Kontyû, Tokyo, **45**(3): 360–371. September 25, 1977

Recombination of Sexes among Four Species of *Psen* (Hymenoptera, Sphecidae) Occurring in Japan

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Synopsis Basing on the distributional and the morphological comparison the following new combinations of sexes are proposed:

(1) *Psen hakusanus* TSUNEKI, 1959 ♂ —— *P. ohnonis* TSUNEKI, 1973 ♀.

(2) *Psen ohnonis* TSUNEKI, 1973 ♂ —— *P. koreanus* TSUNEKI, 1959 ♀.

(3) *Psen hakusanus* TSUNEKI, 1959 ♀ —— *P. affinis*: TSUNEKI, 1959 ♂ (partim).

The species recombined are designated as (1) *Psen affinis* GUSSAKOVSKIJ, 1937, (2) *Psen koreanus* TSUNEKI, 1959 and (3) *Psen seminitidus bettoh* ssp. nov. In connection with the alteration and reinvestigation *Psen alticola* sp. nov., *P. affinis atayal* ssp. nov. and *P. seminitidus attenuatus* ssp. nov. are described.

It is sometimes very difficult to determine the sex combination of a species in the genus *Psen*, because of the complete lack of the bioloigcal evidence, the marked sexual dimorphism, the occasional close resemblance between species and the uneasiness of collecting a sufficient material, especially the microdistributional data. There are certainly some questionable instances of the sex combination among species of the genus in Japan. The present paper deals with the corrections of some of such instances, together with the nomenclatorial problems that are necessarily brought about by the procedure.

On this occasion I thank Messrs. Y. HANEDA, H. SUDA, T. NAMBU, H. ITAMI, H. OKUNO, T. TANO, H. KUROKAWA, T. MUROTA and Miss C. NOZAKA for their king help in affording me the valuable material or information.

Judging from the distributional data accumulated since the publication of my first paper on the genus in 1959 it seems highly probable that the so-called *Psen ohnonis* ♀ is the true female of *P. hakusanus* ♂ (Table 1). The fact has been noticed not only by myself, but also independently by two Japanese Sphecidologists, Messrs. Y. HANEDA and H. SUDA, and they communicated their opinions to me. Recently I could have time to reexamine comparatively with particular care the non-sexual characters of the specimens of *P. hakusanus* ♂ and so-called its ♀ and *P. ohnonis* ♂ and so-called its ♀. The result is given in Table 2. It shows distinctly even in the morphological distinctions the closer affinity of so-called *P. ohnonis* ♀ to *P. hakusanus* ♂ than to *P. ohnonis* ♂ and, at the same time, the greater resemblance of *P. hakusanus* ♂ to *P. ohnonis* ♀ than to so-called its ♀. Thus the new sex combination above suggested seems to be decisive.

There arise naturally the problems as to what are the true opposite sexes of *P. hakusanus* ♀ and *P. ohnonis* ♂. It can not simply be accepted, however, to

Table 1. Data for the distribution of the four related species (s. TSUNEKI, 1959, 1973) of *Psen* (*Psen*) of Japan and Korea.

Locality	*affinis*				*hakusanus*	*ohnonis*		*koreanus*	
	♀A*	♀B····♂C ①		♂D····♀ ②		♂·····♀* ③		♂·····♀ ④	
Hok. Sôunkyô	4	10	8	—	—	1	4	—	
Jôzankei	3	3	1	1	—	—	1	—	
Mt. Hakodate	—	5	1	—					
Hon. Mt. Towada	4	—	—	—	1	2	4	—	
Mt. Shirouma	—	—	7	5	—	5	—		
Mt. Norikura	—	1	1	—					
Mt. Haku	7	16	113	13	6	10	7	—	
Mt. Akato[1)]	7	1	—	—	—	9	7	—	
Mt. Arashi[1)]	21	—	—	—	—	2	21	—	
Mt. Taniyama[1)]	2	—	—	—	—	2	2	—	
W. m. Fukui	—	—	—	—	—	—	—	1	4
Oku-Nasu	—	2	2	1	—	1	—	—	
Suganuma	1	5	25	—	—	1	—		
Oku-Nikkô	—	13	31	—	6	1	—		
Oku-Chichibu	5	11	8	—	1	6	5	—	
Shôsenkyô[2)]	1	—	—	—	—	1	1	—	
Mt. Amari[2)]	2	—	—	—	—	1	2	—	
Mt. Nishizawa[2)]	1	—	—	—	—	1	1	—	
Mt. Momijidai[2)]	4	—	—	—	—	2	4	—	
S. Japan Alps[3)]	—	1	12	—	1	—	—		
Mt. Fuji	—	—	—	9	—				
Shik. Mt. Tsurugi	1	—	—	21	2	1	1	—	
Kor. C. N. Korea	1	—	—	1	—	—	1	—	

