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ON THE LOCAL RACES OF ECTEMNIUS (HYPOCRABRO) SCHLETTERERI (KOHL, 1888) IN EASTERN ASIA (HYMENOPTERA, SPHECIDAE, CRABRONINAE)

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By K. Tsuneki

Abstract. Subspecies jakowlewi F. Morawitz (Siberia), horvatovichi Tsuneki (Korea), chinensis Sickmann (North China), japonicus nov. (Japan), sakaguchii Matsumura et Uchida (Okinawa Is.), ishigakiensis Tsuneki (Ishigaki Is.) and taiwanensis nov. (Formosa) are separated based mainly upon the colorific and sculptural distinctions.

After a lapse of 18 years since my examination of the type of Crabro sakaguchii Matsumura et Uchida I have recently reencountered the Okinawa race of Ectemnius (Hypocrabro) schlettereri (Kohl) and was surprised to find that my image of the subspecies sakaguchii became markedly changed and misled. I, therefore, determined to make the comparative studies of the local populations of Eectemnius schlettereri occurring in East Asia.

First of all I attempted to examine comparatively the colorific distinctions with the specimens in my cabinet which were considerable in number. According to the preparatory observations in these specimens the following parts of the body and appendages are always, with rare exceptions, constantly yellow maculated:

Antennal joint 1 (= scape), mandible (♀ only as a rule), collar and tubercle of pronotum, gastral tergites 2, 4 and 5, and all tibiae. While the following parts are variably (individually or locally) maculated: Axilla of mesoscutum, scutellum, prepectus of mesopleuron, postscutellum, gastral tergite 3, all femora and all metatarsi. Furthermore, in the specimens from certain localities the maculae on certain parts of the body and appendages that are variable in those from other localities (e.g. scutellum, postscutellum, prepectus, gastral tergite 3 etc.) are constant and certain parts that are constantly immaculated in other localities are constantly or variably maculated (e.g. male mandible, antennal joint 2, postspiracular area of mesopleuron, hind coxa etc.). Such maculae as above mentioned are valuable to find out the local races of the species. On the other hand, the quantitative variation in the constant maculae are also of use in statistics. After the preliminary studies I selected for this purpose the maculae on the pronotal collar, the mid tibia and gastral tergites 4 and 5. The criteria of developmental degrees of the pronotal collar and gastral tergites are given directly in the table, but for those relating to mid tibia some explanations are necessary, because for this segment different criteria are used between the sexes by reason of that in the present species the male is on the mid tibia as well as on other areas much less maculated than the female and the same standard can not well show the true feature of variation in each sex. The degrees are divided into three, namely, well, moderate and ill. In the female well means that the inner side is more than half of the total length yellow, moderate less than half yellow and ill whole the space of inner side black; while in the male in well the black of the inner side not expanded to whole the area (and outer side broadly yellow), in moderate the inner side wholly black and outer side broadly yellow, and in ill inner side ditto and the yellow on outer side narrow and or short.

The selected parts bearing yellow maculae and the individual numbers of the appearance or developmental degree of the maculae are given in table 1. According to the table it is at once perceived that the male is much less ma-

Table 1. Comparison of yellow mark frequencies of the local forms of Ectemnius (Hypocrabro) schlettereri (Kohl) occurring in Japan, Korea and Formosa.

		Japan pr.		Korea		Okinawa		Ishigaki		Formosa		Peking
		♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♂
Collar	Near band	11	1	17	1	2	-	?	-	12*	11*	-
	M > IS	58	11	22	6	-	-		1	-	-	1
	M = IS	16	25	-	2	-	-		-	-	-	-
	M < IS	1	47	-	1	-	-		-	-	-	-
	2 spots	-	49	-	-	-	2		-	-	-	-
Prepectus		6	-	2	-	-	-		-	12	11	-
Scutellum		10	-	21	-	2	-		-	12	11	1
Postscutellum		77	-	34	1	2	1		1	12	11	1
Axilla		1	-	1	-	-	-		-	12	11	1
Fore femur		8	4	17	6	2	-		-	12	11	1
Mid femur		6	-	18	1	2	-		-	12	11	-
Hind femur		-	-	-	-	-	-		-	12	11	-
M. tibia	Well	-	-	-	-	-	-		-	12	11	-
	Moder.	65	102	32	2	2	-		-	-	-	-
	Ill	21	29	7	8	-	2		1	-	-	1
	None	-	2	-	-	-	-		-	-	-	-
H. tibia	Well	3	-	7	-	-	-		-	12	11	-
	Moder.	59	2	27	-	2	-		-	-	-	1
	Ill	24	115	5	10	-	2		1	-	-	-
Fore metatarsus		34	-	28	-	-	-		-	12	11	-
Mid metatarsus		60	-	33	1	-	-		-	12	11	1
Hind metatarsus		77	5	35	3	-	-		-	12	11	1
Tergite 2	M > IS	1	5	11	10	-	-		-	12	11	1
	M = IS	16	21	27	-	-	-		-	-	-	-
	M < IS	69	103	1	-	2	2		1	-	-	-
	None	-	2	-	-	-	-		-	-	-	-
Tergite 3		2	4	26	8	2	2		1	12	11	1
Tergite 4	2 spots	3	57	-	-	-	-		-	-	-	-
	3-4 spots	2	14	-	-	-	-		-	-	-	-
	2 marks	68	24	4	-	-	-		-	-	-	-
	Near band	-	-	20	1	-	-		-	-	-	-
	Band	13	21	15	9	2	2		1	12	11	1
	None	-	17	-	-	-	-		-	-	-	-
Tergite 5	2 marks	10	59	-	-	-	-		-	-	-	-
	Band	76	74	39	10	2	2		1	12	11	1
Total specimens		86	133	39	10	2	2		1	12	11	1

Abbreviations: M = mark, IS = interspace, M. = mid, H. = hind, Moder. = moderate, T. = tergite.

