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Pamphilius alternans (Hymenoptera, Pamphiliidae) and its Close Relatives

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Abstract The *alternans* group of the sawfly genus *Pamphilius*, with three subgroups, is characterized and a key is given to the 14 component species, of which two are described as new; the western Palearctic *alternans* subgroup contains *P. alternans* (COSTA), *P. pugnax* KONOW, *P. caucasicus* GUSSAKOVSKIJ, *P. ignymontiensis* LACOURT, *P. armeniacus* SHINOHARA, *P. aurantiacus* (GIRAUD) and *P. marginatus* (LEPELETIER), the western Palearctic *lethierryi* subgroup contains *P. lethierryi* (KONOW), *P. cilix* KONOW and *P. turkomanus* n. sp. from Turkmenistan, and the eastern Palearctic *komonensis* subgroup contains *P. komonensis* TAKEUCHI, *P. kyutekparki* n. sp. from Primorskij Kraj and Korea, *P. takeuchii* BENEŠ and *P. croceus* SHINOHARA. On the basis of cladistic analysis, a hypothesis of the relationships of the species is presented. *Pamphilius theresae* PIC is synonymized with *P. alternans*. *Pamphilius pugnax* and *P. cilix* are redescribed and the previously unknown male of *P. croceus* is described. *Pamphilius croceus* is newly recorded from Korea.

The leaf-rolling sawfly genus *Pamphilius* is represented by over 90 species distributed in the Holarctic Region. The genus is subdivided into several species-groups, of which the two largest, the *vafer* group (26 species: BENEŠ, 1976; SHINOHARA, 1988 b; SHINOHARA & TAEGER, 1990) and the *sylvaticus* group (22 species: SHINOHARA, 1985, 1988 c), accommodate more than half the described species. The *alternans* group, as defined in this paper, is the third largest and contains 14 species, all occurring in the Palearctic Region.

The *alternans* group was first proposed by KONOW (1897), who included in it four western Palearctic species (*P. alternans* (COSTA), *P. pugnax* KONOW, "*P. neglectus* (ZADDACH)" [=*aurantiacus* (GIRAUD)] and "*P. aurantiacus* (GIRAUD)" [=*ignymontiensis* LACOURT]). BENEŠ (1976) redefined the *alternans* group, giving "entirely yellow scape of the antenna, densely pilose cell C in the forewing, yellow clypeus and often tridentate right mandible" as its characteristics and added three more western Palearctic species (*P. caucasicus* GUSSAKOVSKIJ, *P. norimbergensis* ENSLIN and *P. marginatus* (LEPELETIER), the last one with some reservations) to the species-group; *P. pugnax* was not included, probably because BENEŠ regarded it as a synonym of *P. alternans* (see discussion under *P. pugnax*).

In this paper, a new concept of the *alternans* group is proposed mainly on the basis of male genitalic characters and a synopsis of the 14 component species is given, together with discussions on their relationships. The species-group is subdivided into

the western Palearctic *alternans* and *lethierryi* subgroups and the East Asian *komonensis* subgroup. The species of the *alternans* group occur mainly in temperate deciduous forests, and the known larvae are solitary feeders on *Acer*, *Corylus* or *Carpinus*, making specialized screw-like leaf-rolls.

The following abbreviations are used in the text for the depository of the material: BM—Natural History Museum, London; DEI—Institut für Pflanzenschutzforschung, Eberswalde; EWU— Ewha Womans University, Seoul; KWU— Kangweon National University, Chuncheon; MU— Moscow State University, Moskva; ZIL— Zoological Institute, Academy of Sciences of the USSR, Leningrad; ZSM— Zoologische Staatssammlung, München.

The Group of *Pamphilius alternans*

The members of this species-group are characterized by the following features: clypeus entirely yellow; antenna with scape entirely yellow, in females sometimes marked with dark brown or entirely black; 3rd antennal segment more than twice as long as 4th; right mandible tridentate (incision between median and apical teeth distinct; Fig. 1 A–E); forewing sometimes with brownish infuscated area and cell C pilose or glabrous; tarsal claw with inner tooth shorter than outer one and with basal lobe developed (Fig. 1 F–P); sawsheath peg more or less pilose (Fig. 2 A–C). Male genitalia: ventral arm of gonostipes with narrow plate-like process along proximal margin, developing inside gonocardo (Fig. 2 D–F); inner margin of harpe roundly or angularly produced at base.

Represented by 14 Palearctic species classified into the following three subgroups:

The *alternans* subgroup: antennal scape entirely yellow in both sexes; left mandible with distinct middle tooth; forewing usually without distinct infuscation; cell C pilose all over; femora entirely yellow; tarsus without black marking; tarsal claw short (Fig. 1 F–L); plate-like process on ventral arm of gonostipes weakly developed, not exceeding proximal margin of gonocardo (Fig. 2 D); valviceps dorsally with well-developed, usually large lateral process (e. g., Fig. 6 A, D), and with ventral margin roundly produced (e. g., Fig. 6 C, F).