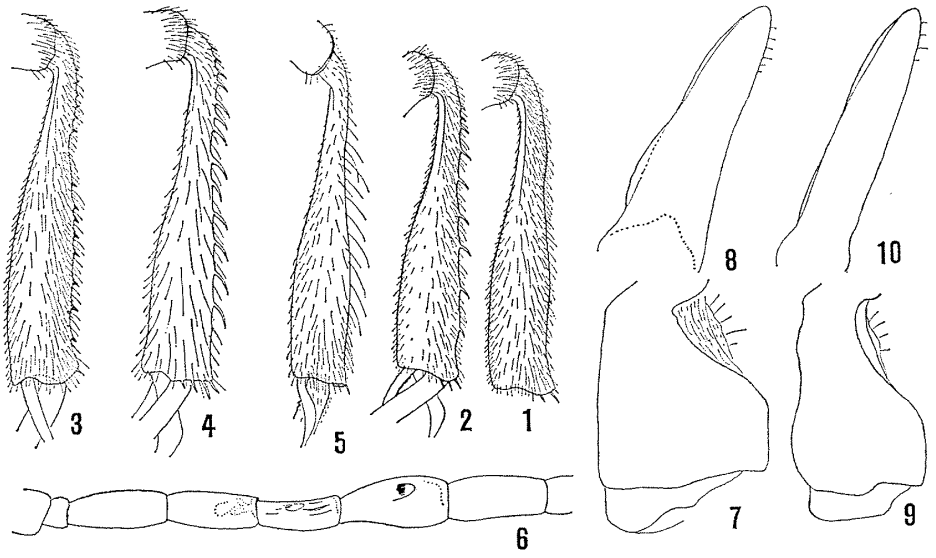
Remarks. Data having one sex alone are omitted. *affinis* ♀A*=*ohnons* ♀*. Encircled number shows a new combination. ①=*alticola* sp. nov. ②=*seminitidus bettoh* ssp. nov. ③=*affinis* GUSSAKOVSKIJ. ④=*koreanus*. Hok.=Hoddiado. Hon.=Honshu. W. m. Fukui=Western montanic region of Fukui Pref. Shik.=Shikoku. Kor. Korea. C.=Central. 1) Eastern montanic region of Fukui Pref. 2) Yamanashi Pref. 3)=Dentsuku Pass (2000 m).

combine them together, since they are distinctly different from each other not only in the morphological characters, but in the frequency of their occurrences also (Tables 1 and 2).

As to *P. ohnonis* ♂ the problem has simply been solved. In the course of the reexamination of the material I have found out from among my reserved specimens an undetermined female which did not belong to any known Japanese species and which is very close in the non-sexual characters to *P. ohnonis* ♂. It was collected in the locality not far from that of the type of *P. ohnonis* (♂), the sole specimen known up to that time, and similarly in the low montanic region. There seemed to be no question as to combining them together. Further investigation revealed that the species to which the specimen was to be ascribed was

nothing else than *P. koreanus* m., 1959, a species (♀) known from Central Korea and hitherto unrecorded from Japan. More recently the validity of the new combination was confirmed by the discovery of 3 ♀ 1 ♂ specimens of the species collected near the second locality above mentioned and 1 ♀ 1 ♂ of which were captured even at the same time.

On the other hand, as to the male of so-called *P. hakusanus* ♀, however, there is no other allied species in Japan that is known by the male sex alone. It is suggested, therefore, that the true male of the species in question is very close to some other species and has been confused with it, because so-called *P. hakusanus* ♀ is not very rare, though not always abundant, and there is no reason to presume that the male has not been collected.



Figs. 1–10. 1, 2, 4, 6–10. *Psen affinis* s. TSUNEKI (1=♂D, 2=♂C, 4=♀A, ♀B). —— 3, 5. *Psen hakusanus* (3=♀, 5=♂). —— 1–5. Hind tibia. —— 6. Joints 1–8 of abnormal antenna. —— 7, 9. Male genitalia, basiparamere (lateral). —— 8, 10. Do., paramere (dorsal).

Of the specimens in my cabinets those of *P. affinis* ♂ were markedly large in number and a doubt was thrown upon them as to whether or not the males in question had gotten mixed among them, since the species was similar in bodily punctuation to so-called *P. hakusanus* ♀ and it occurred in some localities in sympatric with the females of this species.

