rather large and close punctures on the posterior margin. Mesopleura simply or rugosely reticulate, below sparsely punctured. Area cordata on propodeum with very coarse irregular network in the middle (Fig. 13, F and G), with the posterior limb smooth and highly polished, remainder of the segment coarsely rugoso-reticulate, Petiole rugosely punctured, remaining segments slightly punctate posteriorly, sternites with sparse punctures, apical segment very finely and closely punctured. Length 5.5-7.5 mm.

♂. Similar to ♀. Head from above slightly less thick than in ♀, OOD subequal to, or slightly longer than OCD. Clypeus with a feeble projection in the middle of the median incision, sometimes it becomes very indistinct, but sometimes strongly developed. Abdomi-

nal sternites 2-4 sometimes also 5, with dense erect hairs across the middle. Legs normal, genitalia as shown in Fig. 19, F. Wing venation as in ♀. Length 3.8-6.0.

Table 11. Head width of *Ceratophorus intermedius* (mm).

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
♀				1	6	8	4	1	1	
♂	1	5	5	19	29	17	2	—	1	

Length of the body is nearly 4 times as long as the width of the head.

*Holotype*: ♀, Japan (Sapporo), 13. VII. 1947. K. Tsuneki leg.

*Allotype*: ♀, Japan (Sapporo), 7. VII. 1947. K. Tsuneki leg.

*Paratypes*: 18 ♀♀ 77 ♂♂, Japan, Hokkaido (Sapporo, Chitose, Tokachi), 1 ♀, 1 ♂, Korea (1 ♀, Keijō, 1 ♂ Nansetsurei).

*Habitat*: Japan (Hokkaido) and Korea.

*Remarks*. Two species of *Ceratophorus* have hitherto been known from Europe, namely *clypealis* Thomson (1870) and *carinatus* Thomson (1870). According to some authors they are synonymized to each other and referred to *morio* v. d. Linden (1829). But judging from the Thomson's original descriptions they are believed to be a good independent species respectively. The species described here as new differs from both of them, showing somewhat intermediate characters between them. The differences among them will be tabulated below.

Table 12. Comparison of the characters among *clypealis*, *carinatus* and *intermedius*.

Characters		Species		
		<i>clypealis</i>	<i>carinatus</i>	<i>intermedius</i>
♀	punctures on apical abdominal sternite	fine	strong	fine
	sides of pygidial area	hardly carinate	finely carinate	finely carinate
	incision of clypeus	with a median small tooth	without a median tooth	without a median tooth
	abdominal sternites	less pilose	pilose	sparsely pilose
	length of body	smaller	not small	5.5—7.5 mm.
♂	abdominal sternites 2—4	with erect hairs across the middle	without erect hairs	with erect hairs across the middle
	incision of clypeus	?	?	with a small tooth in the middle

Variation of wing venation: In fore wing, the 2nd recurrent nervure is received in 4 ♀♀ 11 ♂♂ out of 19 ♀♀ 78 ♂♂ just at the base of the 1st transverse

cubital nervure, in 2 ♂♂ even slightly beyond that point and is received by the 1st cubital cell. Furthermore, the 1st transverse cubital nervure is in 1 ♂ entirely, in 2 ♂♂ partly extinct. Similar extinction occurs in 1 ♂ on the 2nd recurrent nervure in part.

### Subgenus *Dineurus* Westwood, 1837

*Dineurus* Westwood, Ann. Mag. Nat. Hist. n. s., Vol. I, p.137, 1837.

Subgeneric characters :-- Very similar in general feature to *Pemphredon* s. str., but with the smaller body, the shorter antennae and the different wing venation. The 3rd joint of antennae 2-2.5 times, the 6th nearly 1.5 times as long as broad at the apex. In fore wings both the 1st and the 2nd recurrent nervures received by the 1st cubital cell, only rarely the 2nd received interstitially. — The sexual characters as in *Pemphredon* s. str.

### Key to species.

♀ ♀

1. Hind tibiae without noteworthy spines on the outer surface. Anterior border of clypeus slightly produced and broadly truncate in the middle, rarely very feebly emarginate ..... *lethifer* Shuckard
- Hind tibiae with about 5 strong spines on the outer surface. Clypeus of another conformation. .... 2
2. Clypeus with the anterior border narrowly but deeply and roundly notched in the middle, petiole of abdomen nearly 3 times as long as broad at the apex and usually surpassing the apex of hind trochanter stretched backwards. Mesonotum fairly strongly punctured. Pygidial area comparatively narrow, with a median short keel at the apex. Rather large species, 8.5-10 mm. .... *unicolor* Panzer (nec Fabr.).
- Clypeus otherwise conformed. Petiole of abdomen 2-2.5 times as long as broad at the apex, not surpassing the apex of hind trochanter. Pygidial area without a median short keel at the apex. Small species, 6-7 mm. .... 3
3. Clypeus remarkably produced anteriorly and raised in the middle, with the apex bluntly tridentate, the median tooth much larger, more raised and more produced than the others, with the apex subacute. Punctures on mesonotum rather fine or medium-sized, and generally sparse. Pygidial area broad, broader than the base of hind metatarsi. .... *Shuckardi* (A. Morawitz).
- Clypeus with the anterior border broadly and arcuately emarginated, bearing a small up-raised tooth in the middle of the emargination; mesonotum extraordinarily coarsely and strongly punctured or punctured-rugose; pygidial area narrow, nearly as wide as the base of hind metatarsi. .... *deirvillae* Iwata.

♂ ♂

1. Abdominal sternites 2-5 with a transverse impression in front of the posterior margin, so as to form, in some aspect, a slight and often arcuate ridge, also with a ring of erect

- hairs across the middle. .... 2
- Abdominal sternites without an impression before the posterior margin, also without a ring of erect hairs across the middle. .... 3
2. Petiole of abdomen very long, more than 3 times as long as broad at the apex, in the lateral view gradually narrowing towards the base. Metatarsi of mid legs slightly bending; posterior limb of area cordata narrow, not distinctly bordered on both edges, the surface rugose, only rarely partly smooth. Flagellar joints of antennae with the lateral carina less remarkably produced. .... *unicolor* Panzer (nec. Fabr.).
- Petiole of abdomen not so lengthened, 2-2.5 times as long as broad at the apex, in the lateral view, quite suddenly narrowed towards the base; metatarsi of mid legs straight. Limb of area cordata on propodeum broad, well outlined on both edge, with the surface smooth and shining. .... *lethifer* Shuckard
3. Head and thorax finely, rather sparsely and very feebly punctured, only rarely the punctures moderately strong. .... *shuckardi* (A. Morawitz)
- Head and thorax very coarsely and strongly punctured or punctured-rugose. .... *diervillae* Iwata.