Seven western Palearctic species are included:

P. alternans (COSTA, 1859)	Europe
P. pugnax KONOW, 1897	Azerbaijan
P. caucasicus GUSSAKOVSKIJ, 1935	Caucasus
P. ignymontiensis LACOURT, 1973	Europe (on *Acer*)
P. armeniacus SHINOHARA, 1988	Armenia
P. aurantiacus (GIRAUD, 1857)	Europe (on *Acer*)
P. marginatus (LEPELETIER, 1823)	Europe (on *Corylus* and *Carpinus*)

The *lethierryi* subgroup: antennal scape yellow to orange, in females often marked with dark brown; left mandible with or without distinct middle tooth; forewing with distinct brownish infuscated area; cell C pilose or glabrous; femora mostly black in

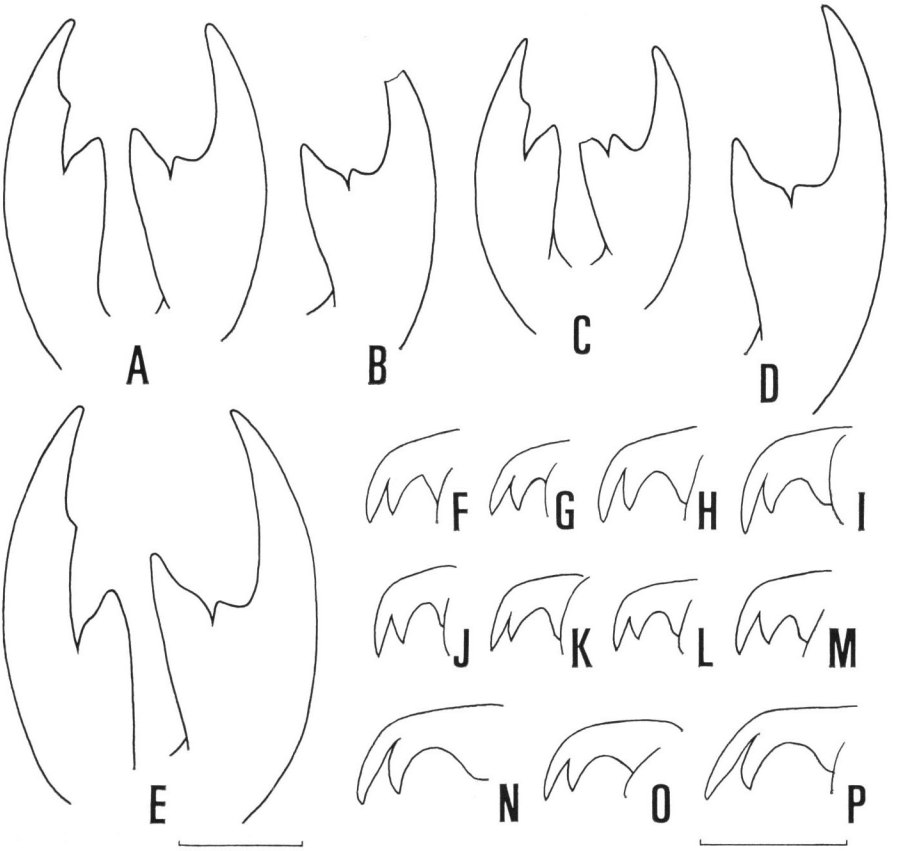

Fig. 1. Mandibles (A–E; B, D, right one only; scale: 0.5 mm) and tarsal claws (F–P; scale: 0.25 mm). A, F, *Pamphilius alternans*, ♀, Laško; B, G, *P. pugnax*, ♀, holotype; C, *P. turkomanus*, ♂, holotype; D, M, *P. kyutekparki*, ♀, paratopotype; E, *P. croceus*, ♂, Mt. Odaesan; H, *P. caucasicus*, ♀, holotype; I, *P. aurantiacus*, ♀, Laško; J, *P. ignymontiensis*, ♀, paratopotype; K, *P. armeniacus*, ♀, holotype; L, *P. marginatus*, ♀, Březová; N, *P. lethierryi*, ♀, Montigny-les-Cormeilles; O, *P. cilix*, ♀, holotype; P, *P. turkomanus*, ♀, paratopotype.

females and only dorsally black in males; each of 2nd to 4th tarsal segments black-marked; tarsal claw long (Fig. 1 N–P); plate-like process on ventral arm of gonostipes developed, but not exceeding proximal margin of gonocardo; valviceps dorsally with well-developed, but rather small lateral process (Fig. 11 A, D), and with ventral margin not produced (Fig. 11 C, F).

Three western Palearctic species are included:

P. lethierryi (KONOW, 1887)	Europe to Caucasus
P. cilix KONOW, 1897	Turkey
P. turkomanus n. sp.	Turkmenistan

The *komonensis* subgroup: antennal scape yellow, in females often black; left mandible with distinct middle tooth; forewing often with distinct brownish infuscated area; cell C pilose or glabrous; femora entirely yellow; tarsus without black marking; tarsal claw short (Fig. 1 M); plate-like process on dorsal arm of gonostipes strongly developed, exceeding proximal margin of gonocardo (Fig. 2 F); valviceps dorsally without lateral process (Fig. 13 A, D), and with ventral margin not produced (Fig. 13 C, F).