P. affinis ♂ has been believed to form a well integrated group, having marked characteristics in the locations of the antennal tyloidea and the apical tuft of pubescence of the abdominal sternite and, therefore, all the other minor differences among the specimens have been considered intraspecific variations. I reexamined these slight differences in order to find out whether or not they were constant to certain groups and, further, whether or not they were parallel to the differences

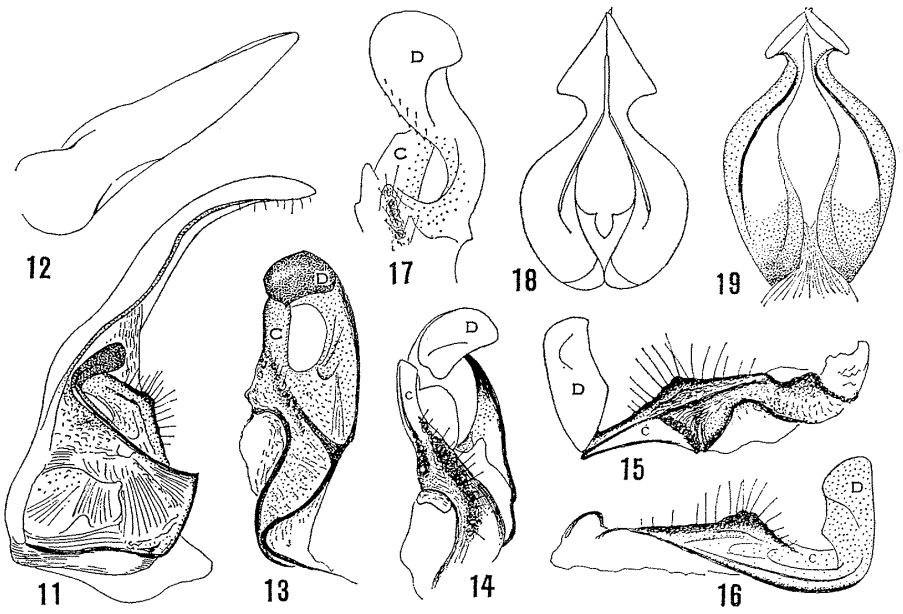
Table 2. Selected non-sexual characters of the four related species (s. TSUNEKI, 1959, 73) of *Psen* (*Psen*) in Japan.

Character	*affinis*			*hakusanus*		*ohnonis*		*koreanus*	
	♀A*	♀B·····♂C ①		♂D·····♀ ②		♂·····♀* ③		♂·····♀ ④	
(Number examined)	83	78	224	51	17	67	83	2	4
Postocellar furrow	Weak	Weak	Weak	Deep	Deep	Weak	Weak	Deep	Deep
Raise behind POF	None	Weak	Weak	Clear	Celar	None	None	Clear	Celar
IAC lateral end[1]	Off	Off	Off	Off	Off	Off	Off	Touch	Touch
IAC top angle	<90	<90	<90	<90	<90	<90	<90	>120	>120
Frons punctuation	Fi, cl	Fi, de	Fi, de	Fi, cl	Fi, cl	Fi, cl	Fi, cl	L, sp	L, sp
Frons rugosity	Weak	Strong	M-str	Weak	Weak	Weak	Weak	None	None
M-sctum puncture	Large	Fine	Fine	Fine	Fine	Large	Large	Large	Large
〃 IS: PD	IS≦PD	IS>PD	IS>PD	IS>PD	IS>PD	IS≒PD	IS≦PD	IS≦PD[2]	IS≦PD
Petiole beneath	None	Keel	Keel	Keel	Keel	None	None	None	None
H-tibia spinosity	Long[3]	Long[3]	Long[4]	None[5]	Short[6]	Weak[7]	Long[3]	None[5]	Short[6]
F-, M-tarsi colour	D-br	D-br	D-br	Ferr	Ferr	D-br	D-br	F-wh	F-wh