Remarks. Special marking: (1) A pair of large lateral maculae on gastral tergite 1 in the Ishigaki population. (2) Yellow antennal joint 2 and yellow maculated male mandible in the Formosa population.

* **Mostly entire, without complete interruption in middle.**

culated than the female and that the Formosa population is the brightest maculated one, the Pekin is next to it (taking into consideration the sexual difference) and the Korea is less than the Pekin but much more richly maculated than the Japan which is the least maculated one of all. On the other hand, the island populations of the Ryukyus have special markings and or characteristic combination of markings of the thorax, gaster and the legs. Thus it is suggested that the populations of these areas may be respectively a local race. So in order to collect further and more steadfast evidences I examine the morphological characters of these population comparatively.

During the course I took notice of the fact that a marked variation was observed on the sculpture of the body, especially of the gastral tergites, among the individuals of the same population and the same sex. At first it was quite puzzling, but soon I found that the problem was simply and clearly solved by combining the variation with the collecting dates of the specimens, namely, those collected in spring or early in summer, that is to say, the 1st generation of the year, were much more finely and sparsely punctured on the gastral tergites than those collected in summer or august, the 2nd generation.

Table 2. Comparison of yellow mark frequencies (%) of the local and seasonal forms of Ectemnius schlettereri (Kohl) occurring in East Asia.

Seasonal form		Summer form																Spring form			
Part \ Loc.		Hokkaido		Honshu		Shikoku		Kyushu		Korea		Okinawa		Ishigaki		Formosa		Honshu		Korea	
		♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
Collar	Near band	-	-	13	1	-	-	50	-	46	33	100	-			100	100	-	-	25	-
	M > IS	71	50	68	8	75	7	50	-	54	67	-	-	100	-	-		71	8	75	57
	M ≒ IS	19	-	19	12	25	43	-	50	-	-	-	-	-	-	-		15	25	-	30
	M < IS	-	50	-	40	-	21	-	25	-	-	-	-	-	-	-		15	29	-	14
	2 spots	-	-	-	40	-	29	-	25	-	-	-	100	-	-	-		-	37	-	-
Prepectus		-	-	6	-	-	-	33	-	6	-	-	-			100	100	-	-	-	-
Scutellum		-	-	11	-	-	-	50	-	57	-	100	-			100	100	-	-	25	-
Postscutellum		86	-	95	-	100	-	100	-	91	33	100	50			100	100	30	-	50	-
Axilla		-	-	2	-	-	-	-	-	3	-	-	-			100	100	-	-	-	-
Fore femur		-	-	11	5	-	-	17	-	49	33	100	-			100	100	-	-	-	71
Mid femur		-	-	8	-	-	-	17	-	51	33	100	-			100	100	-	-	-	-
Hind femur		-	-	-	-	-	-	-	-	-	-	-	-			100	100	-	-	-	-
M. tibia	Well	-	-	-	-	-	-	-	-	-	-	-	-			100	100	-	-	-	-
	Moder.	71	100	82	84	100	93	67	75	91	67	100	-			-	-	30	37	-	-
	Ill	19	-	18	16	-	7	33	25	9	33	-	100	100	-	-	-	71	55	100	100
	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	8	-	-
H. tibia	Well	-	-	3	-	-	-	17	-	20	-	-	-			100	100	-	-	-	-
	Moder.	71	-	78	2	75	-	50	-	74	-	100	-			-	-	-	-	25	-
	Ill	19	-	19	98	25	-	33	100	6	100	-	100	100	-	-		100	100	75	100
Fore metatarsus		14	-	43	-	100	-	33	-	77	-	-	-			100	100	-	-	25	-
Mid metatarsus		57	-	78	-	100	-	50	-	89	33	-	-			100	100	15	-	50	-
Hind metatarsus		100	-	92	5	100	-	100	-	91	100	-	-			100	100	43	-	75	-
Tergite 2	M > IS	-	-	-	2	-	-	17	-	23	100	-	-			100	100	-	12	75	100
	M ≒ IS	14	-	15	12	-	7	33	25	74	-	-	-			-	-	57	33	25	-
	M < IS	86	-	85	85	100	86	50	75	3	-	100	100	100	-	-		43	55	-	-
	None	-	-	-	1	-	7	-	-	-	-	-	-	-	-	-		-	-	-	-
Tergite 3		-	-	-	-	-	-	33	-	74	100	100	100			100	100	-	-	-	71
T. 4	2 spots	-	50	3	50	25	43	-	50	-	-	-	-			-	-	-	25	-	-
	3-4 spots	-	-	-	14	-	7	17	-	-	-	-	-			-	-	15	-	-	-
	2 marks	100	50	85	16	75	-	33	-	9	-	-	-			-	-	43	33	25	-
	Near band	-	-	-	-	-	-	-	-	57	33	-	-			-	-	-	-	-	-
	Band	-	-	12	9	-	7	50	25	34	67	100	100			100	100	43	42	75	100
	none	-	-	-	11	-	43	-	25	-	-	-	-			-	-	-	-	-	-
T. 5	2 marks	100	-	3	43	-	86	17	50	-	-	-	-			-	-	-	29	-	-
	Band	-	100	97	57	100	14	83	50	100	100	100	100			100	100	100	71	100	100
Total specimens		7	2	62	89	4	14	6	12	35	3	2	2			1	12	11	7	24	4	7

In connection with the sculpture the marking patterns were also less developed in early appeared specimens than in the later. Such being the case it became obvious that the material for statistics must be separated not only upon the basis of the locality and sex, but also upon that of the appearance of the specimens. So I remade the comparative table upon such bases and, further, divided the Japanese population into four main islands groups according to their derivations to see whether or not there were some tendencies towards the differentiation as a group or some derivative connection with the adjacent localities. It is table 2. In the table, in order to make easier the comparison, the frequency is given by percentage, although the material from certain localities is too scanty.