Four East Asian species are included:

P. komonensis TAKEUCHI, 1930	Japan (on *Acer*)
P. kyutekparki n. sp.	Soviet Far East to Korea
P. takeuchii BENEŠ, 1972	Japan (on *Acer*)
P. croceus SHINOHARA, 1986	Soviet Far East to Korea

Remarks. The *alternans* group and each of the subgroups herein defined are regarded as being monophyletic as discussed in the "relationships" section.

The only known character unique to the species of the *alternans* group is the plate-like process on the gonostipes in the male genitalia (see comments on the character 1 below). Although recognition of the presence of this structure is decisive, the species of the *alternans* group may be distinguished from the other congeners, with the exception of the species related to *P. sulphureipes*, by the combination of the tridentate right mandible and the long 3rd antennal segment, which is more than twice as long as the 4th. In the species of the *sulphureipes* group (*P. sulphureipes* KIRBY, *P. coreanus* TAKEUCHI and *P. ishikawai* SHINOHARA; see SHINOHARA, 1979), the right mandible is tridentate (or nearly so; the incision between the middle and apical teeth is very shallow) and the 3rd antennal segment is long, and they are similar in general morphology to *P. takeuchii* and *P. croceus*; however, mostly black coloration, as well as the male genitalic characters, will distinguish the species of the *sulphureipes* group from those of the *alternans* group.

The host-plant preference of the species of the *alternans* group is characteristic. Of the five species for which hosts are known (noted in the list above), four feed on *Acer* and one (*P. marginatus*) on *Corylus* and *Carpinus*. It should be noted that the four species are the only known pamphiliids associated with *Acer*, and *P. marginatus* is one of the three species of the family known to feed on *Corylus* or *Carpinus*; other two species are *P. fumipennis* (CURTIS) from Europe (on *Corylus* and *Alnus*) and *P. middlekauffi* SHINOHARA et SMITH from N. America (on *Corylus* and *Carpinus*), both belonging to the *sylvaticus* group (SHINOHARA, 1985 b).

Another interesting feature of the species of the *alternans* group may be the shape of the leaf-rolls made by the larvae. The larvae are known for five species of the species-group, all making a screw-like abode (type C of STRITT, 1935). Besides the species of the *alternans* group, this type of larval abode is known only for *P. histrio* (LATREILLE) and *P. inanitus* (VILLERS) from Europe and *P. hilaris* (EVERSMANN) from eastern Palearctic (LORENZ & KRAUS, 1957; SHINOHARA & OKUTANI, 1983).

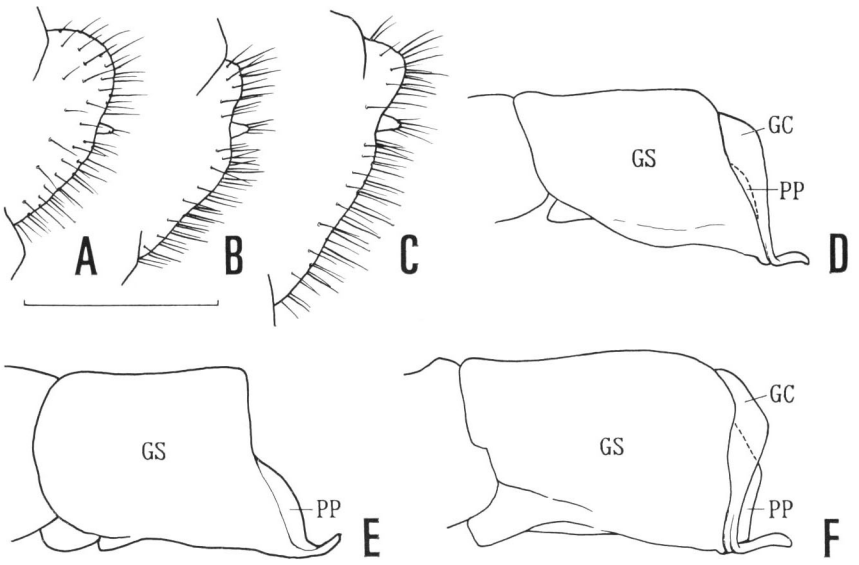

Fig. 2. Sawsheaths (A–C; scale: 0.5 mm) and part of male genitalia, lateral view (D–F; GS: gonostipes; GC: gonocardo; PP: plate-like process). A, *Pamphilius cilix*, holotype; B, *P. turkomanus*, paratopotype; C, *P. kyutekparki*, paratopotype; D, *P. alternans*, Krapina; E, *P. aurantiacus*, Laško, gonocardo removed; F, *P. croceus*, Mt. Odaesan.