### 9. *Pemphredon* (*Dineurus*) *shuckardi* (A. Morawitz, 1864)

- Cemonus unicolor* Shuckard, Essay indig. Fossor. Hymen., p. 200, 1837.
- Cemonus Shuckardi* A. Morawitz, Bull. acad. sc. St. Petersb., VII, p. 460, 1864.
- Pemphredon* (*Cemonus*) *unicolor* Thomson, Opus. entom., II, p. 234, 1870.
- Pemphredon dentatus* Puton, Ann. Soc. entom. France, (5) J, p. 94, 1871.
- Cemonus dentatus* André, Spec. Hymen. Europ., III, P. 30, p. 195, 1888.
- Pemphredon* (*Diphlebus*), *Shuckardi* Kohl, Ann. naturh. Hofmus. Wien, V, p. 56, 1890.
- Pemphredon* (*Diphlebus*) *dentatus* Kohl, t. c., p. 52, 1890.
- Pemphredon* (*Cemonus*) *Shuckardi* E. Saunders, Hymen. Acul. Brit. Isl., p. III, p. 92, 1893.
- Pemphredon shuckardi* Dalla Torre, Cat. Hymen. etc., VIII, p. 360, 1897.
- Pemphredon* (*Diphlebus*) *shuckardi* Birula, Rev. Russ. Entom., XII, n. 3, p. 538, 1921; t. c., XVI, n. 4, p. 382, 1914.
- Pemphredon* (*Diphlebus*) *shuckardi* Wagner, Deuts. Entom. Zeits., p. 141 et 142, 1918.
- Pemphredon* (*Cemonus*) *Shuckardi* Berland, Faun. France, X, Hymen. Verspif., p. 139, 1925.
- Pemphredon* (*Diphlebus*) *shuckardi* Perkins, Entom. Mon. Mag., LXV, p. 54, 1929.
- Pemphredon* (*Diphlebus*) *Shuckardi* Schmiedeknecht, Hymen. N. M. Europ., p. 670, 1930.
- Pemphredon* (*Cemonus*) *shuckardi* Hedicke, Tierw. M. Europ., Bd. V, L. 1, Ins. 2, p. 133, 1930.
- Diphlebus Shuckardi* Harttig, Sttlet. entom. Zeit., 91, II, p. 229 et 230, 1931.
- Cemonus shuckardi* Harttig, Konowia, X, 2, p. 81, 1931.
- Pemphredon* (*Dineurus*) *shuckardi* Blüthgen, Konowia, X, 2, p. 124, 1931.
- Pemphredon* (*Dineurus*) *shuckardi* Wagner, Deuts. Entom. Zeitschr., p. 227, 1931.
- Pemphredon* (*Dineurus*) *shuckardi* Gussakovskij, Ark. Zool., 24 A, No. 10, p. 9, 1931.
- Pemphredon* (*Dineurus*) *shuckardi* Gussakovskij, Mushi, VII, 2, p. 88, 1934.

♀. Pubescence normal. Entirely black, palpi, too, black. Veins of wings dark- or orange-brown. Head seen from above with temples well developed (Fig. 14, A), OOD : POD = 5 : 3~2 : 1, OOD : OCD = 3 : 4~2 : 3, PLE runs across the middle of postocelli. Head seen in profile : Fig. 14, B. Clypeus (do., M and N) remarkably produced anteriorly and raised in the middle, with the apex bluntly tridentate, the medial tooth much larger,

more produced, more raised and subacute at the apex, the distance between the lateral teeth more than half as long as the lateral margin. The distance between eyes at the base of clypeus slightly less than as long as eye. Mandibles (do., M) with a large rounded condyle at the base on the anterior surface, with, besides the normal 4 teeth, 2 additional teeth, one of which located on the inner edge of the upper surface near the base, the other in the center of the inner surface. Antennae (do., C) comparatively short, with the 3rd joint slightly more than twice as long as broad at the apex, with the 6th 1.5 times as long as broad, relative length of the joints:— 26 : 10 : 12 : 9 : 9 : 9 : 9 : 9 : 8 : 8 : 11. Area cordata on propodeum with posterior limb broad, roundly incassate and distinctly bordered on both edges. Petiole of abdomen 2-2.5 times as long as broad at the apex, always not reaching the apex of hind trochanter stretched backwards. Pygidial area (do., D) rather broad, in most examples broader than the base of hind metatarsi, but in some, nearly as wide as that portion, with the surface slightly hollowed and distinctly bordered by the carinae on the posterior portion, without the longitudinal keel at the apex in the middle. Hind tibiae spinose. Vertex rather finely, very sparsely and feebly punctured, temples somewhat more

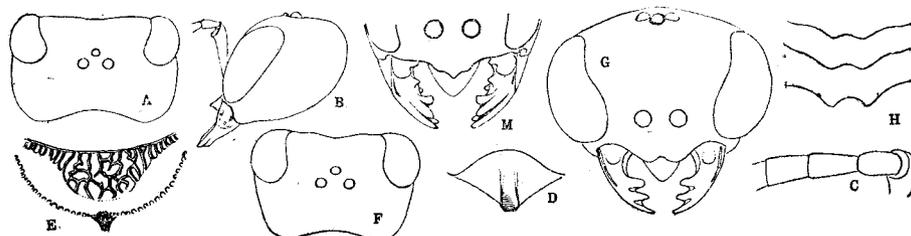


Fig. 14. *Pemphredon (Dineurus) shuckardi* A. Morawitz.

A, B...head (♀); F, G...do. (♂), M...clypeus and mandibles (♀), C... basal portion of antenna (♀), D...pygidial area (♀), E...area cordata (♀), H...variation of the form of clypeus (♂).

closely punctured, but sparsely so below. Frons very closely, longitudinally somewhat arcuately punctured-striate, the striae well-defined on the lateral and upper portions. Mesonotum anteriorly finely, closely, somewhat rugosely punctured, on the disc and posterior portion punctures, in most examples, somewhat large, shallow, sparse and indistinctly outlined, but sometimes deep, distinct and rather strong, moreover, in some examples longitudinally confluent and subrugose. Scutellum, at least posteriorly, somewhat closely punctured or subrugose. Area cordata (do., E) very coarsely radiately striate, generally the striae turning into a irregular network in the middle, posterior limb smooth and highly polished, rest of the segment coarsely punctured-rugose or punctured-reticulate. Abdomen with hypopygium somewhat closely and distinctly punctured, rest of the abdomen without noteworthy punctuation. Hind tibiae with the polished surface between the spines on the outer margin. Length 5.5-7.5 mm.

♂. Similar to ♀. Normally pubescent, without a row of erect hairs on the abdominal sternites across the middle. Black. Palpi brown, in some examples apical margin of each abdominal sternite also brownish (*vide* Remarks). Head from above (Fig. 14, F) with eyes well developed and large, with temples slightly roundly convergent posteriorly, OOD : POD

Table 13. Correlation table of HW : PL and HW : PW. (Subgen. *Dineurus*)

Sp.	Part HW (mm)	Length of petiole											Width of petiole						Total
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	.15	.20	.25	.30	.35	.40		
<i>wesmaeli</i> ♀	2.6									2						2	2		
	2.5							3	—	1					2	2	4		
	2.4							2							2		2		
	2.3						1	2	3						6		6		
	2.2						3	4						1	6		7		
	2.1						2	4	1					5	2		7		
<i>wesmaeli</i> ♂	2.2														1		1		
	2.1									1							3		
	2.0					1	—	7						3			8		
	1.9					1	4	4						3	1		9		
	1.8				1	1	5	2					1	8			9		
	1.7					2	1						3	5	1		9		
	1.6					2	1						1	2			3		
	1.5				1	2							1	1	1		3		
	1.4			1	1	1							2	2			2		
<i>fabricii</i> ♀	2.1					1										2	2		
	2.0					5	19	4						1	7	2	28		
	1.9					7	12							1	12	6	19		
	1.8					8	4							2	10		12		
	1.7																0		
	1.6		1	1										1			2		
<i>fabricii</i> ♂	2.0																1		
	1.9					1	4	1									6		
	1.8					2	10							7	5		12		
	1.7					14	10	2						17	7		26		
	1.6					14	4							5	13		18		
	1.5		1	—	2									2	1		3		
<i>shuckardi</i> ♀	2.0					1									1		1		
	1.9					8	4							1	10	1	12		
	1.8					7								2	4	1	7		
	1.7		1		1									1	1		2		
	1.6		2											1			2		
	1.5													1			0		
	1.4		1														1		
<i>shuckardi</i> ♂	1.8					2	1								3		3		
	1.7					3	3							1	3	2	6		
	1.6					6								1	4	2	7		
	1.5		1		1									1			2		
	1.4		2		1												3		
	1.3		3										1	2			3		
	1.2	1												3			3		
	1.1													1			1		
<i>dieri</i> ♀	2.2									1						1	1		
	2.1						4	1									5		
	2.0					1	11							3	7	2	12		
	1.9					3	7							3	8		10		
	1.8		1		1									2	2		2		
	1.7													2			0		
	1.6				1									1			1		
<i>dieri</i> ♂	1.9					1	1							1	1		2		
	1.8					3	1							3	3	1	4		
	1.7					3	1							2	2		4		
	1.6					4	1							5			5		