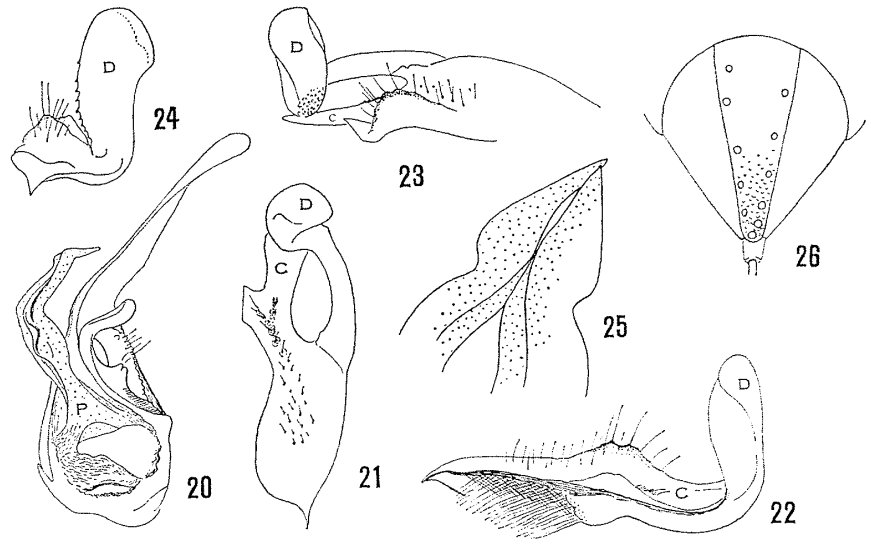
Remarks. Encircled numbers show the new combinations: ①=*alticola* sp. nov. ②=*seminitidus bettoh* ssp. nov. ③=*affinis* GUSSAKOVSKII. ④=*koreanus* m. *affinis* ♀A*=*ohnonis* ♀*.

Abbreviations: POF=Postocellar furrow. IAC=Internatennal carina. M-scutum=Mesoscutum. IS=Interspace. PD=Puncture diameter. H-tibia=Hind tibia. F-, M-tarsi=Fore and midtarsi. Fi=Fine. de=dense. cl=close. L=Large. sp=sparse. M-str=medium to strong. D-br=Dark brown. Ferr=Ferruginous. F-wh=Ferruginous white.

1) Whether it starts directly from the rim of antennal socket (touch) or from a short distance apart from it (off). 2) Along scutal lines and side IS<PD and on disc IS>PD. 3) Fig. 4. 4) Fig. 2. 5) Fig. 1. 6) Fig. 3. 7) Fig. 5.



Figs. 11–19. *Psen affinis* s. TSUNEKI, ♂D (=*P. seminitidus bettoh* ssp. nov., ♂), genital organs (C, cuspis and D, digitus of volsella). —— 11. Dissected right half seen from inside (penis valve removed). —— 12. Paramere (dorsal). —— 13. Left volsella (ventral). ——14. Do. (from beneath and somewhat from outside). —— 15. Do. (from outside). —— 16. Do. (from inside). —— 17. Do. (from beneath and somewhat from inside, showing denticles on the digitus). —— 18. Penis valve (dorsal side from apex, the body is curved, doubled line are ridges). —— 19. Do. (from beneath, thick black lines are ridges).



Figs. 20–26. —— 20–25. *Psen affinis* s. TSUNEKI, ♂C (=*P. alticola* sp. nov., ♂), genital organs. —— 26. *P. seminitidus attenuatus* ssp. nov., ♀, caudal tergite. —— 20. Dissected right half seem from inside. —— 21. Left volsella (ventral). —— 22. Do. (from inside). —— 23. Do. (from outside and somewhat from above. —— 24. Do. (from base beneath and somewhat from inside, showing the denticles on digitus). —— 25. Apical part of penis valve.

of the non-sexual characters between the females of *P. hakusanus* and *P. affinis*. As a result it was discovered that there were two groups of the male specimens in *P. affinis* sens. TSUNEKI, 1959, namely, one had the slightly longer flagellar joints of the antennae, the well-developed inter- and post-ocellar furrows, the vertex somewhat roundly raised behind the postocellar furrow and the hind tibiae without the longitudinal row of spinules on outer side (cf. Fig. 1), while in the other *vice versa* (as to hind tibia see Fig. 2). The first three of these character differences were parallel to those between the females of so-called *P. hakusanus* and *P. affinis* and the fourth could also be said subparallel, since in the former the spinules were very short (Fig. 3) and frequently apically subtruncate, while in the latter they were always long, curved, attenuated and pointed apically (Fig. 4). Thus it seems rather natural to combine together the first group of *P. affinis* ♂, sens. TSUNEKI, 1959 (=♂D in Table 2), with so-called *P. hakusanus* ♀, because there is no contradiction in other respects of the two forms concerned. Microdistributional data, however, except for a few instances, do not always give evidence for their sympatric occurrence. But at the County level they always support the probability of the new combination. The fact is possibly due to the rather rare occurrence of this spceis. I then took out the genital organs from three specimens of each group and compared. At a glance it was easily perceived that in the first group the organs were very much thicker and robuster than in the second at the part of basiparamere and broader at the part of paramere (Figs. 7, 8, cf. Figs. 9, 10). As to the dissected and separated parts the volsella is somewhat different in form between the two (Figs. 13 and 21), but the form may be variable according to the treatment and condition during the operation. The denticles on the inner side of the digitus of the volsella appear also somewhat different in distribution. But the state could not be confirmed in detail. Generally speaking, the structures of volsella and penis valve are not so much different from each other group in the essential characters as to merit a special mention (Figs. 11–19 and 20–25). But the difference in size as a whole is considered important.