Comparison with the Existing Systems

BENEŠ (1974, 1976, 1982) divided the Palearctic species of *Pamphilius* into seven species-groups, mainly on the basis of female external features. My study of the male genitalia has shown that BENEŠ's *alternans* and *lethierryi* groups are closely related, together forming a monophyletic group here called the *alternans* group, and one species included in BENEŠ's *histrio* group is also a member of this assemblage. The *alternans* subgroup in my system is the same as BENEŠ's *alternans* group, except that *P. norimbergensis* is excluded (it belongs probably to the *vafer* group; see SHINOHARA, 1989) and *P. pugnax* (see introduction) and recently described *P. armeniacus* are added. My *lethierryi* subgroup may correspond to BENEŠ's *lethierryi* group, although BENEŠ has not published a definition of the species-group (see SHINOHARA, 1982). Of the four species of my *komonensis* subgroup, three were unknown to or not dealt with by BENEŠ, and only *P. takeuchii* was included in his *histrio* group. As discussed elsewhere (see comments on the character 12 given below), BENEŠ's *histrio* group is based on non-homologous similarities and *P. takeuchii*, along with the three remaining species, forms a subgroup within the *alternans* group.

ACHTERBERG and AARTSEN's (1986) classification of the European *Pamphilius* differs from BENEŠ's system, so far as is concerned here, only in placing *P. lethierryi*

near *P. betulae* (LINNAEUS) in their *histrio* group. This treatment, probably following the old idea of KONOW (1887, 1897), is not acceptable, because an examination of the male genitalia clearly shows that *P. lethierryi* belongs to the *alternans* group and *P. betulae* to the *histrio* group in a restricted sense (see also remarks under *P. lethierryi*).

Relationships

Based on the character analysis given below, a hypothesis of the relationships of the component species of the *alternans* group (Fig. 3) is presented. The polarity of the character transformation has been determined basically by out-group comparison. As out-groups, I have taken all the Pamphiliinae into consideration, since the sister-group of the *alternans* group has not been clarified.

The male genitalic characters have been found crucial for inferring relationships of the species. Synapomorphies supporting monophyly of major clades and even the *alternans* group itself pertain exclusively to the male genitalia. Therefore, attribution of the four species known only from the females (*P. pugnax*, *caucasicus*, *armeniacus* and *cilix*, all placed in parentheses in Fig. 3) is problematical. I have, nevertheless, included them in the cladogram largely on the basis of overall similarity in female characters; the hypotheses about their position will be tested by the characters of the males to be discovered.

In the following discussion and the cladogram, character states forming a transformation series are designated as "1, 1-1" (meaning transformation from 1 to 1-1), and similar conditions of different origin (homoplasies) as "1-a, 1-b, etc."

1) Narrow plate-like process along proximal margin of ventral arm of gonostipes (PP in Fig. 2 D–F). This obviously specialized structure is known only for the species of the *alternans* group and regarded as its autapomorphy [1]. In the species of the *komonensis* subgroup, the process is strongly developed so as to exceed the proximal margin of the gonocardo (Fig. 2 F). This character state is inferred to represent further modification and regarded as an autapomorphy [1-1] of the *komonensis* subgroup.

2) Dorsolateral process of valviceps. The species of the *alternans* and *lethierryi* subgroups possess a lateral process at dorsal margin of the valviceps (e. g., Fig. 6 A, D), which is rather thin, directed dorsally and has flat dorsal surface. This type of dorsolateral process is uniquely known for the species of the *alternans* and *lethierryi* subgroups and postulated as a synapomorphy [2] uniting them. The lateral process found in the species of the *vafer* group may look similar to it in dorsal aspect, but the former is usually thick, never directed dorsally and with rounded dorsal surface (for some examples, see SHINOHARA, 1988 b); I conclude that the lateral processes in the two groups are of independent origin. In the *komonensis* subgroup, the valviceps is simple without such a process (Fig. 13 A, D), representing the plesiomorphic state of the *alternans* group.

Within the *alternans* and *lethierryi* subgroups, the following three character

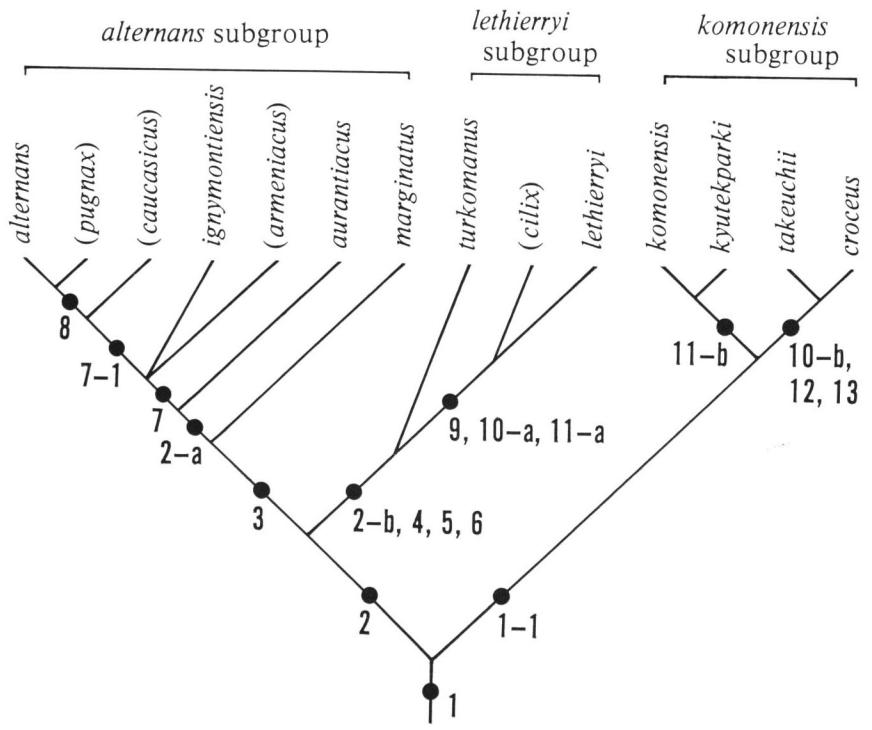

Fig. 3. Cladogram showing relationships among the species of the *alternans* group. Species known only from the females are in parentheses. Numbers refer to the synapomorphies discussed in the text.