$\approx 3 : 5$ , OCD slightly longer than OOD. Head in front (do., G) with the inner margins of eyes fairly strongly convergent below, with the distance between eyes at the base of clypeus nearly as long as eye; clypeus: Fig. 14, G, its variation in form: do. H. Mandibles normally tridentate (do., G), with the innermost tooth somewhat broad, but not so broad as in *lethifer* Shuck., its basal condyle very feeble. Relative length of the antennal joints:— 24 : 10 : 12 : 10 : 9 : 9 : 9 : 8 : 8 : 8 : 8 : 8 : 10; joints 4-9 with a carina on the lateral margin which is roundly produced on each joint. Posterior limb of area cordata on propodeum distinctly elevated and broad, but narrows medio-posteriorly and sometimes interrupted in the middle by the longitudinal groove. Petiole rather short (Table 2 et 13), not or just reaching the apex of hind trochanter stretched backwards. Abdominal sternites without transverse impression in front of the posterior margin of each segment. Hind tibiae more feebly spinose than in ♀. Genitalia (18 examples are examined) (Fig. 19, G), with squamae well developed and large, but variable in colour, sometimes dark brownish, sometimes pale yellow; penis, as a whole, sword-shaped, narrower at the base than near the apex, apex triangular, pointed; volcella short, elongate triangle in form, bearing a few short hairs at the apex. Punctuation on vertex as in ♀, on mesonotum anteriorly somewhat close and fine, on the rest fine and sparse, never subrugose, on scutellum as in ♀, but, in general, somewhat stronger than on mesonotum. Posterior limb of area cordata smooth and polished, but sometimes very minutely punctured and dull. Length 5.0-6.5 mm.

*Habitat*: Europe, Manchuria, the Ussuri region, Kamchka, Saghalien, Korea and Japan (Hokkaido).

*Specimens examined*: 99 ♀♀ 13♂♂, Hokkaido (Sapporo, Jōzankei, Sōunkyō, Nopporo and Tokachi), 1 ♀, Manchuria (Pei-an), 3 ♀♀, Korea (Keijo and Hakuto-zan), 1 ♀, Saghalien (Oya).

*Remarks*. The examples I examined agree well with the descriptions of the previous authors except for the following points:

1) After Birula (1914), "spatium inter oculorum marginem internum et areolam antennarum basalem fere diametro areolae aequilongum". In my examples, however, the *spatium* is definitely broader than the *diametro areolae*, the ratio being nearly 3 : 2 (♀ ♂).

2) Following Harttig (1931), "mittlere Fühlrglieder (5-11) unterseits kaum oder nicht gewölbt", and following Wagner (1931), "Die Unterseite der mittleren Geißelglieder hat am Rand einen deutlichen Kiel... der Kiel gerade oder höchstens in der Mitte etwas winklig ist". In my examples (♂), however, these descriptions do not always hold true. In most examples, the keel is distinctly roundly produced posteriorly, and by this character alone this species is unable to be separated from *lethifer* Shuckard.

3) According to the descriptions and the figure of Wagner (1931), the clypeus of *shuckardi* (♀) seems to bear an independent medial projection behind the anterior margin that is slightly produced and obtusely bidentate in the middle. But such is not the case in my examples. Figures given by Berland (1925) and Hedicke (1930) may be derived from the same origin, but that is quite inaccurate.

4) Harttig made use of the punctuation on the anterior portion of mesonotum as a separating key of this species, but the nature of punctuation on that portion is, so far as the examples of our regions are concerned, too variable to be applied to such a purpose.

5) According to Wagner (1931), "Bauchringe am Ende nicht heller gefärbt, wie bei anderen Arten", but a considerable number of my examples (♂) bear the abdominal sternites

coloured brown on each apical margin.

In the male examples, the curvature of the rounded medial incision of the clypeus is more or less variable as shown in the figure. Its surface is sometimes slightly convex, sometimes flattened, with, in most examples, dense fine punctures. But in some examples the punctures are very few in number and scattered only on the anterior portion. The female of this species is rather characteristic of the dentation of the mandibles, though the true nature of which can be ascertained only on the specially prepared examples.

As for the wing venation, 7 ♀♀ 11 ♂♂ out of 104 ♀♀ 134 ♂♂ examined showed the 2nd recurrent nervure received by the cubital nervure just or nearly at the base of the 1st transverse cubital nervure.

This species is the commonest Pempfredonid in Hokkaido.

#### 10. *Pempfredon (Dineurus) unicolor\* wesmaeli* (A. Morawitz, 1864).

*Cemonus wesmaeli* A. Morawitz, Bull. aca. sc. Petersb., VII, p. 495, 1864.

*Pempfredon (Cemonus) lethifer* Thomson, Opusc. entom., P. II, p. 234, 1870; Hymen. Scandin., III, p. 189, 1874.

*Pempfredon (Chevriera) Wesmaeli* Kohl, Mitt. Schweiz. entom. Ges., VI, p. 10, p. 658, 1884.

*Diphlebus Wesmaeli* Kohl, Verh. zool.-bot. Ges. Wien, XXXVIII, p. 722, 1888.

*Pempfredon (Diphlebus) Wesmaeli* Kohl, Ann. Nat. Hofm. Wien, V, p. 56, 1890.

*Pempfredon Wesmaeli* Ed. Saunders, Hymen. Acul. Brit. Isl., P. III, p. 93, 1893.

*Pempfredon wesmaeli* Dalla Torre, Cat. Hymen. etc., VIII, p. 361, 1897.

*Pempfredon wesmaeli* Birula, Rev. Russ. Entom., XII, n. 3, p. 537, 1912; *Ibid.*, XVI, n. 4, p. 381, 1914.

*Pempfredon (Diphlebus) wesmaeli* Wagner, Deut. Entom. Zeitschr., p. 140 & 142, 1918.

*Pempfredon (Cemonus) wesmaeli* Berland, Faun. France, 10 Hymen. Vespif., I, p. 139, 1925.

*Pempfredon (Diphlebus) wesmaeli* Perkins, Ent. Mon. Mag., LXV, p. 54, 1929.

*Pempfredon (Diphlebus) wesmaeli* Schmiedeknecht, Hymen. N. M. Europ., p. 670, 1930.

*Pempfredon (Cemonus) wesmaeli* Hedicke, Tierw. M. Europ., Bd. V, Lt. 2, Ins. 2, p. 133, 1930.

*Diphlebus wesmaeli* Harttig, Stet. Entom. Zeit., 91, II, 2, p. 229 et 230, 1930.

*Pempfredon (Dineurus) unicolor wesmaeli* Blüthgen, Konowia, X, n. 2, p. 123 et 127, 1931.

*Pempfredon (Dineurus) unicolor wesmaeli* Wagner, Deutsch. Entom. Zeitschr., IV, p. 223, 1931.