According to the table (1) it is very clear that the summer form is more brightly maculated than the spring form in the Korean as well as in the Japanese population; (2) between the Japanese and Korean populations the same conclusion as led from table 1 is applicable not only to the summer form, but also to the spring form, strictly, however, except for the marking on the midleg in the male (it appears, however, that between the maculae on the pronotum and mid tibia there is a reverse correlation in the developmental degrees).

As to the Japanese specimens, among the populations of four main islands a slight change in the developmental degree of the yellow maculae is observed. The Hokkaido population shows somewhat a stronger tendency towards melanism than the Honshu one. This is possibly due to the northern climatic conditions, as better observed in the Siberia population. The Shikoku population, especially the males, also shows a similar tendency, but in this case the reason for this is unknown. While, the Kyushu population is more brightly maculated than the Honshu population, rather close to the Korea population in this regard. This is very remarkable fact and it may possibly be attributed to the closer geographic relationship.

Of the morphological characters, the racial differences are more easily observed on the sculpture than on the structure which is naturally very slight, if any, and frequently needs comparative measurements. The distinction of the sculpture in this species is much clearer on the gaster which is simply punctured than on the thorax-complex which is partly rugoso-punctate, punctate-striate or rugoso-striate. The head is simply punctured in the main, but according to the preparatory observation the variation is more irregular than on the gaster and can not be combined with any of the local, sexual or seasonal changes, at least with my material. I, therefore, used the gastral punctation as an important means of the sculptural comparison. Although there is a certain range of variation within a group which is presumed to be a local race from the colorific distinctions and sometimes even a considerable overlapping between such groups, yet there is a certain constant difference between them which is parallel to the macular characteristics. The delicate differences in punctuation is difficult to express by words, so I show the representative or averaged instances on tergites 1 and 2 (partim) by figures and give comparatively with these on the punctuation of sternite 2 which is also characteristically varied with the race. Besides the punctuation the longitudinal str-

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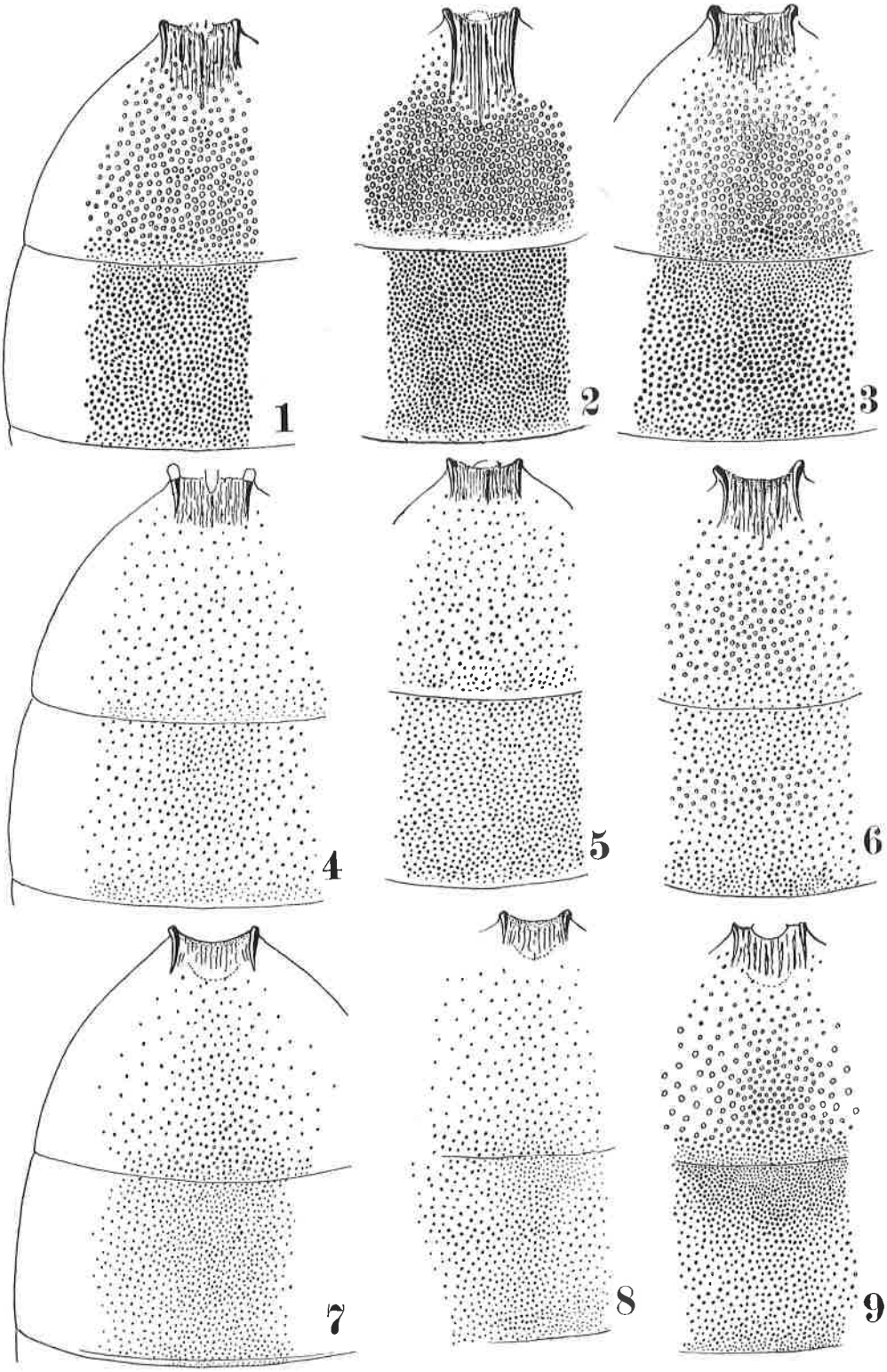
Figs. 1-9. Punctuation and sculpture of gastral tergites 1 and 2.