states can be recognized: in dorsal view, (a) long and narrow (*P. marginatus*, Fig. 8 D), (b) long and wide (*P. alternans*, Fig. 6 A, *aurantiacus*, Fig. 8 A, and *ignymontiensis*, Fig. 6 D), and (c) short and comparatively wide (*P. lethierryi*, Fig. 11 A and *turkomanus*, Fig. 11 D). It is easily surmised that (a) is the least developed (plesiomorphic) condition and the state (b) is a derivation from it. Somewhat problematical is the state (c), which is confined to the species of the *lethierryi* subgroup. This character state can be interpreted either as a further modification from the state (b) or an independent development from the state (a). Here I take the second hypothesis, because the first is a direct conflict with the postulated synapomorphy 3 discussed below. Thus I regard the state (b) as a synapomorphy [2-a] linking the three species of the *alternans* subgroup given above (or probably all the species of the subgroup but *P. marginatus*) and the state (c) as a synapomorphy [2-b] uniting the two species of the *lethierryi* subgroup given above (or probably all the species of the subgroup).

3) Shape of ventral margin of valviceps. The ventral margin of the valviceps is not produced in lateral view (e. g., Fig. 11 C, F) in the *lethierryi* and *komonensis* subgroups, whereas it is roundly produced ventrally (e. g., Fig. 6 C, F) in the *alternans*

subgroup. In out-groups, the former state is usual (exceptions: *P. leucocephalus* TAKEUCHI and a few species of *Neurotoma*) and I regard the latter as an autapomorphy [3] of the *alternans* subgroup.

4) Coloration of femora. The femora of the species of the *lethierryi* subgroup are marked with black, whereas most species of the Pamphiliini, including all the remaining species of the *alternans* group, share entirely yellow femora. The black-marked femora are thus inferred to be derivative and regarded as an autapomorphy [4] of the *lethierryi* subgroup. In certain species of *Pamphilius* (i. e., *P. sylvarum* STEPHENS of the *sylvarum* group, *P. nigrifemorata* SHINOHARA et TAEGER of the *vafer* group, and several species of the *sylvaticus* group (see SHINOHARA, 1985 b)), the femora are also marked with black; these similarities are postulated as homoplasies. Differences in details of pigmentation among the species of the different species-groups will also support this view.

5) Coloration of tarsal segments. In the species of the *lethierryi* subgroup, the 2nd to 4th tarsal segments are yellowish with black ventral margins. This peculiar coloration is unique to the three species and regarded as an autapomorphy [5] of the *lethierryi* subgroup. All the other Pamphiliinae have concolorous, usually yellow tarsi.

6) Length of tarsal claw. The tarsal claw of the *lethierryi* subgroup is long (Fig. 1 N–P), whereas it is short in the species of the *alternans* and *komonensis* subgroups (Fig. 1 F–M). Determination of polarity by the out-group comparison at the level of the *alternans* group is difficult, since both the long and short (as well as somewhat intermediate) conditions occur in out-groups, although the short claws are predominant in the Pamphiliini. If, however, we accept the synapomorphy 2, then the short claws can be regarded as plesiomorphic for the monophyletic group composed of *alternans* and *lethierryi* subgroups and the long claws can be regarded as an autapomorphy [6] of the *lethierryi* subgroup.

7) Groove on upper part of frons. In *P. alternans*, *pugnax* and *caucasicus*, the upper part of frons is rather weakly (in the male, more strongly) convex as in the other members of the *alternans* subgroup, but they are unique in having a deep, sharply defined longitudinal groove running from the ocellar basin to the large median fovea. Within the *alternans* subgroup, a generally similar but very shallow and bluntly defined groove is found in *P. ignymontiensis* and *armeniacus*, which is hypothesized to represent an intermediate condition between the absence of groove (plesiomorphic state; *P. marginatus* and *aurantiacus*) and the presence of a sharply defined groove (the most apomorphic state shared by the three species given above) in a transformation series. In conclusion, I regard the presence of a groove as a synapomorphy [7] uniting the five species and the deep, sharply defined groove as a synapomorphy [7-1] uniting the three species. Somewhat similar, usually bluntly defined grooves known for the *Pamphilius* species with strongly swollen frons (often described as "notched"; see also characters 12 and 13) are considered to be different in origin from the grooves in the *alternans* subgroup.