♀. Black. Palpi apically light brown, apex of each tarsal joint dark brown. Normally pubescent and pilose. Head from above: Fig. 15, A, nearly 1.5 times as broad as long in the middle, and as broad as the thorax at the tegulae of wings, with temples well developed, longer than eye. OOD:POD=3:2 (*vide* Remarks), PLE runs across the middle of post-ocelli. Head in front (Fig. 15, B) with the inner orbits of eyes slightly convergent below, with the distance between eyes at the base of clypeus slightly less than as long as eye (nearly 5:6). Clypeus flattened on the surface, with the apical border narrowly subsemicircularly notched in the middle, the distance between the lateral angles of the notch nearly as broad

\* *unicolor* (Panzer, 1798), nec Fabricius, nec Latreille.

as the scape of antenna at its broadest portion, the lower margin on the notc hrather thick, with more or less well-defined surface seen from below. Labrum broad, not remarkably incrassate, with the margin thin and scarious. Mandibles (Fig. 13, D) with, besides the ordinary 4 teeth, a short tooth on the inner surface in the middle, the innermost tooth remarkably large, broad-triangle in shape, standing perpendicularly aganist the length axis of the mandible, basal condyle feebly developed, with the surface flattened, Wagner's Mittelfeld on the outer surface nearly thrice as long as broad. Antennae (Fig. 15, C) comparatively incrassate, the 3rd joint twice, the 6th 1.5 times as long as broad at the apex, length ratio of the joints:— 31 : 11 : 13 : 11 : 11 : 11 : 10 : 10 : 10 : 10 : 10 : 13. Pronotum not transversely carinated across the middle. Marginal limb of area cordata well defined, broad, but attenuating toward the middle and vaguely interrupted in the middle by the longitudinal groove. Petiole, in most examples, 3-3.5 times, but sometimes only 2.5 times as long as broad at the apex (Table 2) and, in most examples, more than as long as hind coxa and trochanter united, but in rare cases (3 out of 29) as long as the segments. Pygidial area (do., E) bordered by well-defined

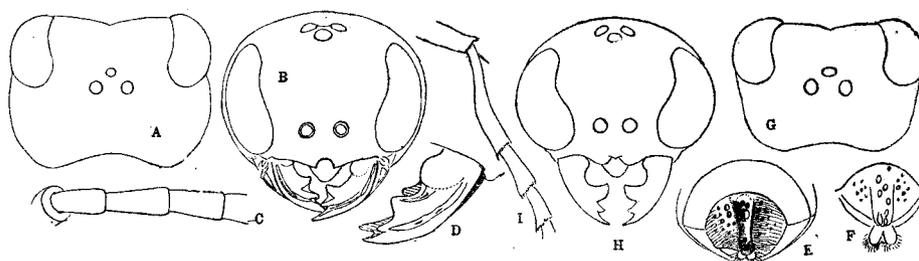


Fig. 15. *Pemphredon (Dineurus) unicolor wesmaeli* (A. Morawitz).

A, B... head (♀); G, H... do. (♂), C... basal portion of antenna, D... mandible (♀), E... pygidial area (♀), F... variation of do., I... mid tibia and tarsi (♂).

carinae, with the surface longitudinally grooved and bearing a short median carina at the apex; the surface slightly narrowed behind the middle and usually wider than hind metatarsi at the base, but sometimes subequal to the portion. Hind tibiae spinose on the outer surface. Vertex sparsely but strongly (in some examples finely) punctured, the punctures slightly close towards the margins, on temples below somewhat stronger and sparser. Frons very closely punctured-rugose or -striate. Punctures on mesonotum sparse and rather coarse, but sometimes in part subreticulate or subrugose, on the anterior portion, however, smaller, very close and less strong. Scutellum coarsely, sparsely and strongly punctured, the punctuation fine and very close posteriorly. Area cordata on propodeum radiately and stoutly striate, in the middle portion rugosely striate or subreticulate; posterior limb usually smooth and polished, rarely rugulose, rest of the segment rugosely punctate with variable density, rarely subreticulate. Petiole coarsely, simply or rugosely punctate. Length 8.5-10.0 mm

♂. As usual abundantly pubescent. Palpi brown, in some examples greater part of mid tarsi bright ferruginous. Head from above (Fig. 15, G) with eyes well developed, as long as temples, OOD : POD = 3 : 2~5 : 3, PLE passes across the middle of postocelli. Head in front (do., H) with the inner margins of eyes roundly and strongly convergent below, with the distance between eyes at the base of clypeus distinctly less than as long as eye (the ratio

Table 14. Length ratio of OOD : POD and l.m. : inc.  
in *P. (Dineurus) unicilor wesmaeli*. ♀

No.	OOD : POD	The same	l.m. : inc.	Loc. of ex.
1	21 : 14	1.5	30 : 10	Hokkaido
2	21 : 14	1.5	29 : 10	"
3	20 : 13	1.5	27 : 9	"
4	19 : 11	1.7	27 : 10	"
5	21 : 13	1.6	27 : 9	"
6	21 : 14	1.5	28 : 10	"
7	23 : 14	1.6	28 : 10	"
8	20 : 13	1.5	27 : 10	"
9	20 : 14	1.4	28 : 10	"
10	20 : 13	1.5	26 : 9	"
11	20 : 13	1.5	26 : 10	"
12	20 : 14	1.4	27 : 9	"
13	21 : 14	1.5	27 : 10	"
14	21 : 14	1.5	27 : 10	"
*15	21 : 12	1.8	28 : 8	"
16	21 : 14	1.5	30 : 10	Honshu
17	21 : 14	1.5	27 : 11	Korea
18	22 : 17	1.3	32 : 11	"
19	25 : 14	1.7	33 : 12	"
20	26 : 16	1.6	32 : 12	"
21	24 : 14	1.7	34 : 11	"
22	23 : 16	1.4	32 : 12	Saghalien
23	22 : 13	1.7	30 : 10	"
**24	24 : 15	1.6	30 : 6	Polland

\* . . . . . This examples bears the clypeal conformation somewhat resembling *scoticus* Perkins.

\*\* . . . . . *scoticus* Perkins. l.m. . . lateral margin. inc. . . incision of clypeus.

nearly 3 : 4). Clypeus (do.) with the surface flattened or feebly convex, with the anterior border subtrapezoidally emarginated in the middle; lateral angles of the emargination, in most examples, roundly produced anteriorly, sometimes, however, more or less angulated: in the latter case apical margin of the protuberances subtruncate; in the middle of the emargination always produced a short blunt tooth. Mandibles with the innermost tooth very broad and large, obliquely subtruncate at the apex; the longitudinal groove (middle area) on the outer surface well-defined. Antennal joints 4-10 provided with a feeble longitudinal carina which is slightly roundly produced on each joint. Area cordata on propodeum with narrow, more or less incrassate posterior limb. Petiole in most examples 3-3.5 times, sometimes, however, only 2.2-2.7 times as long as broad at the apex, but always longer than the hind coxa and trochanter taken together. Pygidial area cannot be proved in my examples even in the slightest degree, though some authors alluded to it. Abdominal sternites 2-5 with a distinct apical impression, extending some distance in front of the apical margin. Metatarsi of mid legs (Fig. 15, I) apically slightly dilated and feebly bending. Genitalia: Fig. 19, H; greater part of squama, in general, coloured dark, but in some examples the apical portion alone is clouded. Vertex finely sparsely punctured. Frons longitudinally closely punctured-striate. Mesonotum anteriorly closely, posteriorly sparsely punctured as in ♀, the punctures, however, finer and less strong. Scutellum distinctly and more largely punctured, postscutellum very closely subgranulately punctured. Area cordata rather closely, radiately rugose-

striate or simply striate, in the middle portion occasionally subreticulated; posterior limb variably rugose or striate, sometimes without sculpture (*vide* Remarks), remaining portions of the segment mostly very coarsely, rarely moderately, rugoso-punctate or rugoso-reticulate. Punctuation on abdomen normal. Length 6.0-9.0 mm.

*Habitat*: Europe, Korea, Japan (Honshu and Hokkaido) and Saghalien.

*Specimens examined*: 16 ♀♀ + 2 ♂♂, Hokkaido (Sapporo and Kamikawa); 5 ♀♀ + 2 ♂♂, Korea (Keijō, Shōyōzan, Nansetsurei and Daitaku); 1 ♀, Honshu (Iwate Pref.); 2 ♀♀, Saghalien (Terandomari).