1. Summer form of the Korea population.
2. Summer form of the Japan population.
3. Summer form of the Formosa population.
4. Spring form of the Korea population.
5. Spring form of the Japan population.
6. Summer form of the North China population.
7. Summer form of the Okinawa population.(♀).
8. Ditto (♂).
9. Summer form of the Ishigaki population (♂).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iae filling the medio-basal depressed area of tergite 1 are also in some races in the relative length distinctive. Furthermore, during the course of successive examination of the specimens I took notice of the fact that the posterior margin of gastral tergite 1 was considerably variable in structure sometimes in close connection with the punctuation of sternite 2 and the degrees of variation were comparatively easily divisible. So it was determined that the variations of these characters were also added to the table of punctuation of gastral sternite 2. Thus, table 3 was resulted.

In this table, T. 1 bs. st. (tergite 1, basal striae) shows the relative length of the striae at medio-basal depressed area of tergite 1 to the total length of the tergite. T. 1 ps. mg. (Tergite 1, posterior margin) indicates the character of the posterior margin: Strl.C.L. (strongly constricted, lamellate, not punctured) = the margin with a considerable breadth strongly constricted, the constricted part becomes lamellate, without puncture and frequently slightly raised towards apex. Subcon.P. (subconstricted, punctured) = the margin fairly strongly constricted, but the part not lamellate, carrying somewhat finer (than on disc), distinct, close punctures. Weak.C.P. (weakly constricted, punctured) = the constriction weakly defined on posterior margin even at the medial area and the constricted part distinctly punctate, not lamellate. Non C.;P. (non constricted, punctured) = the posterior margin laterally slightly constricted, but at the medial area smoothly continued to the disc, without constriction, with the surface finely punctured. S. 2 Pt. (sternite 2, punctures) = the upper of the couplet shows the size and the lower the density of punctures, e. g. the top section means that the punctures on sternite 2 posteriorly smaller and closer, in type A, or B, or C; A and B as in Fig. 10, A and B respectively, C being other types than A and B, if in this case a small circlet is given in A- or B-section it shows that the punctuation is close to type A or B, or if between A and B, intermediate between A and B.

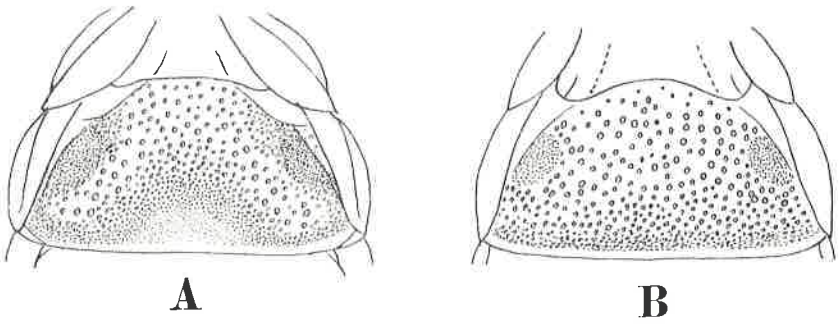


Fig. 10. Two types, A and B, of punctuation of gastral sternite 2 in the Japan population of Ectemnius schlettereri (Kohl), ♂.

Japan population. In the representative summer form in the female, punctures on T (= tergite) 1 large and close (laterally sparser) and T 2 small and dense, smaller and denser apically (Fig. 2), difference in size of punctures between T 1 and 2 is the largest of all populations observed. Very unique character of the population is that in the greater part of the specimens (♀ ♂) the posterior margin of T 1 is very strongly constricted, without puncture and lamellate. Similarly the longitudinal striae at the medio-basal depressed area are markedly long in this population (Table 3). Punctures on S (= sternite) 2 are distinctly smaller than those on T 1, but slightly larger than those on T 2 and very sparse, on medio-apical area much sparser, with only a few punctures

Table 3. Comparison of frequency (%) of the sculptural characters of the local and seasonal forms of Ectemnius schlettereri (Kohl) occurring in East Asia