8) Coloration of stigma. The stigma of *P. alternans* and *pugnax* is bicolored (basally yellow and apically black; Fig. 5 B), whereas the other species of the *alternans* subgroup and the species of the *lethierryi* subgroup share a concolorous yellowish stigma. Both bicolored and concolorous yellowish stigmata occur in the *komonensis* subgroup; only *P. takeuchii* has a bicolored stigma somewhat similar to the one found in *alternans* and *pugnax*, but in *takeuchii* the black part is smaller. In the Pamphiliinae, several species belonging to different clades are known to have a bicolored stigma, suggesting its multiple origin. If the synapomorphies 2, 3 and 7 are acceptable, however, then it can be postulated that the concolorous stigma is plesiomorphic for the *alternans* subgroup and the bicolored stigma is a synapomorphy [8] linking the two species.

9) Shape of left mandible. In Pamphiliinae, the left mandible is provided with a distinct middle tooth (Fig. 1 A–E); loss of a distinct middle tooth occurs only in three species of *Onycholyda* (SHINOHARA *et al.*, 1988) and in *P. basilaris* SHINOHARA (the sole representative of the *basilaris* group, SHINOHARA, 1982), besides *P. lethierryi* and *cilix* of the *lethierryi* subgroup. The character state in *P. lethierryi* and *cilix* is regarded as a synapomorphy [9] uniting the two species, and the similar conditions in *Onycholyda* and in *P. basilaris* are postulated as homoplasies.

10) Pilosity of cell C of forewing. The cell C of forewing is glabrous in *P. lethierryi* and *cilix* in the *lethierryi* sugroup and *P. takeuchii* (often partly pilose) and *croceus* in the *komonensis* subgroup, whereas it is pilose in all the other species of the *alternans* group. As in the character 6, both the character states occur in out-groups, and the polarity cannot be determined by an analysis at the level of the *alternans* group. However, if each of the *lethierryi* and *komonensis* subgroups is monophyletic, as suggested by synapomorphies 2-b, 4, 5, 6, and 1-1, it is safely hypothesized that the pilose condition is plesiomorphic and the loss or reduction of pilosity has independently occurred in *P. lethierryi*+*cilix* (synapomorphy 10-a) and in *P. takeuchii*+*croceus* (synapomorphy 10-b).

11) Coloration of antennal scape. The antennal scape is entirely black in *P. komonensis* and *kyutekparki*, yellow with blackish marks in *P. lethierryi* and *cilix*, and entirely yellow in all the remaining species of the *alternans* group. Out-group comparison at the level of the *alternans* group fails, because both black and yellow scapes as well as every shade of intermediate conditions occur in out-groups. Following the same logic as for the character 10, however, it is hypothesized here that yellow scape is plesiomorphic and entirely black scape is a synapomorphy [11-b] linking *P. komonensis* and *kyutekparki* and partly blackish scape is a synapomorphy [11-a] linking *P. lethierryi* and *cilix*.

12) Swelling on the upper part of frons. In the *alternans* group, *P. takeuchii* and *croceus* have the upper part of frons very strongly swollen, with shallow longitudinal depression medially extending from the ocellar basin to the median fovea, whereas the remaining species have weakly or moderately swollen upper part of frons. The former state is inferred to be a synapomorphy [12] linking the two species, because

the latter is the generally observed condition within the Pamphiliinae. The strongly convex upper part of frons is known also for several species of *Pamphilius* and BENEŠ (1972 a) based his "*histrio* group" (including *P. takeuchii*) mainly on this "character." As was suggested by SHINOHARA (1985 b), however, this resemblance is due to convergence, independently acquired in such separate clades as the *sylvaticus* group, the *alternans* group and the *histrio* group in a restricted sense.

13) Pilosity of the upper part of frons. The upper part of frons is glabrous in *P. takeuchii* and *croceus*, while it is more or less pilose in the other species of the *alternans* group. The latter is a common character state in the Pamphiliidae, and the former is regarded as a synapomorphy [13] uniting the two species. Probably associated with the development of the swelling on the upper part of frons (character 12), loss of pilosity on the upper part of frons is known also for some species of *Pamphilius* with strongly swollen frons. As in the case of the character 12, it is here assumed that the loss of the pilosity has occurred independently more than once.

Key to Females

1. Femora entirely yellow 2
— Femora largely black 10
2. Antennal scape yellowish or orange 3
— Antennal scape black 12
3. Upper part of frons only moderately convex, not forming paired swellings in front of ocelli 4
— Upper part of frons very strongly convex, forming paired swellings in front of ocelli 13
4. Mesepisternum largely yellow; abdomen black above, without orange marks ..... *P. marginatus*
— Mesepisternum mostly or entirely black; abdomen with at least 4th and 5th terga orange 5
5. Stigma yellow basally and black apically; meso- and metascutella black 6
— Stigma unicolored pale brown to yellow; meso- and metascutella yellow 7
6. Head behind transverse and lateral transverse sutures with rather dense, large, distinct punctures; black area on upper part of frons extending dorsally to include median fovea; lateral pronotum mostly or entirely black; mesepisternum without yellow marks; 2nd tergum largely black ..... *P. alternans*
— Head behind transverse and lateral transverse sutures with sparse, ill-defined punctures; black area on upper part of frons not reaching median fovea (Fig. 5 C); lateral pronotum mostly yellow; anterior margin of mesepisternum yellow; 2nd tergum orange ..... *P. pugnax*
7. Second and 3rd abdominal terga black; upper part of head largely black, with large pale yellow spot along each lateral suture (cf. fig. 5 in SHINOHARA, 1988 a). ..... *P. armeniacus*