*Remarks*. According to F. Blüthgen (1931), 3 subspecies are included in *unicolor* (Panzer) s. latr., namely *unicolor* s. str., *wesmaeli* A. Morawitz and *scoticus* Perkins. Each of these subspecies was formerly regarded as a good species. Following Wagner (1931), they are distinguished from one another by the following characters:

1. *unicolor* s. str. (= *rugifer* auct., = *solivagus* Bondroit).

Median emargination of the anterior border of clypeus semicircular, nearly as wide as the antennal scape at its narrowest portion; middle area of mandibles twice as long as broad; pygidial area nearly equal in broadness to the base of hind metatarsi and somewhat narrowed behind the middle. Posterior limb of area cordata mostly dull and opaque; scutellum sparsely or closely punctured.

2. *wesmaeli* A. Morawitz.

Median emargination of the anterior border of clypeus transversely semioval, nearly as wide as the antennal scape at its widest portion; middle area of mandibles thrice as long as broad; pygidial area similar in form and in the relative width to *unicolor* s. str. Posterior limb of area cordata mostly smooth and glittering; scutellum sparsely punctured, with intervals shining.

3. *scoticus* Perkins.

Median emargination of the anterior border of clypeus small, quartercircular (or, after Perkins, hardly more than a slight impression in the middle); middle area of mandible thrice as long as broad; pygidial area somewhat broader than the base of hind metatarsi and not or hardly narrowed behind the middle. Scutellum closely punctured, with the intervals opaque; posterior limb of area cordata mostly smooth and polished.

As for our examples the following characters could be found: (1) Median incision of clypeus. This character seems to be comparatively constant and agrees well with that of *wesmaeli*, except for one specimen (No. 15 - *vide* Table 14). (2) Middle area of mandible. This impression on the outside of mandibles is variable in form and, moreover, sometimes indistinct on the outlines. But in general comparatively large. (3) Pygidial area. Out of 24 examples only 5 have the area as wide as the base of hind metatarsus. In the remainders it is wider than the compared bodily part. In 1 example from Sapporo it is twice, in 3 from Korea 1.5-1.7 times as wide as that part. As for the form, 21 examples agree with the description of *wesmaeli*, but in 3 (not including No. 15) otherwise formed (in 2 gradually narrowed backward, in 1 nearly parallel). (4) Scutellum. In all the example the

area is anteriorly rather remotely and largely but posteriorly finely and very closely punctured. (5) Limb. Smooth and polished excepting for 3 examples (not including No. 15), in which dull and feebly striate.

I examined also 1 female example from Poland, wherein the characters are as follows: (1) A large rounded puncture or impression in place of the normal incision (as given in the original description of *scoticus*), (2) similar to ours, comparatively large, (3) broader than the base of hind metatarsi, (4) similar to ours, (5) feebly striate (area coriata is more stoutly, more coarsely rugose-striate than in ours).

Judging from the above comparisons it seems to be conclusive that: (1) Our examples belong all to *wesmaeli*, (2) the Polish example must be *scoticus*, (3) *unicolor* s. str., *wesmaeli* and *scoticus* represent probably a geographical race respectively, since, (a) in our regions occurs only *wesmaeli*, (b) there is a certain crossing among the variation ranges of characters of these 3 races, and therefore each merits a subspecies of *unicolor* s. l., as proposed by P. Blüthgen, (4) out of the 5 characters, that of clypeus alone seems comparatively constant, others seem to be of the secondary importance. There remains especial difficulties to distinguish the male of the 3 subspecies. Wagner published his opinion on the subject (only treating *unicolor* s. str. and *wesmaeli*) basing upon the structural difference of clypeus. But as the character in our examples is quite variable (including a considerable percentage of the type *unicolor* of Wagner), his opinion seems to be not conclusive.

Variation of other characters: (1) Punctuation on the anterior body in ♀ is generally larger, rather coarse, compared with *lethifer* or *shuckardi*. The sculpture on limb in ♂ is variable as below. (a) Very coarsely striate or rugose-striate (as in *rugifer* Dhlb. 1), (b) finely rugulose, occasionally accompanying fine punctures, (c) very feebly sculptured and dull, (d) without sculpture and polished (5 examples out of 44). (2) The ratio of OOD:POD. *Vide* Table 14. (3) The carina on the antennal flagella. It is slightly roundly produced on each joint. Its curvature was once adopted by Harttig as a separating key between this species and *lethifer* Shuck. But such a method is hardly applicable to our examples, since the character is variable in both species. (4) Petiole. *Vide* Table 2. (5) Venation of wing. It has been known upon the European examples of this subspecies that the 2nd recurrent nervure is received by the cubital nervure occasionally just at the 1st transverse cubital nervure. The fact is admitted upon the examples of *scoticus* from Poland. But in all the Asiatic examples treated by me, though the distance between the junction of the 2nd recurrent nervure and the origin of the 1st transverse cubital nervure varies considerably, the recurrent nervure is always received distinctly by the 1st cubital cell.

### 11. *Pemphredon (Dineurus) lethifer fabricii* (M. Müller, 1911)

[nec *Pelopaesus unicolor* Fabricius, 1804, according to P. Blüthgen (1931).]  
*Pemphredon (Cemonus) unicolor* Latreille, Gen. Crust. & Ins. IV, p. 89, 1809.

- Cemonus lethifer* Shuckard, Essay indig. Fossor. Hymen., p. 201, 1837.  
*Cemonus unicolor* Dahlbom, Hymen. Europ., I, p. 225, 1845.  
*Cemonus unicolor* Smith, Cat. Brit. Foss. Hymen., p. 178, 1858.  
*Cemonus unicolor* Giraud, Ann. Soc. Entom. France (4), VI, p. 471, n. 17, 1866.  
*Cemonus unicolor* Radoszkovsky, Fedtschenko Turkest. Spheg., p. 66, 1875.  
*Cemonus unicolor* Ed. Saunders, Trans. Entom. Soc. London, p. 260, 1880.  
*Pemphredon* (*Chevrieria*) *unicolor* Kohl, Mitt. Schweiz ent. Ges., VI, 10, p. 658, 1884.  
*Pemphredon* (*Diphlebus*) *unicolor* Kohl, Ann. naturh. Hofmus. Wien, V, p. 56, 1890.  
*Cemonus Fabricii* M. Müller, Entom. Runcschau, XIV, p. 107, 1911.  
*Pemphredon* (*Diphlebus*) *unicolor* Wagner, Deut. Entom. Zeitschr., p. 141 & 142, 1918.  
*Pemphredon* (*Diphlebus*) *littoralis* Wagner, *minutus* W., *neglectus* W., *fuscatus* W. t. c.  
*Pemphredon* (*Cemonus*) *unicolor* Berland, Faun. France, X, Hymen. Vespif., I, p. 139, 1925.  
*Pemphredon* (*Diphlebus*) *lethifer* Perkins, Entom. Mon. Mag., 65, p. 54, 1929.  
*Pemphredon* (*Diphlebus*) *unicolor* Schmiedeknecht, Hymen. N. M. Europ., p. 670, 1930.  
*Pemphredon* (*Cemonus*) *unicolor* Hedicke, Tierw. M. Europ., Bd. V, Lief. 1, Ins. 2, p. 133, 1930.  
*Diphlebus unicolor* Harttig, Sett. Entom. Zeit., 91, p. 229 & 230, 1930.  
*Pemphredon* (*Dineurus*) *lethifer* (Shuck.) var. *fabricii* Blüthgen, Konowia, X, 2, p. 125 & 127, 1931.  
*Pemphredon* (*Dineurus*) *lethifer* f. *fabricii* Wagner, Deut. Entom. Zeitschr., p. 229 & 230, 1931.  
*Pemphredon* (*Dineurus*) *lethifer* f. *littoralis* Wagner, f. *neglecta* Wagner, f. *confusus* Wagner (p. 223) t. c.  
*Pemphredon* (*Dineurus*) *unicolor* Gussakovskij, Mushi, Vol. XII, n. 2, p. 83, 1934.  
(Classical literature catalogued by C. G. Dalla Torre under the name of *unicolor* (Latr.)  
Fabr. have chiefly been omitted excepting those which seem to be especially important for identification and for distribution, also those which concerned with the biology alone).