Seasonal form		Summer form																Spring form			
		Hokkaido		Honshu		Shikoku		Kyushu		Korea		Pkg	Okinawa		Igk	Formosa		Honshu		Korea	
		♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♂	♀	♂	♂	♀	♂	♀	♂	♀	♂
T. 1. basal Striae	< 1/3												100	100	100						29
	≒ 1/3	14	100	-	16	-	44	33	50	14	33	-	-	-	-	-	45	57	56	100	43
	≒ 2/5	-	-	23	64	-	44	50	50	63	67	100	-	-	-	100	55	43	36	-	29
	≒ 1/2	43	-	62	20	100	12	17	-	23	-	-	-	-	-	-	-	-	8	-	-
	> 1/2	43	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. 1. ps. Mg.	Strl.C.L.	100	100	82	85	100	89	50	63	-	-	-	-	-	-	-	-	-	40	-	-
	Subcon.P.	-	-	12	15	-	11	50	37	20	67	-	-	50	100	100	100	43	44	75	71
	Weak.C.P.	-	-	3	-	-	-	-	-	49	33	-	-	-	-	-	-	14	8	25	14
	Non C.;P.	-	-	3	-	-	-	-	-	31	-	100	100	50	-	-	-	43	8	-	14
S. 2. Pt.	< T.1.Pt.	14	100	55	86	100	89	17	-	9	-	100	-	-	-	-	-	-	24	-	-
	≒ T.1.Pt.	86	-	45	14	-	11	17	33	91	100	-	-	-	-	100	55	100	40	-	-
	> T.1.Pt.	-	-	-	-	-	-	66	67	-	-	-	100	100	100	-	45	-	36	100	100
S. 2. Pt. Posteriorly	Smaller Closer A	-	100	-	86	-	89	-	67	-	33	-	-	-	-	-	-	-	40	-	-
	Smaller Closer B	-	-	-	14	-	11	-	33	-	67	-	-	-	100	-	-	-	60	-	-
	Smaller Closer C	29	-	-	-	-	-	-	-	-	-	100	-	100	-	-	82	-	-	-	43
	Smaller Sparser	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Similar Closer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	18	-	-	-	-
	Similar Similar	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Similar Sparser	43	-	43	-	-	-	33	-	40	-	-	-	-	-	25	-	-	-	25	57
	Larger Sparser	29	-	54	-	100	-	67	-	60	-	-	100	-	-	-	-	100	-	75	-
Specimens		7	2	62	89	4	14	6	12	35	3	1	2	2	1	12	11	7	24	4	7

Abbreviation. Pkg = Peking. Igk = Ishigaki. T. 1 = Tergite 1. S. 1 = Sternite 1. ps.Mg. = posterior margin. Strl.C.L. = Strongly constricted, lamellate (without puncture). Subcon.-P. = Subconstricted, punctured. Weak.C.P. = Weakly constricted, punctured. Non C.;P. = Non constricted; punctured. Pt. = Puncture.
Explanation. See text.

scattered, but in size everywhere almost unchanged or slightly larger posteriorly. In the summer male the punctuation of the tergites is generally similar to that of the female, but generally somewhat sparser; punctures on disc of S 2 are mostly smaller than on T 1, distinctly separable into two types, A and B as given in Fig. 10, mostly A, this is due to that type A is apparently linked together with the strong constriction of the posterior margin of T 1 (Table 3); basal striae of T 1 somewhat shorter than in the female, but longer than other populations.

In the spring form the female has the punctuation on T 1 and 2 as given in Fig. 5 and on S 2 punctures as large as those on T 1, rounded and sparse, much sparser on medio-posterior area; posterior margin of T 1 subconstricted or not constricted and medio-basal striae not so long as in the summer form. In the male the characters are generally as in the female, but T 1 in a considerable number constricted or subconstricted and the punctuation on S 2 belongs either to type A or to B according to the condition of the constriction of the posterior margin of T 1 (Table 3).

Korea population. In the summer female punctures on T 1 slightly smaller, on T 2 slightly larger and in both somewhat sparser than in the same seasonal form of the Japan population. As a result the difference in size betwe-

en T 1- and 2-punctures is smaller than in the Japan population; medio-basal striae of T 1 considerably long and posterior margin subconstricted, weakly constricted or completely without constriction, never lamellate and smooth. Punctures on S 2 as large as those on T 1, variable in density, but generally sparser on medial area than on the lateral and always slightly sparser posteriorly. In the male the punctuation is generally similar, but punctures on medial area of S 2 posteriorly smaller and closer. In Table 3 subcon.P. appears to be linked with type B of S 2 and weakC.P. with type A. In reality, however, this is not always the case. In the spring form (♀ ♂) dorsal punctuation and striae as in Fig. 4, generally much sparser and slightly smaller than in the spring form of the Japan population. Punctures on S 2 different between the sexes, though both larger than those on T 1, in the female posteriorly sparser and in the male variable, in about a half of them closer. In the male the basal striae are sometimes very short, the states of the posterior margin of T 1 generally as in the summer form.

North China population. Punctuation and striae of a male summer specimen from Peking as given in Fig. 7; punctures on T 1 and 2 relatively slightly smaller than those of the Korea population and somewhat sparser, on S 2 slightly smaller and as sparse as on T 1, with the type of punctuation between A and B above mentioned. Posterior margin of T 1 without constriction.

Okinawa population. Punctuation and striae: Fig. 7 (♀) and 8 (♂), punctures on S 2 in the female are not uniform in size, larger ones very much larger than those on T 1, with interspaces 2-3 times, in some places even 4-5 times as large as the puncture diameter; in the male generally similar, but somewhat more uniform in size and on medial area slightly finer and closer than on the lateral; medio-basal striae of T 1 (♀ ♂) except the lateral marginal carinae very weak and short, posterior margin mostly without constriction.