As for the remaining male and female specimens of *P. affinis* sens. TSUNEKI, 1959, there is no question to combine them together, in view of their sympatric occurrence and the close resemblance of their non-sexual distinctions. However, with respect to the correct name of the species there is a problem which is discussed in relation to *P. ohnonis* ♀.

On the nomenclatorial problems

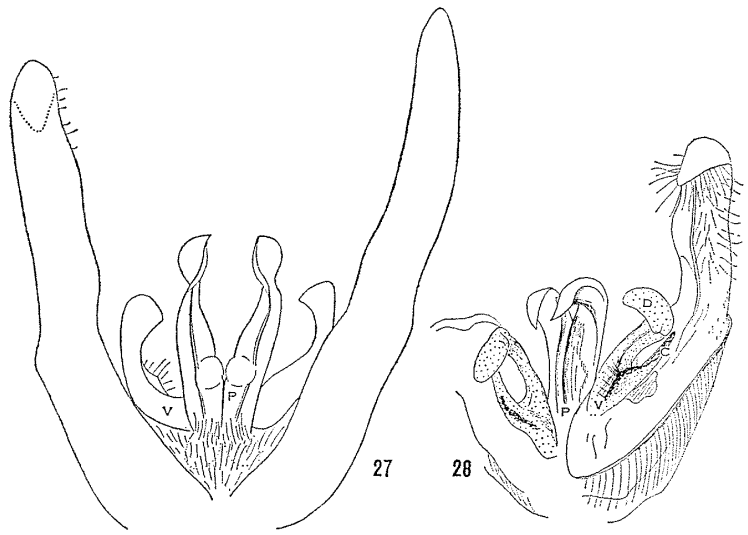
In the following, in order to make easy the explanation and to avoid the confusion, the name of each new combination finally concluded is given first, with the main references to it and then the consideration led to the conclusion is related in some detail. In succession some important characters of the species, supplemental to Table 2, specimens examined, designation of the types in case of the new taxon and some remarks when necessary etc will be mentioned.

1. *Psen (Psen) affinis* GUSSAKOVSKIJ, 1937 (*P. hakusanus* ♂ — *P. ohnonis* ♀)

Psen (s. str.) *affinis* GUSSAKOVSKIJ, 1937, p. 652 (♀, Ussuri).
Psen (*Psen*) *affinis*: TSUNEKI, 1959, p. 65 (♀, partim, nec ♂, Japan and Korea).
Psen (*Psen*) *hakusanus* TSUNEKI, 1959, p. 72 (♂, nec ♀, Japan).
? *Psen* (*Psen*) *affinis affinis*: LITH, 1965, p. 44 (? partim).
Psen (*Psen*) *hakusanus seminitidus*: TSUNEKI, 1966, p. 6 (♂, Formosa).
Psen (*Psen*) *ohnonis*: TSUNEKI, 1973b, p. 23 (♀, Japan).

At the time of recombining *P. ohnonis* ♀ with *P. hakusanus* ♂ I attempted the detailed reexamination of the original description of *P. affinis* GUSSAKOVSKIJ (♀) in order to confirm which of the two forms of *P. affinis*: TSUNEKI, 1959 (Table 2, ♀A and ♀B) was the true female of the species, since *P. ohnonis* ♀ was formerly split from *P. affinis*: TSUNEKI (=♀A in the Table). If *P. ohnonis* ♀ is really different from *P. affinis* GUSSAKOVSKIJ, as was considered at that time, the species newly combined is to be called *P. hakusanus* TSUNEKI, because the type of *hakusanus* is the male and it precedes *ohnonis*. In the original description of *P. affinis*, however, there is no explanation on the character of the ventral side of the abdominal petiole which is decisive to separate ♀A (=*ohnonis* ♀) from ♀B. But the punctuation on the mesoscutum is given in detail: "mesonoto multo nitidus, non crassius, sed multo densius quam in *P. atro* Fb. punctato, interstitiis puncta non lateoribus". This is just corresponding to ♀A of *P. affinis* s. m. and it becomes doubtless that the present species is the true representative of *P. affinis* GUSSAKOVASKIJ. On the other hand, *P. hakusanus* is to be suppressed as a synonym of the species.