♀. Pubescence and pilosity normal. Black. Apical portion of palpi light brown. Head from above wider than thorax, nearly as wide as abdomen, with the lateral margins behind eyes either slightly bulging outwards before the middle, or paralleling towards the middle and thence continuously roundly convergent posteriorly (Fig. 16, A), or as a whole simply roundly convergent backwards (do. B); ratio of width to length nearly 10 : 7. Ocelli in an isosceles triangle, OOD : POD ≈ 2 : 1, OOD : OCD ≈ 2 : 3. Head in front (do., C) with the inner margins of eyes roundly and moderately convergent below, with the distance between eyes at the base of clypeus slightly less than as long as eye; clypeus (do., D) slightly produced, with the anterior margin broadly truncate in the middle, rarely slightly emarginate, or more rarely gently roundly produced. Its surface, in general, slightly convex or slightly raised longitudinally in the middle, but in some examples entirely flattened. Mandibles with, besides the 4 ordinary teeth, a short tooth produced on the inner surface in the middle (do., C), basal condyle not well developed. Relative length of the antennal joints :— 27 : 10 : 11 : 10 : 10 : 9 : 9 : 9 : 8 : 8 : 8 : 11. Mesonotum medio-anteriorly with 2 short grooves, in most examples this area is somewhat depressed, but in some the depression is ill-defined. Posterior limb of area cordata broad and elevated and sharply outlined on both edges (do., E). Petiole of abdomen variable in both length and width, 2-3 times as long as broad at the apex, usually not reaching the apex of hind trochanter stretched backward, in form seen from above parallel, seen in the lateral view, with the upper margin roundly curved upwards and suddenly narrowed near the base. Pygidial area comparatively broad in general (in most examples

broader than the base of hind metatarsi), but variable in form (*vide* Remarks). Hind tibiae (Fig. 16, F) without spine on the outer surface. Fore wing (do., G, H) with the 2nd recurrent nervure sometimes received just at the base of the 1st transverse cubital nervure. Vertex moderately largely and somewhat sparsely punctured, with intervals smooth and polished; frons above subreticulate, below punctured-striate, in some examples punctured-striate or punctured-rugose throughout. Mesonotum anteriorly finely, closely, posteriorly somewhat largely and less closely punctured, in most examples punctures on anterior portion deep and distinct, on posterior portion shallow and indistinctly outlined. Some examples bear anteriorly shallow and subrugose punctures and posteriorly fine, deep and very remote ones. In 7 examples out of 64, punctures on the disc ill-outlined, shallow and partly longitudinally confluent. Scutellum with sparse medium-sized punctures, but the punctuation posteriorly

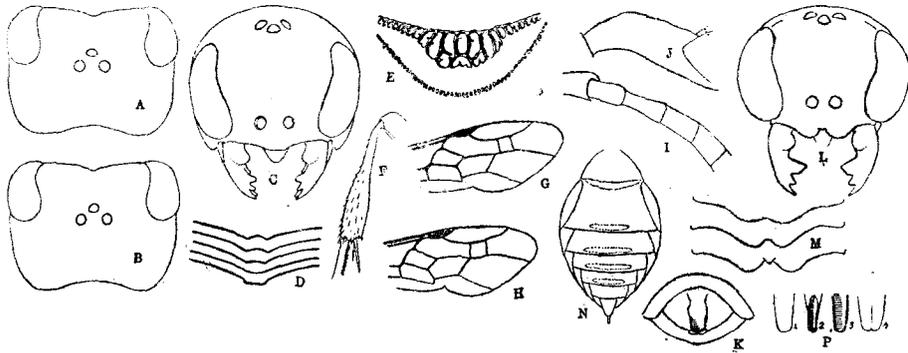


Fig. 16. *Pemphredon (Dineurus) lethifer fabricii* M. Müller.

A....head seen from above (♀), B....do. (variation of the form), C....do. seen in front, L....do. (♂), D....variation of the form of the anterior margin of clypeus (♀), M....do. (♂), I....basal portion of antenna, E....area cordata (♀), F....hind tibia (♀); G, H....variation of wing venation, N....abdominal sternites (♂), J....petiole of abdomen seen in the lateral view, K....pygidial area (♀), P....variation of the form of do.

fine and close; postscutellum very finely and rather densely punctured with variable strength. Area cordata radiately coarsely striate, with the median portion usually irregularly rugose or subreticulate; posterior limb smooth and shining, and in general, outlined on the posterior margin by the close, slightly elongate punctures located distinctly in row; sometimes, however, this arrangement of the punctures indistinct or irregular; rest of the segment closely punctured or punctured-reticulate or punctured-rugose, with quite variable strength and size according to individual. Punctuation on abdomen normal. Length 6-8 mm.

♂. Similar to ♀ in colour, but quite unlike in form and in sculpture. Pubescence, as usual, more abundant and much longer. Head from above variable in form as shown in Fig. 17, nearly 1.5 times as wide at the posterior margins of eyes as long in the middle. OOD : OCD = 4 : 3, OOD : POD = 3 : 2. Head in front (Fig. 16, L) with the inner margins of eyes rather strongly convergent below, with the distance between eyes at clypeus slightly less than as long as the eye. Clypeus with the anterior border broadly incised in the middle, lateral

angles of the incision broadly rounded; its surface, in most examples, slightly convex or longitudinally convex in the middle, but in some, nearly even, in others transversely raised across the middle, again in a considerable number, the median longitudinal elevation is so remarkable that it is slightly produced at the end into a small prominence in the middle of the incision, as shown in Fig. 16, M. All these different states of the clypeal surface are closely connected with one another by the successive grades of the transition. Mandibles tridentate, with the innermost tooth broader than others and obliquely truncate at the apex. Antennal joints 4-11 with a longitudinal carina on the lateral margin. In general, it is more roundly produced on each joint than in *unicolor* Pz. but in some examples it is not so remarkably rounded (*vide* Remarks of *unicolor wesmaeli*). Posterior limb of area cordata on propodeum comparatively broad and in most examples, distinctly bordered on the posterior margin by the well-defined puncture-line. Petiole of abdomen with variable length and width, 2-3 times as long as broad at the apex and nearly, or slightly less than, as long as hind coxa and trochanter united. Its form in the lateral view as in ♀. Abdominal sternites 2-5 with a transverse impression before the posterior margin (Fig. 16, N). Mid metatarsi not crooked. Genitalia is very similar to that of *unicolor*, differing only in the relative length of the squama to volcella, namely the ratio is larger than in *unicolor*. Punctures on vertex sparse, comparatively large and rather strong, with well defined outlines and, in general, stronger than in *unicolor* Pz. ♂; in some cases the punctures developed so well that they become larger than the intervals between them and often longitudinally subrugosely confluent. In other cases, however, they are less strong and very small or shallow and very feeble, becoming quite similar to those of *unicolor*. Intervals between the punctures usually polished, but sometimes dull and opaque. Frons longitudinally arcuately punctured-striate or simply closely punctured. Mesonotum anteriorly finely, closely, less strongly punctured, punctures sparse backward and generally fine but distinct, with intervals smooth and shining. In some examples, however, the punctures rather large and somewhat strong and more closely distributed; in others they are very fine, very feeble and very sparse. But in the example examined (99 in number) no rugosity can be met with. Scutellum more closely punctured than on mesonotum and posteriorly subrugose or subgranulate. Postscutellum finely and very closely punctured with variable strength, with intervals shining or opaque. Area cordata sculptured as in ♀, remaining portions of the segment punctured-reticulate or rugose-reticulate, or simply subrugose, with the sculpture variable in size, in density and in strength. Posterior edge of area cordata bordered by the elongate punctures located distinctly in row. Length 6.0-7.5 mm.

