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NOTES ON THE SYNONYMY AND DISTRIBUTION OF ASIATIC *PSEN* LATR. AND *PSENULUS* KOHL (HYMENOPTERA, SPHECIDAE, PSENINI)

Eduardas BUDRYS

Institute of Ecology, Akademijos 2, 2600 Vilnius, Lithuania. E-mail: ebudrys@ekoi.lt

Abstract. *Psen affinis grahami* Lith, 1965 and *Psen kulingensis* Lith, 1965 are synonymized with *Psen affinis* Gussakovskij, 1937. Nominal subspecies *attenuatus* Tsuneki, 1977 is transferred to *Psen bettoh* Tsuneki, 1977. The lectotype of *Psen kashmirensis* Nurse, 1903 is designated and the species transferred to *Psenulus*; the two paralectotypes are *Mimumesa littoralis* (Bondroit, 1934). *Psenulus tobiasi* Budrys, 1988 is synonymized with *Psenulus pan* Beaumont, 1967. New characters of the discussed species, particularly in male genitalia, are given.
Key words: taxonomy, synonymy, distribution, Hymenoptera, Sphecidae, Psenini, *Psen*, *Psenulus*

INTRODUCTION

Psen and *Psenulus* are the largest genera of the Psenini tribe, containing correspondingly ca. 90 and 160 species. Most of the species (ca. 60 *Psen* and 85 *Psenulus*) are distributed in the Oriental zoogeographic region. In the Palearctic region, *Psen* is represented by 12, *Psenulus* by 21 species.

The revisions of Oriental Psenini by J.P. van Lith (1959-1976) include the East Palearctic species of *Psen*, earlier described by V. Gussakovskij (1934, 1937). Types of these species were inaccessible to J.P. van Lith. Study of the material identified by the latter author has lead to the establishment of some new synonymies and published misidentifications. Examination of the type series of *Psen kashmirensis* Nurse, 1903, has revealed that the syntypes represent species in two genera, *Psenulus* Kohl and *Mimumesa* Malloch.

The basic objectives of this research in *Psen* and *Psenulus* were: (1) to establish new synonymies, and (2) to present some diagnostic characters of closely related species, particularly in the structure of male genitalia.

MATERIAL AND METHODS

The material, mentioned in this paper, is deposited in the following collections:

BMNH – Natural History Museum, London, UK;
BPIV – Biology and Pedology Institute, Vladivostok, Russia;
CAS – California Academy of Sciences, San Francisco, USA;
FSAG – Faculte des Sciences Agronomiques de Gembloux, Belgium;
RMNH – Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands;
USNM – National Museum of Natural History, Washington, USA;
ZISP – Zoological Institute, Sanct Petersburg, Russia;
ZMMU – Zoological Museum of the Moscow University, Moscow, Russia.

The study of wasps was made using a binocular microscope MBS-10, mostly at magnification 56×. The drawings of genitalia were partly made using the microscope Olympus BX40 and program MicroImage 3.0.01 for video-digital capture of images. The faunal and morphometric data were managed, using database managing system Borland Paradox 4.5 for DOS.

RESULTS

Psen affinis Gussakovskij

- *Psen affinis* Gussakovskij, 1937: 652, ♀. Holotype: ♀, Russia, Primorsk terr.: Shtykovo, 03 09 1929, leg. V. Shabliovskij (ZISP), examined.
- *Psen hakusanus* Tsuneki, 1959: 52, 72, ♂ only (♀ = *bettoh*). Holotype: ♂, Japan: Haku mt. (coll. Tsuneki). Lith, 1965: 41, ♂ only (♀ = *bettoh*); Tsuneki, 1977: 366 (as synonym of *affinis*).

- *Psen kulingensis* Lith, 1965: 41, ♀. Holotype: ♀, labeled as 'paratype', China: Kuling, 13 06 1926, leg. C.Y. Wong (RMNH), examined. **New synonym**. Lith, 1968: 119; Bohart, Menke, 1976: 166.
- *Psen affinis grahami* Lith, 1965: 44, ♀ only (♂ = *seminitidus*). Holotype: ♀, China, Sichuan: O-Er, 06-16 08 1933, leg. D.C. Graham (USNM, holotype No 69074), examined. **New synonym**. Bohart, Menke, 1976: 166.
- *ohnonis* (non Tsuneki, 1973a): Tsuneki, 1973b: 23, ♀ only, corrected by Tsuneki, 1977: 366.