Characters additional to those of Table 2 (now combination ③). Area dorsalis semicircular on posterior margin, recurrent vein 2 interstitial, sometimes



Figs. 27–28. *Psen hakusanus* ♂ (=*P. affinis* GUSSAKOVSKIJ ♂), genital organs. —— 27. From above. —— 28. From beneath.

subinterstitial (mostly slightly postfurcal) (♀ ♂); pygidial area slightly broader than in ♀B, distinctly microcoriaceous all over and coarsely punctured along lateral margins, hind tibial spines as in Fig. 4 (♀); antennal joints 3–10 (rarely also 11) with tyloidea, each slightly broad, smooth and shining and somewhat ferruginous in colour, hind tibia: Fig. 5, with hairs on outer margin long and bristle-like; genital organs: Figs. 27, 28 (♂).

Specimens examined. 72 ♀ 51 ♂, Japan (S. and C. Hokkaido, Aomori, Iwate, Toyama, Ishikawa, Fukui, Nagano, Gumma, Tochigi, Saitama, Yamanashi, Kanagawa, Shizuoka, Kyoto and Ehime Prefs.; 1 ♀, N. Korea (Daitaku), 22. VII. 1943, K. TSUNEKI leg.

Remarks. In connection with the determination of the species name I reexamined two N. Korean specimens that were formerly recorded as *P. affinis*. The female corresponded to *P. ohnonis*, namely, the present species, while the male belonged to ♂D, namely, *P. seminitidus* later explained. On the other hand, similar reexamination of the male specimen from Formosa that was reported under the name, *P. hakusanus* (TSUNEKI, 1966) revealed that it was to be considered to belong to another undescribed subspecies, having the antennal joints relatively slightly longer, with the tyloidea located on joints 3–12 (but the punctuation, characters of the abdominal petiole and pubescence tufts on sternites of abdomen were similar to those of the specimens from Japan):

Psen (*Psen*) *affinis atayal* ssp. nov.

Holotype: ♂, Sungkang, Nantou Pref., Formosa, 1. V. 1965, T. SHIRÔZU leg. (Coll. TSUNEKI).

Psen (*Psen*) *affinis affinis*: LITH, 1965, may be identical with *P. affinis*: TSUNEKI, 1959, since it is presumed that he examined the specimens sent by me. But he says clearly "petiole with ventral keel". It shows that the specimens examined by him at least are not *P. affinis* designated here ,but *P. alticola* later described. If the account is based upon the type specimen (♀), however, *P. alticola* comes to be a synonym of *P. affinis* GUSSAKOVSKIJ and the present species must be called *P. hakusanus* m. But, judging from his account it seems that this is not the case.

2. *Psen* (*Psen*) *koreanus* TSUNEKI, 1959
(*P. ohnonis* ♂ — *P. koreanus* ♀)

Psen (*Psen*) *koreanus* TSUNEKI, 1959, p. 73 (♀, Korea).
Psen (*Psen*) *koreanus*: TSUNEKI, 1965, p. 167 (ssp. *formosanus* TSUNEKI, ♀, Formosa).
Psen (*Psen*) *ohnonis* TSUNEKI, 1973a, p. 9 (♂, Japan).

There is no problem as to adopting *P. koreanus* for the present combination. The non-sexual characters common to both sexes are ample enough to combine them together, especially the mode of connection of the interantennal carina with the rim of the antennal sockets is quite peculiar to the present species. Further, they are sympatric in nature.

Characters to be supplemented. Punctures on vertex markedly sparse, with

the surface, especially on the lateral areas, broadly without puncutre and shining, those on mesoscutum larger than in *P. affinis* or *P. seminitidus*. Area dorsalis close to triangle in form, not semicircular on posterior margin as in other species, recurrent vein 2 always slightly antefurcal, received by cubital cell 2 (♀ ♂); pygidial area smooth and polished, no trace of microreticulation except the finely plicate apical part and strongly and sparsely punctured along lateral margins; short spines on hind tibia as in Fig. 3, but very frequently they are truncate at the apices (♀); antennae without tyloidea and abdominal sternites 3 and 4 carry a tuft of pubescence on each apical margin in middle (♂).

Specimens newly examined. 1 ♂, Hotokebara, Ohno, Fukui Pref., 2. VIII. 1972, Y. HANEDA leg.; 1 ♀, Mt. Hino, Fukui Pref., 18. VIII. 1973, K. TAUNEKI leg.; 1 ♀, Sinjô, Wakasa, Fukui Pref., 26. VIII. 1970, T. TANO leg.; 1 ♀ 1 ♂, the same place, 31. VII. 1973, H. KUROKAWA and C. NOZAKA leg.; 1 ♀, Mt. Sanjusangen, Wakasa, Fukui Pref., 12. VIII. 1974, H. KUROKAWA leg.