*Habitat*: Europe, Turkestan, Manchuria, the Ussuri region, Korea, Saghalien and Japan (Honshu and Hokkaido).

*Specimens examined*: 62 ♀♀ 97 ♂♂, Hokkaido (Sapporo, Jōzankei, Akanuma near Hakodate, Kamikawa, Sōunkyō and Okushiri Island); 2 ♀♀ 1 ♂, Honshu (Gumma, Kyoto); 1 ♀, Korea (Keijo); 1 ♂, Saghalien (Konuma).

*Remarks*. In 1931 P. Blüthgen sank *P. (Dineurus) fabricii* (M. Müller) (= *unicolor* (Fabr.) Latr. et auct) to a subspecies of *P. (Dineurus) lethifer* (Shuckard). Accordingly the latter came to include 2 subspecies within, viz. *lethifer* s. str. and *fabricii* (M. Müller). The former subspecies is said to be separated from the latter chiefly by the form of head which is remarkably convergent backward (seen from above) and by the punctures just behind the limb of the area cordata which is not well arranged in row. Soon after the publication of Blüthgen's paper, A. C. W.

Wagner studied in detail on the classification of the subgenus *Dineurus* of Europe. He treated the above mentioned subspecies as forms and proposed anew the occurrence of another intermediate form *littoralis*. Beside them he separated newly f. *neglecta* and f. *confusa* mainly by the characters of the form of the head and the punctuation on the thorax. Moreover, he added later another form *brevipetiolatus*, which was first published by him as a good species. My examination of a number of examples, however, made it clear that *lethifer* s. l. is a species that bears morphological characters of a very variable nature as shown below :

(1) The form of the head seen from above. It varies to a certain extent not only in the relative ratio of length to width, but also in the curvature and the grade of convergency of the temples. Five kinds out of many were given as examples in

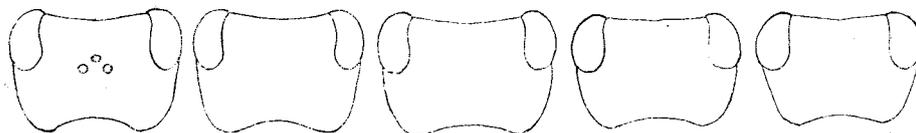


Fig. 17. Variation of the form of the head in *Pemphredon (Dineurus) lethifer* ♂ seen from above.

Figure 17. Wagner attempted to separate *fabricii*, *littoralis* and *lethifer* s. str. from one another chiefly by the form of the head seen from above and by the index of the width to the length. But apart from *lethifer* s. str., it was impossible for me to separate such forms according to his method. At least in my examples, variation of the form of the head is not so regular as pointed out by him. (2) Petiole. As to the variation of the relative length to other parts of the body, *vide* Table 13, as to the ratio of length to width, *vide* Table 4. Usually it does not reach the apex of the trochanter of hind legs stretched backward, but sometimes it does, especially so in the male examples. In form seen from above, it is either slightly divergent backward or nearly parallel. In the latter case, in most examples, it broadens abruptly at the apex. Seen in the lateral view, it narrows suddenly toward the base. This nature alone which was found by Wagner seems to be very constant. (3) Pygidial area. In form it is considerably variable as shown in Fig. 14, K. & P, canalculated only on the posterior portion, usually divergent anteriorly but rarely constricted behind the middle. In 41 examples out of 63, it is distinctly, in 10 only slightly broader than the base of hind tibiae (seen from behind), in other 10, nearly as broad as, in the remaining 2 distinctly narrower than the part. Fig. 16, P<sub>4</sub> may be an exceptional case, wherein the area is nearly twice as broad as those in the normal case, bearing a feeble median ridge on the posterior portion as if it were composed of two similar area fused together. (4) Punctuation on vertex and mesonotum. Punctures on head and thorax are especially variable in size, in strength as well as in density.

Moreover, these variations do not occur in parallel on all parts. For instance, the strong punctuation on head does not always accompany the strong punctuation on mesonotum or coarse sculpture on propodeum. So that any attempt to separate some form according to the character of punctuation (as attempted by Wagner) seems to be of little significance. The sole constant nature of the punctuation on mesonotum is that it is closer on the anterior part than on the disc. However, the rugosity on the part was found in my material only in the female examples. (5) Sculpture on propodeum. Punctures that border on the posterior margin of area cordata are, in most examples, distinctly arranged in row, but in a few female examples they are somewhat disordered as in *lethifer* s. str. (Table 15). (6) Clypeus. Its form is especially variable in ♂ (Fig. 16, M). But any extremities of deviation are connected well with other forms of successive gradation. (7) The venation of fore wing. The 2nd recurrent nervure is usually received by the 1st cubital cell at varying distances from the base of the 1st transverse cubital nervure. But in some examples (8 ♀♀ 2 ♂♂ out of 65 ♀♀ 99 ♂♂) it is received just at the nervure.

Judging from the evidences given above, it seems to me that Wagner's forms *neglectus*, *confusus* and *brevipetiolatus* are all of little significance. Moreover, *littoralis*, together with other allied forms is probably eligible for *fabricii* Müller (*vide* Table 15). Generally speaking, it appears that this species, when supplied with abundant food in the larval stage and grows large, has a tendency to show the characters of *fabricii*, while in the contrary occasions, those of *lethifer* s. str. However, it will be worthy of notice that most of our examples belong to the type *fabricii*

Table 15. Variation of characters of *Dineurus lethifer fabricii*.

Char.	Type	♀					♂				
		<i>fabr.</i>	<i>lit.</i>	<i>let.</i>	<i>f.-li.</i>	<i>li.-le.</i>	<i>fab.</i>	<i>lit.</i>	<i>let.</i>	<i>conf.</i>	<i>oth.</i>
Ch. 1	1	16	23	2	18	6	10	31	—	—	43
Ch. 2	2	45		4	16		1 ?	74			10
Ch. 3	3	57		8			35	49	(37)		
Ch. 4	4	46		19			35	38	11		
Ch. 5	5	—	36	28			0	21	54	9	0
							9	8	7	6	5

(mm)

*fabr.* . . . . *fabricii*, *lit.* . . . . *littoralis*, *let.* . . . . *lethifer*, *conf.* . . . . *confusus*, *f.-li.* . . . .. . . . intermediate between *fabr.* and *lit.* *li.-le.* . . . . intermediate between *lit.* and *let.*

Ch. 1 . . . . the form of the head, Ch. 2 . . . . punctures on mesonotum, Ch. 3 . . . .

. . . . the puncture-line on propodeum, Ch. 4 . . . . the sculpture on propodeum,

Ch. 5 . . . . length of the body.

(Types were classified according to the Wagner's key)

(including *littoralis* and near forms) and a few as exceptional cases approach the type *lethifer* s. str. According to Wagner, however, in some regions of North Europe, examples showing the characters of *lethifer* are very common and abundant. The fact seems to indicate that *fabricii* and *lethifer* must be a geographical race respectively and therefore each merits a subspecies.

## 12. *Pemphredon (Dineurus) diervillae* Iwata, 1933.

*Pemphredon (Dineurus) diervillae* Iwata, Trans. Kansai Ent. Soc., No. 4, p. 45, fig. 1, 1933.