Distribution. China, Korea, Far East of Russia, Japan.

Material. China: Kuling, 25 06 1926 1♀ – according to description (Lith, 1965), paratype of *Psen kulingensis* but labeled as 'holotype No 69075', leg. C.Y. Wong (USNM). Japan, if not indicated otherwise, leg. Tsuneki (USNM): Fukui: Akato mt., 20 09 1974 3♀, 6♂; Arashi, 26 08 1970 1♂, 04 09 1970 1♀, 08 09 1970 1♀, 20 09 1970 6♀, 27 08 1971 1♀, 29 08 1971 3♀, 25 09 1971 1♀; Arashiguti, 04 10 1973 2♀; Fukui, 21 09 1972 4♀, 31 08 1973 1♀, 08 09 1973 1♀, 15 09 1973 2♀, 1♂, 22 09 1973 1♀, 23 09 1973 1♀, 29 09 1973 2♂; Haku mt., 15 08 1956 1♂, 31 07 1957 2♂, 15 08 1957 1♂, 22 08 1958 1♂ – holotype of *Psen hakusanus* No 103401, 30 07 1960 1♀, 2♂; 01 08 1961 1♂, leg. I. Togashi; Haku mt., 08-09 08 1958 1♂ – paratype of *P. hakusanus* Tsuneki (RMNH); Ichinose, 14 08 1957 2♂; Iwama, 26 07 1959 2♂ (CAS); Koike, 31 08 1963 2♀; Taniyama, 28 09 1972 2♀, 07 10 1972 2♂; Hokkaido: Jozankei, 01 09 1945 1♀, 13 07 1946 1♂, 29 09 1951 1♀; Sounkyo, 08-09 08 1958 1♂ (CAS), 1♀ (USNM); Ishikari: Sapporo, 02 08 1948 1♀; Izu: Amagi mt., 06 09 1974 1♀; Nikko: Chuzenji lake, 07 1913 1♀, leg. F. Muir (RMNH); Suganuma, 04 08 1964 1♀; Oku Nasu, 27 07 1970 1♂, leg. T. Nambu; Towada: Kuzukawa, 24 07 1961 1♀, leg. K. Shimoyama; Towada mt., 11 08 1955 1♀, leg. K. Shimoyama, 30 07 1964 1♀; Soitama, 29 08 1971 1♀, leg. T. Nambu; Japan (unreadable to me localities in Japanese), 08-10 08 1970 5♂, leg. H. Okuno, 17 09 1936 1♀, leg. K. Sirakata, 07 08 1944 3♀, 17 09 1945 1♀, 04 09 1962 1♀, 09 10 1971 1♀. Russia: Primorskij terr.: 'Kedrovaya Pad' nat. res., 29 08 1976 1♀, 03 09 1976 1♀, leg. Berezancev (BPIV); 23 08 1980 1♀, leg. Kireychuk (ZISP); Kunashir Is.: Dubovoye, 22 07-31 08 1973 1♀, 3♂, leg. Kasparyan (ZISP); volkano Golovnina, 23 07 1973 1♂, leg. Kasparyan (ZISP); Sernovodsk, 26 08 1973 1♂, leg. Kasparyan (ZISP); Sakhalin Is.: 3 km N Kholmsk, 13 08 1978 1♀, leg. Leley (BPIV).

***Psen affinis atayal* Tsuneki**

- *Psen affinis atayal* Tsuneki, 1977: 367, ♂. Holotype: ♂, Taiwan, Nantou: Sungkang (coll. Tsuneki).
- *Psen hakusanus seminitidus* (non Lith, 1965): Tsuneki, 1966: 9, ♂. Corrected by Tsuneki, 1977: 366.

Distribution. Taiwan.

No material studied.