— Second and 3rd abdominal terga orange; coloration of upper part of head not as above 8

8. Head largely pale, with gena mostly yellow; 6th abdominal sternum almost entirely yellow ..... *P. caucasicus*

— Head mostly black, with gena black, except for narrow ventral margin; 6th abdominal sternum mostly black 9

9. Smaller species less than 10.5 mm; supraocular stripe complete; upper part of head behind transverse and lateral transverse sutures with very sparse, small punctures ..... *P. ignymontiensis*

— Larger species over 10 mm; supraocular stripe missing; upper part of head behind transverse and lateral transverse sutures with rather dense, large punctures, except for subtriangular, nearly impunctate area just behind lateral transverse suture ..... *P. aurantiacus*

10. Head with large black areas (Figs. 5 D, 9 H); infuscation of forewing extending from base nearly to apex (Fig. 9 F); 2nd to 4th abdominal sterna narrowly orange medially ..... *P. cilix*

— Head orange, with only small area around ocelli black; infuscation of forewing restricted to apical halves of cells 2Rs and 3R1; 2nd to 4th abdominal sterna entirely black 11

11. Antenna with scape blackish brown ventrally; left mandible without distinct median tooth; apical part of cell 3R1 distinctly infuscated; cell C of forewing glabrous, with apical part only sparsely pilose; 2nd tergum mostly orange, and black median vertical stripe on 3rd to 5th terga narrow (Fig. 10 A). . *P. lethierryi*

— Antenna with scape entirely orange; left mandible with distinct median tooth (Fig. 1 C); apical part of cell 3R1 scarcely infuscated; cell C of forewing pilose all over; 2nd to 5th terga broadly black medially, black area covering about half of whole width of abdomen (Fig. 10 C) ..... *P. turkomanus*

12. Frons usually with no yellowish marks; no yellowish mark along lateral suture; stigma almost uniformly blackish brown, with only extreme base somewhat yellowish; 2nd to 5th abdominal segments usually predominantly (at least laterally) black, with various extent of median orange areas ... *P. komonensis*

— Frons with large yellow marking (usually paired spots) in front of ocelli; oblong yellowish spot along lateral suture usually present; stigma yellow, at least basally; 2nd to 5th abdominal segments orange, with black area confined to narrow anterior margin of 2nd segment ..... *P. kyutekparki*

13. Length 13.5–14.5 mm; antenna yellow, with segments beyond 18th–22nd blackish; cervical sclerite and metepisternum largely marked with dark orange; forewing distinctly stained with yellow, and most of apical 2/5 infuscated with blackish brown; entire stigma and all veins in basal 3/5 of forewing yellowish ..... *P. croceus*

— Length 9.5–13.0 mm; antenna yellow, with segments beyond 6th–10th blackish; cervical sclerite and metepisternum entirely or predominantly black; forewing

clear hyaline or very feebly stained with dark brown, with infuscation usually restricted to cell 2Rs, apical half of cell 1Rs, apical 3/4 of cell 2M and narrow anterobasal corner of cell 3M; stigma with blackish marking apically; veins in basal 3/5 of forewing usually mostly blackish brown ..... *P. takeuchii*

Key to Males

1. Femora entirely yellow 2
— Femora more or less black above 6
2. Valviceps dorsally with lateral process (Figs. 6 A, D, 8 A, D, 11 A, D) 3
— Valviceps without lateral process (Fig. 13 A, D) 7
3. Stigma with apical 1/3 and anterior and posterior margins blackish brown (Fig. 5 B) ..... *P. alternans*
— Stigma mostly pale, at most with only anterior and posterior margins blackish brown 4
4. Mesoscutellum entirely black; abdomen black, with only narrow lateral margins yellow ..... *P. marginatus*
— Mesoscutellum marked with yellow; abdomen with at least 4th and 5th terga largely orange dorsally 5
5. Upper part of head behind transverse and lateral transverse sutures with sparse, small punctures; each of 4th and 5th abdominal terga with anterior margin broadly black; genitalia as in Fig. 6 D–F; harpe with basal half blackish ..... *P. ignymontiensis*
— Upper part of head behind transverse and lateral transverse sutures with rather dense, large punctures; 4th and 5th abdominal terga almost entirely orange; genitalia as in Fig. 8 A–C; harpe mostly yellow, with rather small blackish spot basally ..... *P. aurantiacus*
6. Upper part of frons strongly convex, with median longitudinal furrow in front of ocelli; dorsum of abdomen black, with very broad lateral margin (particularly on middle segments) orange to yellow; genitalia as in Fig. 11 A–C ..... *P. lethierryi*
— Upper part of frons rather weakly convex, flattened in front of celli; dorsum of abdomen black, with very narrow lateral margin yellow; genitalia as in Fig. 11 D–F ..... *P. turkomanus*
7. Upper part of frons moderately to strongly convex, with rather large setiferous punctures; facial crest moderately convex, rounded or bluntly carinate, distinctly pilose; prescutum usually with large yellow marking 8
— Upper part of frons very strongly convex, impunctate or with sparse minute punctures, glabrous; facial crest very strongly convex, carinate, glabrous; prescutum usually entirely black or with brownish marking 9
8. Supraocular stripe absent; mesoscutum entirely black; stigma predominantly dark brown to blackish brown ..... *P. komonensis*