Remarks. The female of the present species is very close to *P. seminitidus* (=*hakusanus* ♀) and at the moment of description of *P. koreanus* it was doubted whether it was a local race of *hakusanus* or not. The discovery of the male having marked different characters and the fact of their sympatric occurrence have made it doubtless that *P. koreanus* is a distinct species. The female specimens from Japan differ from those of Korea only in that the pygidial area is more narrowly and faintly ferruginous on apical portion and there is no need of errection of a different subspecies for the Japanese representative.

3. *Psen (Psen) seminitidus bettoh* ssp. nov.
(*Psen affinis* ♂D — *P. hakusanus* ♀)

Psen kohli GUSSAKOVSKIJ, 1934, p. 7 (♀, China: Tibet and Kansu)
Psen (s. str.) *kohli*: GUSSAKOVSKIJ, 1937, p. 31 (do.).
Psen (*Psen*) *affinis*: TSUNEKI, 1959, p. 65 (♂, partim, nec ♀, Japan and Korea).
Psen (*Psen*) *hakusanus* TSUNEKI, 1959, p. 72 (♀, nec ♂, Japan).
Psen (*Psen*) *seminitidus* LITH, 1965, p. 40 (♀, nom. nov. for *kohli* GUSSAKOVSKIJ, nec FOX, 1898).
Psen (*Psen*) *hakusanus seminitidus*: TSUNEKI, 1967, p. 2 (♀, Formosa); LITH, 1968, p. 119 (2 ♀, Formosa, leg. H. SAUTER).

P. seminitidus LITH, 1965 (♀) is a new name for *P. kohli* GUSSAKOVSKIJ, 1934, nec Fox, 1898. *P. hakusanus* TSUNEKI, 1959, is first described as a separate species from *kohli*, basing mainly on the different sculpture of the area pygidialis in the female and later found to be in a subspecific relationship with *P. seminitidus*. As a result, *seminitidus* was sunk to a subspecies of *P. hakusanus*. Now, *P. hakusanus* ♂ (type sex) has been synonymized with *P. affinis* GUSSAKOVSKIJ, 1934, as an opposite sex and the name becomes suppressed. Consquently *seminitudus* recovered its original status.

According to the original description of *P. kohli* GUSSAKOVSKIJ the Japanese representative differs from it at least in that the postocellar furrow is deep and

distinct (in *kohli* "postocellos non impresso"), the area just behind the furrow is distinctly raised and the pygidial area except the apical part and the lateral rows of gross punctures smooth and polished, only rarely very weak coriaceous sculpture is observed under the microscope (but even under such a condition the surface well shining; in *kohli* "opaca, dense subtiliter punctata et per totam superficiem", and in his key the species is placed under the group including *ater* and *affinis*). Basing on such differences the Japanese representative of this species is dealt with as a distinct local race.

Holotype: ♀, Nikengoya, S. Japan Alps, 4. VIII. 1974, K. TSUNEKI leg.

Paratypes: 6 ♀ 6 ♂, Mt. Haku, Oku-Nikko, Renge Spa (Niiagta), VIII. 1955–61.

Other specimens examined. 16 ♀ 51 ♂, Hokkaido (Hidaka), Nikko (Lakeside of Chuzenji), Oku-Nasu, Mt. Mitsumine (Saitama), Mt. Fuji, Mt. Haku, Mt. Bunagadake (Kyoto), Mt. Hyonosen (Hyogo), Mt. Tsurugi (Shikoku) and Towada.

In the male of this species the antennal tyloidea are restricted in distribution to joints 5 and 6, each in a simple carina, varying more or less in length and the ventral tuft of pubescence of the abdomen is also confined to sternite 4 alone.

Remarks. In his proposal of *P. seminitidus* for *P. kohli*, VAN LITH (1965) attempted a redescription of the species using a paratype female specimen from S. Kansu (hologype female is from Tibet). According to this in the paratype "postocellar region slightly raised" and "pygidial area (his figure 92 which has the surface strongly microcoriaceous as in *P. affinis*) with base somewhat convex and shining". The first of the two characters particularly quoted here shows a tendency of the Kansu specimen towards a different geographic race and the second the marked difference from the Japanese representative. In the same paper he gives also a figure of the pygidial area in *P. hakusanus* ♀, in which the surface of the area is wholly, very distinctly, though somewhat more largely than in *seminitidus*, microreticulated. This is quite misleading a figure. In most of the Japanese specimens, as mentioned above, the area except the apical portion is smooth and polished as in *P. exaratus*, the appearance of the very faint microreticulation (under 64×) being rather exception and even in such a case the surface is fairly strongly shining. The difference is so striking that I dealt with it in my first description as a distinct species.