***Psen bettoh* Tsuneki**

- *Psen bettoh* Tsuneki, 1977: 368, ♀, ♂ (as subspecies of *seminitidus*). Holotype: ♀, Japan: Nikengoya, 04 08 1974, leg. K. Tsuneki (coll. Tsuneki). Budrys, 1986: 145 (as synonym of *seminitidus*); Budrys, 1988: 108 (as distinct species).
- *Psen affinis* (non Gussakovskij, 1937): Tsuneki, 1959: 52, 65, ♂ only, partly, + *P. seminitidus*, corrected by Tsuneki, 1977: 368.
- *Psen hakusanus* (non Tsuneki, 1959): Tsuneki, 1959: 50, 72, ♀ only, corrected by Tsuneki, 1977: 368; Lith, 1965: 41, ♀ only, **corrected identification**. The species identity is clear from the picture of pygidial plate, submitted by J.P. van Lith (1965: 36, Fig. 91), typical of *bettoh*.

Distribution. Japan, Far East of Russia (Kunashir island only).

Material. Japan, if not indicated otherwise, leg. Tsuneki (USNM): Fuji mt., 22 07 1956 1♂, leg. T. Minami; 28 07 1971 8♂ – paratypes of *bettoh*; Fukui: Haku mt., 28-31 07 1953 1♀ – paratype of *hakusanus* (RMNH); 01 08 1961 1♀, 24 07 1955 1♀, leg. I. Togashi, 09 08 1955 1♂, 26 07 1959 4♂, 15 08 1959 1♀, 01 08 1962 2♂, 30 07 1966 1♂; 31 07 1959 1♂, leg. I. Togashi; 15 08 1956 3♀ (CAS); the latter 5♀ and 8♂ – paratypes of *bettoh*; Ono, 29 08 1976 1♀, leg. Haneda (ZISP); Sugi-toge, 01 08 1956 1♀ (CAS); Hokkaido: Hidaka, 10 07 1941 1♀, leg. T. Kimura, 27 07 1967 1♂, leg. T. Nambu; Hyogo: Hyono-sen mt., 26 07 1969 1♂; Hirokawara, 20 06 1958 1♀, leg. K. Iwata; Niigata: Echigo-Sammyaku mts., 24 07 1961 1♀, leg. K. Baba; Nikko: Shobu (Syobu), 12 09 1953 2♀ – paratypes of *bettoh*, leg. E. Tanaka, 20 09 1953 1♀; Tochigi: Nikko, 24 08 1954 1♀ – paratype of *bettoh*, leg. E. Tanaka, 10-18 08 1954 1♀; Towada: Towada mt., 06 08 1955 1♀, leg. K. Shimoyama. Russia: Kunashir Is.: 2 km NE Tretyakovo, 11 08 1986 1♀, leg. E. Budrys (ZISP).

***Psen bettoh attenuatus* Tsuneki, new combination**

- *Psen seminitidus attenuatus* Tsuneki, 1977: 370, ♀. Holotype: ♀, Taiwan: Tsuifeng 10 07 1966, leg. K. Tsuneki (USNM, holotype 103437), examined.

- *Psen hakusanus seminitidus* (non Lith, 1965): Lith, 1968: 119; Lith, 1976: 84; **corrected identification**. Studied specimens of *bettoh attenuatus* in USNM and RMNH have been earlier identified by J.P. van Lith as '*hakusanus seminitidus*'.

Distribution. Taiwan.

Material. Taiwan: Hoozan, 11 1910 1♀, leg. S.G. Sauter (RMNH).

***Psen seminitidus* Lith**

- *Psen* (*Psen*) *seminitidus* Lith, 1965: 40. New name for *Psen kohli* (Gussakovskij, 1934). Tsuneki, 1966: 8 (as subspecies of *hakusanus*).
- *Mimesa kohli* Gussakovskij, 1934: 7, ♀. Holotype: ♀, China: Mekong, Chok-Chyu river, 09 1900, leg. expedition of Kozlov (ZISP), examined. Preoccupied by *Psen kohlii* Fox, 1898 (now in *Pseneo*). Gussakovskij, 1937: 653 (*Psen* subg. *Psen*); Bohart, Menke, 1976: 166 (as synonym of *hakusanus seminitidus*); Budrys, 1986: 145 (as synonym of *seminitidus*).
- *Psen alticola* Tsuneki, 1977: 370, ♀, ♂. Holotype: ♂, Japan: Haku mt. (coll. Tsuneki). Budrys, 1986: 145 (as synonym of *seminitidus*).
- *Psen takanensis* Tsuneki, 1978c: 81. New name for *Psen alticola* Tsuneki, 1977; the latter nominal species considered as preoccupied by *Mimesa alticola* Viereck, 1903 (now in *Mimumesa*). The name necessary only if *Mimesa* Shuckard or *Mimumesa* Malloch are regarded as syngeneric with *Psen*. Tsuneki, 1979: 10; Tsuneki, 1982: 3, 15; Budrys, 1995: 393 (as synonym of *seminitidus*).
- *Psen affinis* (non Gussakovskij, 1937): Tsuneki, 1959: 52, 65, ♂ only, partly, + *P. bettoh*, corrected by Tsuneki, 1977: 370 to *alticola*; Lith, 1965: 44, ♀ and ♂ (as *Psen affinis affinis*), **corrected identification** (all studied specimens from Japan in RMNH collection, identified by J.P. van Lith as *affinis* belong to *seminitidus*, while females of the true *affinis* from Japan are identified by J.P. van Lith as *kulingensis*).
- *Psen affinis grahami* (non Lith, 1965: 44, ♀): Lith, 1965: 44, ♂ only (♀ = *affinis*), **corrected identification**.