Ishigaki population. Punctures and striae: Fig. 9 (summer, ♂), characteristic in size and distribution on both tergites, whether or not it shows the constant character of the population is unknown. On S 2 punctures larger than on T 1 and considerably close, closer and larger laterally to become subreticulate, but finer and closer and weaker posteriorly, on medio-posterior area very fine and weak, and general appearance very close to type B of the Japan population.

Formosa population. Punctures on T 1 and 2 of the Formosa population is close to that of the Japan population as given in Fig. 3 (♀ ♂), but somewhat sparser; on S 2 as large as on T 1 and slightly sparser, but posteriorly finer and closer, difference from the Japan population in this respect, in particular in the female, is very marked. Moreover, the presence of the weak microsculpture on puncture-interspaces of S 2, not microcoriaceous, but transversely microrugulose, is very particular; medio-basal striae moderately long, posterior margin subconstricted in both sexes.

As to the gastral characters of the populations of four main Islands of Japan an account will be given under the subspecies of Japan.

Notes on some other structural variations

Besides the structure of the posterior margin of gastral tergite 1, the form of the clypeus, relative distance of interocular space at base of antenna, relative length of antennal segments, the convexity (or constriction at base and at apex) of gastral segments and the medial excavation of the caudal tergite (♂) are more or less variable in this species, and certainly upon the basis of the remarkable instances of these variable characters two forms as separate species have been described, namely, obstrictus Gussakovskij from the Ussuri Region and horvatovichi Tsuneki from North Korea.

Generally speaking, in the Korean specimens the antero-lateral oblique margin of the medial produced part of the clypeus slightly more acutely angled with the anterior margin than in the Japanese specimens, hence the clypeus appears narrower than in the latter. The convexity of the gastral tergites 1,

2 and 3 (especially 2) is considerably different individually among the specimens of the Japan and Korea populations and in the extreme case, for instance, horvatovichi, the specimen appears to be a different species. Statistically, however, it is connected with the normal one by many intermediate grades. The quantitative study may reveal that the frequency of such variations as above mentioned is different from one population to another.

THE LOCAL RACES OF ECTEMNIUS SCHLETTERERI (KOHL)

1. Ectemnius (Hypocrabro) schlettereri schlettereri (Kohl, 1888)

Crabro (Solenius) Schlettereri Kohl, Verh. zool.-bot. Ges. Wien, 38: 135, 1888 (♀).

In the type yellow are mandible except apex, antennal acape, medianly narrowly interrupted band of pronotal collar, tubercle, axillae, scutellum, postscutellum, lateral marks of gastral tergites 2, 3 (3 always small) and band of 4 and 5, marks at apex of each femur, all tibiae except inside and metatarsi. Punctures on gaster just as in persicus in both size and density (= tergite 1 sparsely, largely and 2 much more sparsely and finely punctured).
Locality: Tirol (St. Paul, bei Bozen).

Remarks. According to the description the type is in colour like the brightly maculated specimen of Korea and Japan, but not the brightest, since the prepectus and femora are not widely maculated, but the range of variation is unknown. In punctuation, however, distinctly different from the East Asiatic specimens.

2. Ectemnius (Hypocrabro) schlettereri jakowlewi (F. Morawitz, 1892)

Crabro (Solenius) Jakowlewi F. Morawitz, Horae Soc. Ent. Ross., 26: 170, 1892 (♀ ♂).
Crabro (Solenius) Schlettereri: Kohl, Ann. Naturh. Hofmus. Wien, 29: 72, 1915.
Crabro (Solenius) obstrictus Gussakovskij, Ark. Zool., 24 A, 10: 16, 1932 (♂).

Yellow in ♀: A line on mandible in front, antennal scape, lateral bands on pronotum, a small mark on each side of gastral tergites 2, 4 and 5, all tibiae in front and hind metatarsus; in ♂: Thorax wholly black or 2 small marks on pronotum and tubercle yellow; sometimes postscutellum yellow banded, antennal scape mostly light or dark brown, often wholly black; yellow marks on gaster: sometimes lateral marks on tergite 2 alone, sometimes lateral spots on 1 present and large lateral marks on 2 and band on 4 and 5 yellow, on legs tibiae on anterior side alone yellow and sometimes hind metatarsus yellow.

Punctuation in ♀: Abdomen more largely and closely punctured than in E. continuus, somewhat as in kriechbaumeri (= tergite 2 more finely and closely punctured than tergite 1), sternite 2 fairly closely and largely punctured! In ♂: posterior margin of gastral sternite 2 more or less closely and finely punctured. Gastral tergite 5, as well as 6, medianly distinctly excavated.

Remarks. According to the description E. s. jakowlewi represents the least maculated population ever known of schlettereri, having the range towards the melanism far surpassing that of the Korean and Japanese forms. This is well appeared on the colouration of antennal scape, pronotal tubercle and sometimes on gastral tergites 4 and 5 (sometimes maculae are lacking). It seems noteworthy that a pair of yellow spots sometimes appear on gastral tergite 1 of such melanic specimens and that all tergites other than 2 sometimes completely immaculated.

Crabro obstrictus Gussakovskij is considered a slightly more brightly maculated specimen of the Siberian form, having the strongly convexed gastral tergites and close to some form of the Korea population. But the punctuation

of sternite 2 is distinctly different.