In the key of his 1937 paper GUSSAKOVSKIJ separated *P. kohli* from the group of *ater* and *affinis* by the state of the interantennal elevation. In the former "frons inter antennas denticulo dentiformi nullo, sed plica angusta parva, vix prominula tantum armata", while in the latter group "tuberculo dentiformi acuto distincto armata". In the specimens from Japan the rise at the top angle of the triangularly bent carina between the antennae is considerably variable, sometimes very weak and almost toothless, but more frequently the place is raised into a distinct tooth.

The Formosan specimen that was recorded as *P. hakusanus seminitidus* (♀) is, according to the reexamination, similar to the Japanese representative in the sculp-

ture of the pygidial area, but it is different from this as well as from the typical race from China, in the form of the said area (Fig. 26) and in the punctuation of vertex and mesoscutum. The pygidial area is rather similar in form to that of *P. terrigenus* LITH (cf. LITH, 1965, p. 36), known from Java, with the surface polished and only on apical half faintly microreticulated. Vertex on postocellar and ocellocular areas almost smooth and polished, only scattered with a few fine punctures; punctures on mesoscutum distinctly larger than in *seminitidus* s. str. and also *seminitidus bettoh*, with interspaces on central part of the disc, on an average, smaller than puncture-diameter, but partly as wide as, or wider than punctures and, as a whole, somewhat smaller forwards and sidewards. Judging by such distinctions the specimen may belong to a different species, but until the more characteristic male is discovered it is rather provisionally dealt with as another race of the present species:

Psen (*Psen*) *seminitidus attenuatus* ssp. nov.

Holotype: ♀, Tsuifeng, about 2500 m, Nantou Pref., Formosa, 10. VII. 1968, K. TSUNEKI leg.

On two aberratios. A male specimen captured at midway to the summit of Mt. Haku on August 1, 1962, is abnormal in the structure of antennal joints 5 and 6 (partly also 4 and 7) and in the curvature of the dorsal side of the thorax. In the right antenna joint 5 slenderer and slightly curved and joint 6 markedly incrassate apically into claviform and in both the place of tyloidea not carinated, but somewhat broadly smoothed, shining and minutely hollowed at the centre (Fig. 6). In the left antenna the deformation is generally similar, but somewhat less striking in form, but the smoothed place on joint 6 broader and changing into ferruginous. The mesoscutum strikingly raised and convex, appearing quite abbreviated and at the median scutal line markedly hollowed; the scutellum also more strongly convex than usual. In other respects, however, the specimen is quite normal. In the other male from Hidaka, Hokkaido, collected on July 27, 1967 (leg. T. NAMBU) the mesoscutum not strongly convex, but similarly remarkably impressed medio-anteriorly and the scutum much more finely punctured than usual.

4. *Psen* (*Psen*) *alticola* sp. nov.
(*P. affinis* ♀B — *P. affinis* ♂C)

Psen (*Psen*) *affinis*: TSUNEKI, 1959, p. 65 (♀ ♂, partim).
? *Psen* (*Psen*) *affinis affinis*: LITH, 1965, p. 44 (? partim).

It has been brought to light by the present investigation that *Psen affinis*: TSUNEKI is a complex of three species and as two of which have been separated from the confused group, namely, *P. affinis* GUSSAKOVSKIJ from the female and *P. seminitidus* LITH from the male, the species consisting of the male and female remained has become nameless, hence it is named *alticola*, basing on the higher occurrence of the species than *affinis*. The present species, especially the male, is common and rather abundant on the Alpine flowers of Umbelliferae at the height

of about 1000–2000 m in Central Japan.

The main characters of both sexes of this species are given in Table 2. The form and the sculpture of the pygidial area in the female are very similar to those of *P. affinis* ♀ (=*ohnonis* ♀), only it appears slightly narrower than in this. In the male antennal joints 5 and 6 are provided with carinated tyloidea and the abdominal sternite 4 alone with a tuft of pubescence at the apical margin in middle, just as in *P. seminitidus* ♂. The differences from this species in the male and from *P. affinis* in the female are very slight.

Holotype: ♂, Mt. Haku, Central Japan, 30. VII. 1966, K. TSUNEKI leg.

Paratypes: 10 ♀ 10 ♂, Mt. Haku, VII–VIII. 1957–66, K. TSUNEKI leg.

Remarks. As mentioned earlier in connection with *P. affinis* GUSSAKOVSKIJ it seems highly probable that *Psen affinis affinis*: LITH, 1965 is the present species in view of its character of the abdominal petiole.

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