Distribution. China, Korea, Far East of Russia, Japan.

Material. China: Nanshan: Sinin-che river, 15 09 1908 1♀ – paratype of *Mimesa kohli*, leg. expedition of Kozlov (ZISP); Sichuan: Shin Kai Shi, 07 1935 1♂, leg. D.C. Graham (USNM); Yellow Dragon Temple, 20-24 07 1924 1♂, leg. D.C. Graham (RMNH); 20-24 07 1924 2♂, 25-28 07 1924 1♂, leg. D.C. Graham (USNM). Japan, if not indicated otherwise, leg. Tsuneki (USNM): Denzke Pass, 03-04 08 1974 1♀, 12♂; Hokayu, 27 07 1956 1♀, 1♂, leg. J. Minami, Y. Kubota; Ose, 12 08 1961 2♂, leg. H. Okuno; Fukui: Akato mt., 26 07 1959 2♀, 3♂, 30 07 1960 1♂, 20 09 1974 1♀; Haku mt., 15 08 1956 1♂ (CAS), 1♀ (RMNH), 1♀, 11♂ (USNM); 31 07 1957 1♂, 15 08 1957 2♀, 31 08 1957 1♂ (CAS); 31 07 1957 3♂, 22 08 1958 1♀ (RMNH); 01-02 08 1953 4♂, 11 08 1954 1♀, 31 07 1957 11♂, 15 08 1957 5♀, 2♂, 22 08 1958 4♂, 01 08 1962 1♀, 26 08 1964 2♀, 5♂, 27 08 1964 1♀, 2♂, 18 08 1965 1♀, 42♂, 30 07 1966 3♂, 23 08 1973 2♀; Hokkaido: Hakodate, 13 08 1958 2♀ (CAS); 6♀, 1♂ (USNM); Jozankei, 24 07 1946 1♀, 1♂, 05-06 08 1958 1♀; Sounkyo, 22 08 1947 2♀, 08-09 08 1958 4♀, 6♂; Ishikawa: Kaga, 28 08 1967 1♂, leg. H. Kurahashi; Nagano: Norikuradake mt., 31 07 1954 1♂, leg. Townes family (RMNH); Nikko: Odashiro, 05 08 1964 25♂; Shobu (Syobu), 06 09 1953 1♀, 10-12 08 1954 2♂, 22 08 1954 3♂, leg. E. Tanaka; Suganuma, 04 08 1964 25♂; Saitama: Chichibu, 09 08 1934 1♀; Tochigi: Oku Nasu, 27 07 1970 1♀, 1♂, leg. T. Nambu. Russia: Amur reg.: Gribovka, 23 07 1975 1♂, leg. Kurzenko (BPIV); Chita reg.: Adrianovka, 03 08 1975 1♂, leg. Kasparyan (ZISP); Sakhalin Is.: Novoaleksandrovka, 31 07 1978 1♀, leg. Kurzenko (ZISP); Novoaleksandrovsk, 07 09 1973 1♀, leg. Kasparyan (ZISP); Shebunino, 11 08 1978 1♀, leg. Kupyanskaya (BPIV); Starodubskoye, 01 08 1978 1♂, leg. Lelej (BPIV); Yuzhno-Sakhalinsk, 05 08 1978 1♂, leg. Kurzenko (BPIV); Kunashir Is.: Golovnino, 11 08 1975 2♀, leg. Berezancev (BPIV).