♂. Orange yellow: Antennal scape, interrupted band on collar, large lateral marks on tergite 2, inconspicuous spots on 3 and narrow complete band on 4 and 5, fore femur at apex beneath, fore and hind tibiae externally with a yellow line and a spot at mid knee. Tergites 1-4 convex and towards posterior margin distinctly constricted. Tergite 1 sparsely and largely and at the depressed part of posterior margin densely very minutely punctured (= my subconstricted), on 2 punctures distinctly finer and denser, sternite 2 convex, with disc shining and very largely punctured, apical margin opaque, altaceous and discoloured. Habitat: the Ussuri Region.

This S. E. Siberian form may be dealt with as a distinct local race when the range of variation is investigated. The original author emphasized the difference in the tone of the yellow hue.

3. Ectemnius (Hypocrabro) schlettereri horvatovichi Tsuneki, 1974

Ectemnius (Hypocrabro) horvatovichi Tsuneki, Ann. Hist. Nat. Mus. Nat. Hung., 66: 373, 1974 (♂ ♀).

The Korea population. Differs from the Japan population on an average in that the maculae are slightly better developed, gastral tergite 1 subconstricted (s. Tsuneki), punctures on tergites 1 and 2 slightly sparser, with the difference in size slightly smaller. It differs also from the Siberia population in the much brighter maculation and in the pattern of gastral sternite 2 at least. As to the specimens examined see foot note of p. 11.

4. Ectemnius (Hypocrabro) schlettereri chinensis (Sickmann, 1895)

Crabro chinensis Sickmann, Zool. Jahrb. Syst., 8: 199, 1895.

The North China population. In the original description yellow in ♀ are mandible at apex, antennal scape, medianly interrupted band on pronotum, tubercle, scutellum, postscutellum, two lateral marks on tergite 2 (sometimes 3 with small lateral marks), complete or interrupted band on 4 and 5, fore and mid knees and all tibiae (with black mark on inside, in fore leg till base, in mid leg till 2/3 from below and in hind leg till half) and all metatarsi excepting dark brown apex. In ♂ except for the black mandible similar to ♀. Punctures on gaster: ♀, tergite 1 less closely, the following closely and finely punctured, sternite 2 distinctly, but not closely punctured; ♂, punctures stronger, tergites 6 and 7 more strongly punctured than the preceding segments, 7 with a small longitudinal impression as in continuus, sternite 2 distinctly, but not closely, the following very finely punctured. Loclity: suburbs of Tientsin.

Differs from the Korea population in that maculae are better developed, gastral tergite 1 without constriction at apex, punctures on tergites 1 and 2 slightly smaller and sparser, with the difference in size between them smaller. But comparatively narrow clypeus and posteriorly finer and closer punctuation on sternite 2 (♂) similar. As to the specimen see foot note of p. 11.

5. Ectemnius (Hypocrabro) schlettereri japonicus ssb. nov.

Crabro or Ectemnius schlettereri - specimens from Japan; Kohl, Iwata, Tsuneki, Leclercq and other Japanese authors.

The Japan population. According to Tables 2 and 3 the populations of the four main Islands of Japan are, in the high percentage of the strongly constricted, apically lamellate and impunctate, and basally very long striated gastral tergite 1, close punctuation of tergites 1 and 2 showing marked difference in size between them, characteristic punctuation of sternite 2 and moderately developed maculation (darker on the average than the Korea population), practically identical, forming a distinct subspecific entity, although the Kyushu population shows a close relationships to that of Korea.

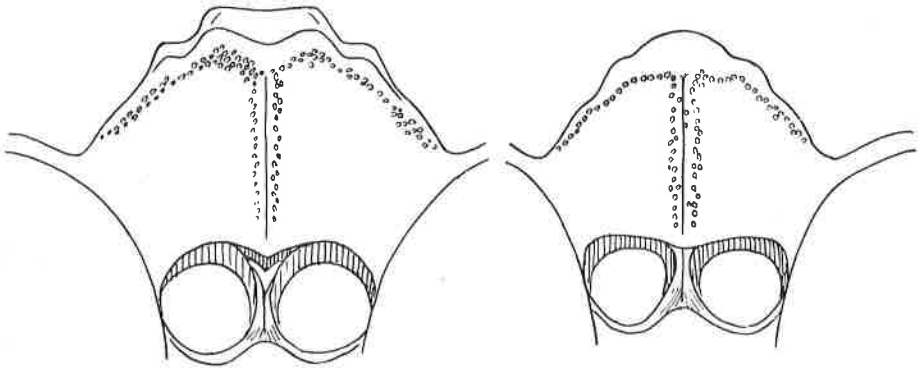
Holotype: ♂, Sabae, Fukui Pref., 30. VIII. 1956, K. Tsuneki leg.
Paratype: 1 ♀, Hossaka, Fukui Pref., 7. IX. 1962, K. Tsuneki leg.
Other specimens examined: 85 ♀ 140 ♂, Hokkaido (suburbs of Sapporo, Sounkyo), Honshu (Aomori, Iwate, Niigata, Ishikawa, Fukui, Tochigi, Saitama, Gifu, Mie, Okayama, Hiroshima), Shikoku (Kochi), Kyushu (Fukuoka, Kagoshima), IV, V, VI, VII, VIII, IX. 1930-72.

Remarks. Except for the gaster, the male is generally more coarsely and grossly sculptured than the female, especially on the propodeual sides and posterior aspect. Among the specimens collected in June some belong to the spring form and some to the summer form. One male specimen collected on July 10, 1954 in Simmei-cho, Fukui Pref. belongs distinctly to the spring form. Apparently the environmental factor that brings about these puncture differentiation is either the temperature or the humidity. But nothing decisive can be said about the matter at present. Certainly some of the spring form specimens show more or less tendency towards the summer form, suggesting that the cause is quantitative.