*Pemphredon (Cemonus) diervillae* Iwata, Mushi, Vol. X, No. 2, p. 129, 1937.

♀. Black, highly polished, with brownish tibial spurs and tarsal claws; palpi dark brown. Head from above, with the sides behind eyes well-developed, rounded (Fig. 18, A); OOD twice, or slightly less than twice, as great as POD, OCD nearly 1.7 times as great as OOD. Head in front, with the inner margins of eyes slightly and roundly convergent below, the distance between eyes at the base of clypeus slightly less than as long as eye (ratio nearly 9:10). Clypeus (Fig. 18, B, C) not produced anteriorly, with the apical margin broadly and arcuately emarginated in the middle; in the middle of the emargination produced a short up-raised tooth which can more easily be observed from obliquely above than in front. Labrum seems to be longer than in other allied species. Mandibles stout, with, besides the 4 ordinary teeth, 2 additional small teeth on the inner surface near the base, one on upper, the other on lower surface; basal condyle well-developed. Antennae rather short, comparatively thick; relative length of the joint:—28:10:12:10:10:9:9:9:8:8:8:11. Mesonotum with the median longitudinal furrow fairly broad and comparatively deep, also with the parapsidal furrows well-defined. Posterior limb of area cordata clearly outlined on both edges. Petiole of abdomen 2-2.5 times as long as broad at the apex (*vide* Table 2) usually not reaching the apex of hind trochanter stretched backwards, its lateral view normal, not narrowed suddenly toward the base. Pygidial area bordered with well-defined carinae which are nearly parallel or slightly divergent anteriorly; the surface slightly excavated. It is nearly as wide as or slightly wider than the base of hind basitarsi. Fore wing with the 2nd recurrent nervure received by the cubital cell sometimes just at the base of the 1st transverse cubital

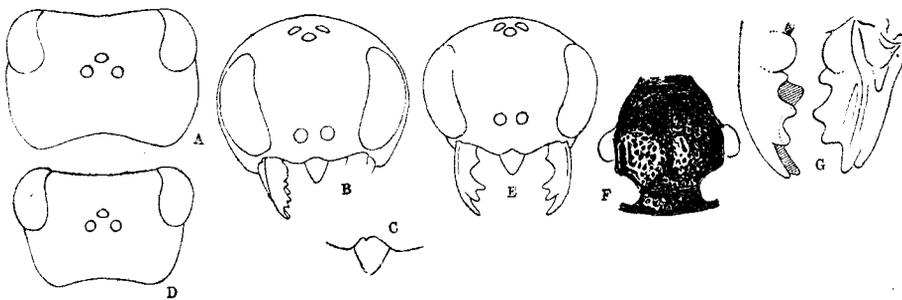


Fig. 18. *Pemphredon (Dineurus) diervillae* Iwata.

A, B....head (♀); D, E....do. (♂), C....Clypeus and labrum, F.... mesonotum, G....mandible (♀).

nervure (7 ex. out of 33). Hind tibiae with well-defined spines (usually 5 in number) on the outer surface. Vertex with sparse moderate-sized punctures, that are usually shallow and indistinctly outlined, but rarely considerably strong and deep. Temples similarly punctured, but near mandibles the punctures coarse and sometimes close. Frons more finely and very closely punctured or somewhat arcuately punctured-striate. Clypeus with sparse fine punctures. Mesonotum on the anterior portion slightly largely, closely and strongly punctured, the punctures usually transversely and subrugosely confluent, on the disc and on the posterior portion more sparsely but extraordinarily coarsely punctured, or more commonly, punctured-rugose. Punctuation on these portions variable in density according to the individual. Scutellum rather strongly punctured or transversely punctured-rugose. Area cordata with very coarse carinae that turn into subreticulation in the middle; posterior limb highly polished and clearly bordered on the posterior edge by a line of the very coarse, somewhat elongate punctures. Remainder of the segment coarsely punctured-rugose or rugosely punctured-reticulate. Apical segment of abdomen including area pygidialis with medium-sized punctures sparsely scattered.

♂. Ordinarily pubescent and pilose. Head from above strongly convergent posteriorly (Fig. 18, D); head in front: Fig. 18, E, relatively broader than in ♀. Clypeus with the anterior margin slightly produced and medianly rather broadly emarginated. The emargination is sometimes semielliptical, sometimes subtrapezoidal or subtriangular in form, with its

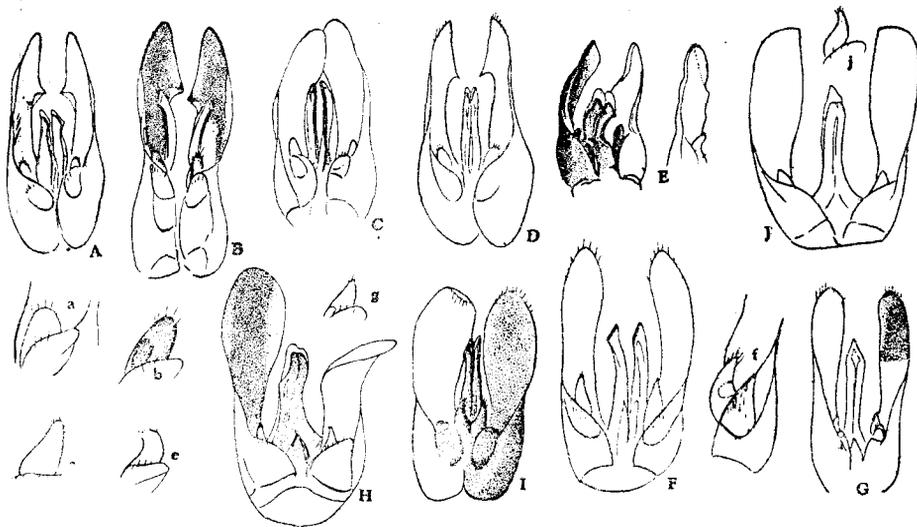


Fig. 19. Male genitalia.

A....*P. japonicus* Matusmura, a....volcella of do., B....*P. flavistigma* Thomson, b....volcella of do., C....*P. laeviceps* Gussak., c....volcella of do., D....*P. pacificus* Gussak., E....*P. montanus* Dahlbom, e....volcella of do., F....*P. intermedius* sp. nov., f....volcella of do., G....*P. shuckardi* A. Moraw., g....volcella of do., H....*P. unicolor wesmaeli* (A. Moraw.), I....*P. lethifer fabricii* M. Müller, J....*P. diervillae* Iwata, j....volcella of do.,

width between the lateral angles varying from half to two-thirds as broad as the lateral margin; the surface flattened or slightly convex in the middle. Antennae rather incrassate, joints 4-9 with a longitudinal keel on the outer margin, which is not so roundly produced as usually found in *lethifer* s. l. Abdominal sternites entirely black and without a transverse impression in front of the posterior margin of each segment. Mid metatarsi not bending. Genitalia: Fig. 19, J. Punctuation on vertex stronger and closer than in ♀, rather subreticulate; on mesonotum similar to ♀ but much closer in general; on scutellum irregularly subrugosely punctured. Other characters as in ♀. Length 5.8-6.8 mm.

*Habitat*: Japan (Houshu, Kyushu and Hokkaido).

*Specimens examined*: 28 ♀♀ 9 ♂♂, Hokkaido (Sapporo, Jōzankei, Sōunkyō and Akanuma near Hakodate); 4 ♀♀ 5 ♂♂, Honshu (The Kanto and Kansai districts); 1 ♀, Kyushu (Hikosan).

*Remarks*. This species is very distinct from other species, chiefly in the form of clypeus and in the very coarse punctuation on mesonotum. In the original description, the character of the clypeus is somewhat otherwise interpreted. But on examining an example of *diervillae* determined by Dr. Iwata, I was able to ascertain the presence of a small median tooth in the middle of the clypeal incision.

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