Closely related species *P. affinis*, *P. bettoh* and *P. seminitidus* may be identified by the characters presented in the Table 1 (Figs. 1-6).

***Psenulus kashmirensis* (Nurse), new combination**

Psen kashmirensis Nurse, 1903: 520. Syntypes: 1♀ and 2♂, India, Kashmir, leg. Nurse (BMNH – Hym. 21.830), examined. Lectotype: ♀, Kashmir, 06 1901, leg. Nurse, **present designation**. Two male paralectotypes (Kashmir, 05 1901, leg. Nurse) are *Mimumesa littoralis* (Bondroit, 1934).

- ? *Psen montanus* Cameron, 1907: 89. Holotype: ♀, India, Simla, 09 1898, leg. Nurse (BMNH – Hym. 21.814), examined. Name unavailable, preoccupied by *Psen montanus* Costa, 1868 (=*Psenulus pallipes*).

Distribution. Northern India.

The female lectotype has a handwritten label 'Type' and a round, red-edged label 'Type'. The species has not been included in the revision of Oriental

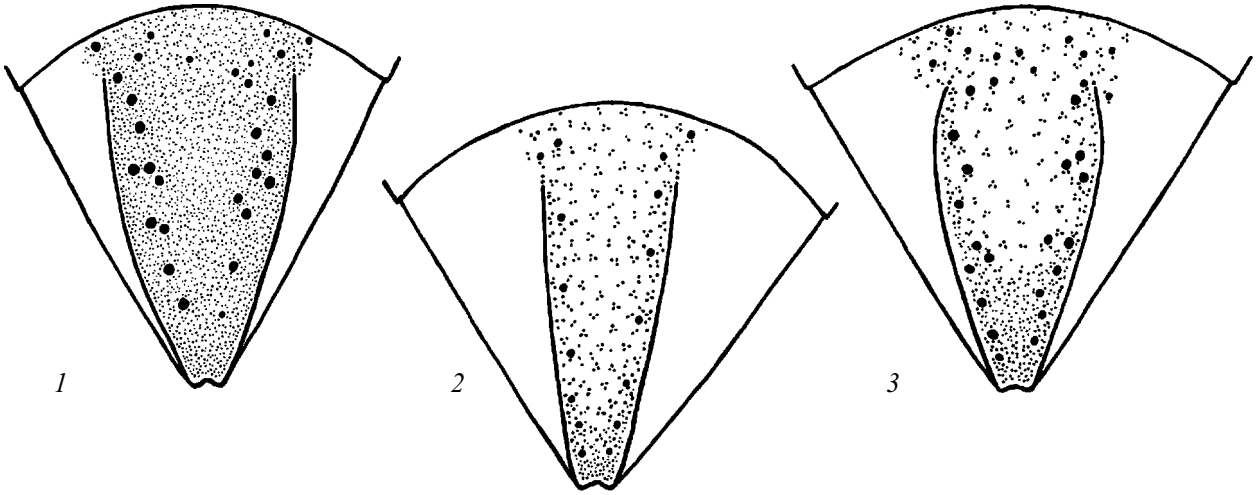

Figure 1-3. Pygidial plate of female of *Psen*: 1 – *P. affinis*; 2 – *P. bettoh*; 3 – *P. seminitidus*

Figure 4-6. Male genitalia of *Psen,* right half, medial aspect: 4 – *P. affinis*; 5 – *P. bettoh*; 6 – *P. seminitidus*