6. Ectemnius (Hypocrabro) schlettereri sakaguchii (Matsumura et Uchida, 1926)

Crabro sakaguchii Matsumura et Uchida, Ins. Mats., 1: 38, 1926 (♀).
Ectemnius (Hypocrabro) schlettereri sakaguchii: Tsuneki, Akitu, 8: 8, 1959.

In my 1959 paper I enumerated the differences of this subspecies (♀) from the Japanese specimens, of which important ones are (1) narrower medial protuberance of clypeus in both sexes (Figs. 11, 12), (2) narrower interocular space on lower frons, (3) brighter maculation (maculae somewhat whitish, having well developed maculae on collar, scutellum, postscutellum, gastral tergites 3, 4 and 5 (♀). According to the newly examined specimens below listed the following can further be added to the differences: (4) punctures on gaster much finer and sparser (Figs. 7, 8), (5) lateral protuberance of anterior margin of clypeus markedly stronger (Fig. 11), (6) medio-basal striae of tergite 1 much shorter and weaker, (7) gastral tergite 1 on posterior margin subconstricted and not lamellate.



Figs. 11 (♀) and 12 (♂). Clypeus of the Okinawa specimens.

Korean specimens observed: 39 ♀ 10 ♂, Keijô (Seoul), Valley Shôyô, Mt. Kodai, Mt. Temma, V, VI, VII, VIII, IX, 1942, 43, K. Tsuneki leg.
North Chinese specimen observed: 1 ♂, Peking, 21. X. 1938, K. Tsuneki leg.

Yellow marks in the female: Mandible at base, antennal scape, medianly very narrowly interrupted broad band on collar, tubercle wholly, scutellum and postscutellum both nearly wholly, lateral marks on tergites 2-3 (or 4), band on 4-5 (or 5 only), on 3 always small, an elongate mark from apex to underside of fore (long) and mid (short) femora, fore and mid tibiae on outer side largely, hind coxa in front and greater part of hind tibia. Yellow in the male: Antennal scape in front narrowly, medianly broadly interrupted narrow band on collar, tubercle, a vestigial line on postscutellum (sometimes lacking), lateral marks on gastral tergites 2-4 (on 3 smallest), a band on 4, a patch on outer side at apex of fore femur, basal half of outer side of all tibiae.

Specimens examined: 2 ♀ 2 ♂, Chizuka, Okinawa Is., VII-IX., G. E. Bohart and C. L. Harnage leg. (Coll. Calif. Acad. Sci.).

7. Ectemnius (Hypocrabro) schlettereri ishigakiensis Tsuneki, 1972

Ectemnius (Hypocrabro) schlettereri ishigakiensis Tsuneki, Etizenia, 59: 19, 1972 (♂).

Characteristic in the gastral maculae (tergites 1-4 with lateral maculae, on 1 and 3 comparatively well developed, not vestigial) and in the punctuation of tergites 1 and 2 (Fig. 9). Tergite 1 with basal striae short, not strong, with apex subconstricted, finely closely punctured. Punctures on sternite 2 as in type B (Fig. 10). Tergites 2 and 3 fairly strongly convex.

Specimen examined: 1 ♂ (type), Nosoko, Ishigaki Is., 1. VIII. 1969, T. Tano leg.

8. Ectemnius (Hypocrabro) schlettereri taiwanensis ssp. nov.

Ectemnius (Hypocrabro) schlettereri sakaguchii: Tsuneki (nec Matsumura et Uchida, 1926), Etizenia, 15:7, 1966; Ibid., 30: 3, 1968; Ibid., 51: 2, 1971; Haneda, Life Study (Fukui), 15: 32, 1971; Ibid., 16: 6, 1972; Murota, Ibid., 17: 118, 1973; Leclercq, Bull. Ann. Soc. R. Belg. Ent., 109: 298, 1973.

Characteristic in the brightest maculation of all the local races of the present species ever known (in ♀: antennal joints 1 and 2 wholly, prepectus largely, axilla, tergite 3 and all femora always broadly yellow; band on collar not completely interrupted in middle, marks on scutellum and postscutellum occupy nearly whole the areas, lateral marks on tergite 2 always broader than the interspace and the bands on 4 and 5 very thick and broad) Punctures on tergites 1 and 2: Fig. 3, tergite 1 with basal striae moderately long, at apical margin subconstricted, but not lamellate, punctures on sternite 2 as large as those on tergite 1, similar in size and sometimes slightly sparser, sometimes slightly closer towards apex. Maculae in ♂: mandible at base, antennal joint 1 wholly, 2 beneath yellow, all the other thoracic, gastral and legs' maculae as in the female, but somewhat less developed.

Clypeus with medial produced part narrower than in the Japanese specimen but wider and with antero-lateral protuberance less strong than in the Okinawa specimen. Minimum interocular distance at above antennal sockets relatively narrower than in the Japanese specimen, but wider than the Okinawa's.

Localities of the specimens: Prefectures Nantou, Chiai and Ilan.

Holotype: ♂, Tahnan, Nantou Pref., 20. VIII. 1968, K. Tsuneki leg.

According to Leclercq (1963) the occurrence of the following populations is known:

9. South China population.

10. North Viet-Nam population.

11. North Pakistan population.

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