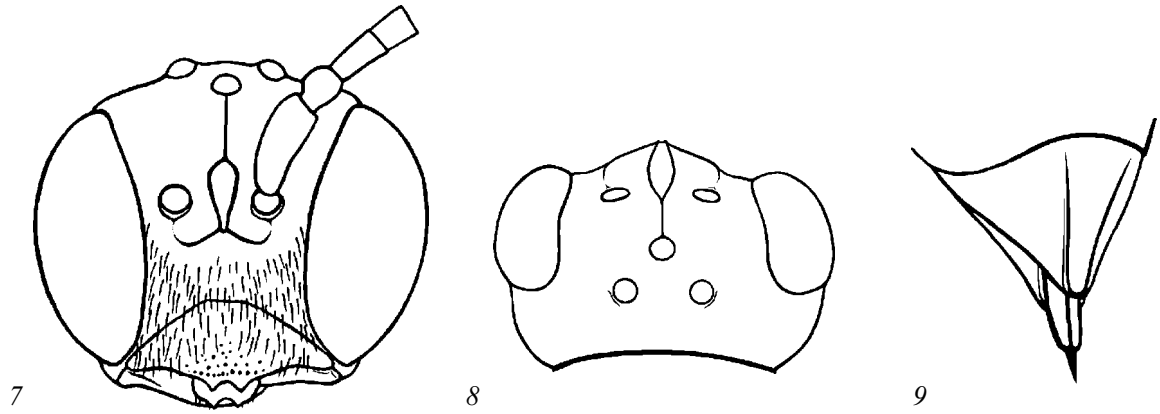

Figure 7-9. Psenulus kashmirensis, female: 7 – head, frontal aspect; 8 – head, dorsal aspect; 9 – 6th abdominal tergite, latero-dorsal aspect

Table1. Diagnostic characters of *P. affinis*, *P. bettoh* and *P. seminitidus*

Character	*affinis*	*bettoh*	*seminitidus*
Antero-dorsal area of propodeum between spiraculum and metapostnotum	with weakly convex smooth and shining belt as wide as the anterolateral part of metapostnotum	with weakly convex smooth and shining belt visibly narrower than the anterolateral part of metapostnotum	without convex shining belt, obliquely rugulose, dull
Petiole	of variable length: 4.5-6.5 times as long as wide, 1-1.5 times as long as metasomal tergum I;	comparatively short: usually 4.5-5 times as long as wide, 1.1-1.2 times as long as metasomal tergum I (in subsp. *attenuatus* very slender, 7.5 times as long as wide, 1.7 times as long as metasomal tergum I)	comparatively long: usually 5.5-6 times as long as wide, 1.5-1.8 times as long as metasomal tergum I;
Flagellomere 1 of female	shorter than scape	about as long as scape	longer than scape
Hind tibia of female	long: more than 5.5 times as long as distally wide	short: 4.8-5.1 times as long as distally wide	short: 4.7-5.2 times as long as distally wide
Postero-dorsal spines of female hind tibia	about as long as surrounding them setae	about twice shorter than surrounding them setae	about as long as surrounding them setae
Pygidial plate of female	comparatively broad, with even granulose microsculpture, completely mat (Fig. 1)	narrow, weakly microsculptured, shining (Fig. 2)	moderately broad, microsculptured, with flat and mat apical part, and slightly convex, weakly shining basal part (Fig. 3)
Flagellum of male	comparatively short: 1-3 flagellomeres combined less than 2.5 times as long as scape; 6th flagellomere less than 1.5 times as long as wide	comparatively long: 1-3 flagellomeres combined more than 2.8 times as long as scape; 6th flagellomere 1.7-1.8 times as long as wide	comparatively long: 1-3 flagellomeres combined more than 2.8 times as long as scape; 6th flagellomere 1.9-2.1 times as long as wide
Tyloidea of male	parallel-sided, subcylindrical, comparatively broad on 2-6 and narrow on 7-8 flagellomeres;	narrowly elliptic, carinate, on 3-4 flagellomeres;	narrowly elliptic, carinate, on 3-4 flagellomeres
Setae of male gonostyle	long and dense (Fig. 4)	short and scarce (Fig. 5)	short and scarce (Fig. 6)
Distal part of male penial valve	thick, evenly narrowed toward apex (Fig. 4)	thin, strongly narrowed before apex (Fig. 5)	rather thick, evenly narrowed toward apex (Fig. 6)

Psenulus by J.P. van Lith (1962, 1966, 1967, 1969, 1970, 1972, 1973, 1976). It belongs in the *concolor* group and is similar to *P. orinus* Lith (1973). *P. kashmirensis* differs from that species in having flagellomere I about 1.6 times as long as wide (2.2 times in *orinus*), in its shorter petiole with length equal to the length of tergum I (about 1.5 times the length of tergum I in *orinus*), in a low but distinct subantennal carina (the latter indistinct, laterally appearing as an evanescent shining line in *orinus*), and other characters (Figs. 7-9).

Psen montanus Cameron is very similar to *kashmirensis* and may be a synonym, but until more material of *kashmirensis* is available for study, I cannot be certain of the synonymy.

***Psenulus pan* Beaumont**

Psenulus pan Beaumont, 1967: 340, ♀, ♂. Holotype: ♀, Turkey: Ankara: Kavaklidere, 06 08 1960, leg. Guichard, Harvey (BMNH), examined.

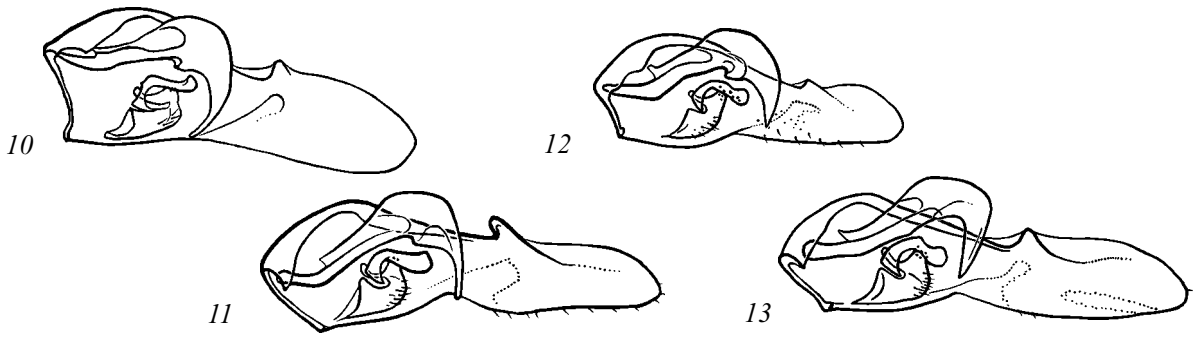

Figure 10-13. Male genitalia of *Psenulus*, right half, medial aspect: 10 – *P. pan*; 11 – *P. meridionalis*; 12 – *P. laevis*; 13 – *P. pallipes*

Psenulus tobiasi Budrys, 1988: 103, ♀. Holotype: ♀, Georgia: Tbilisi, 16 06 1982, leg. E. Budrys (ZISP), examined. **New synonym.**

Distribution. Turkey, Georgia, Azerbaijan.

Material. Turkey: Kavaklidere, 06-12 08 1960 14♀, 10♂ – paratypes of *P. pan*, leg. Guichard, Harvey (BMNH); Kulu, 25 07 1966 4♂ (FSAG); Azerbaijan: Baku, 1♀ – paratype of *P. tobiasi* (ZMMU).

Comparison of the types of *Psenulus tobiasi* with the types of *P. pan* have confirmed that the first, having a slightly larger fovea of the frontal carina, are though inside the ranges of individual variability of the latter species and must be synonymized with it.

Structure of male genitalia of *Psenulus pan* (Fig. 10) confirms its close affinity with *P. meridionalis* Beaumont (Fig. 11), *P. laevis* Gussakovskij (Fig. 12) and *P. pallipes* (Panzer) (Fig. 13). Apex of penial valve of *pan* is very narrow and elongate, as in *meridionalis*, but digitus is very slender, similar to that in *laevis*; subapical longitudinal desclerotized line of gonostyle, typical of *pallipes*, is lacking.

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Duomenys apie Azijos *Psen* Latr. ir *Psenulus* Kohl genčių žiedvapsvių (Hymenoptera, Sphecidae, Psenini) sinonimiją ir paplitimą

E. Budrys

Santrauka

Porūšis *Psen affinis grahami* Lith, 1965, ir rūšis *Psen kulingensis* Lith, 1965, laikomi rūšies *Psen affinis* Gussakovskij, 1937, sinonimais. Nominalus porūšis *attenuatus* Tsuneki, 1977, perkeliamas į rūšį *Psen bettoh* Tsuneki, 1977. Rūšies *Psen kashmirensis* Nurse, 1903, išskiriamas lektotipas, o rūšis perkeliama į gentį *Psenulus*. Du šios nominalios rūšies paralektotipai priklauso rūšiai *Mimumesa littoralis* (Bondroit, 1934). Rūšis *Psenulus tobiasi* Budrys, 1988, laikoma rūšies *Psenulus pan* Beaumont, 1967, sinonimu. Pateikti ištirtų rūšių nauji požymiai, daugiausia patinų genitalijų struktūroje.