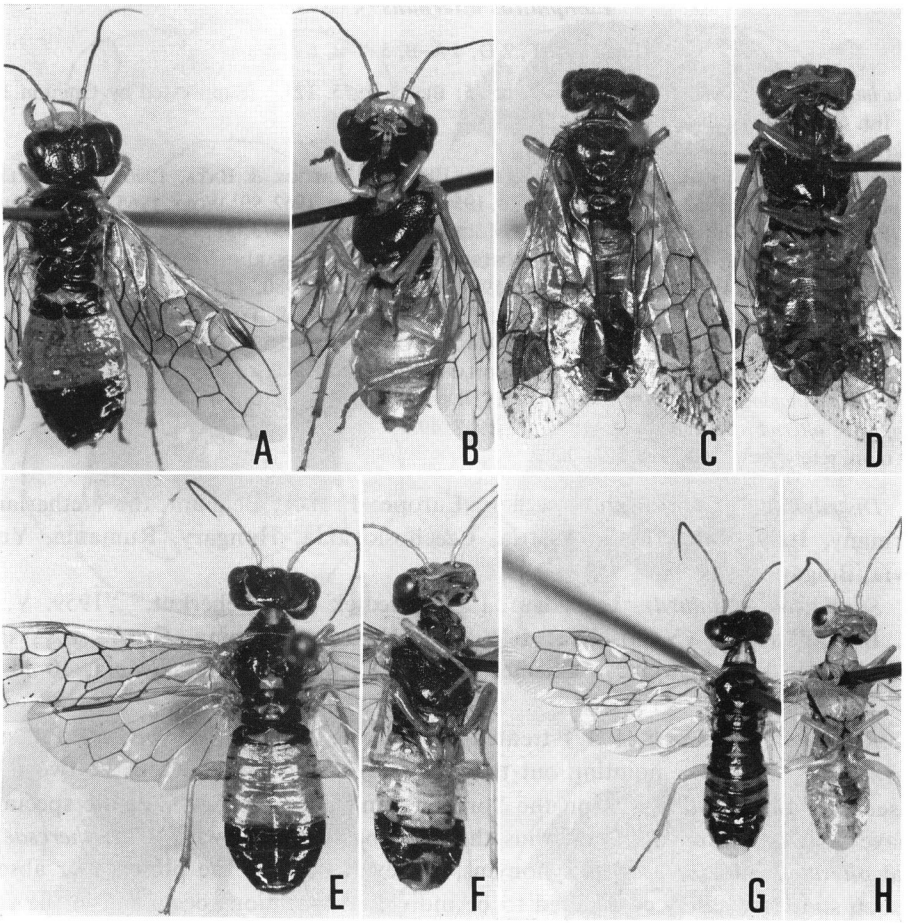

Fig. 4. A–B, *Pamphilius alternans*, ♀, Laško; C–D, *P. pugnax*, ♀, holotype; E–F, *P. ignymontiensis*, ♀, paratopotype; G–H, do., ♂, paratopotype.

— Supraocular stripe present, though usually broadly interrupted at middle; mesoscutum marked with yellow, at least with small yellow mark anterolateral to mesoscutellum; stigma predominantly pale yellow..... *P. kyutekparki*

9. Length 11.5–13.5 mm; wings strongly infuscated, at least with apical half blackish brown..... *P. croceus*

— Length 8.5–11.5 mm; wings hyaline, usally with only slight infuscation around cells 1Rs, 2Rs and 2M..... *P. takeuchii*

Pamphilius alternans (COSTA)

(Figs. 1 A, F, 2 D, 4 A–B, 5 A–B, 6 A–C)

Lyda inanis KLUG, 1808, 278; BENEŠ, 1972 b, 25; BENEŠ, 1975, 121. [Suppressed by Opinion 1066, Int. Comm. Zool. Nomencl., 1977.]

Lyda alternans COSTA, 1859, 3.

Pamphilius alternans: KIRBY, 1882, 340; KLIMA, 1937, 49; GREGOR & BAŤA, 1940, 217; BERLAND, 1947, 48; STRITT, 1952, 40, 43; PRECUPEȚU, 1958, 1045; PAPP, 1962, 99; WOLF, 1965, 458; SCOBIOLA-PALADE, 1968, 378; BENEŠ, 1972 b, 25; MÓCZÁR & ZOMBORI, 1973, 31; OOSTSTROOM, 1974, 161; BENEŠ, 1975, 121; BENEŠ, 1976, 159; OOSTSTROOM, 1976, 4; PESARINI & PESARINI, 1976, 62; LACOURT, 1977, 124; CHEVIN & BARBIER, 1978, 119; SCHEDL, 1980, 4; CHEVIN, 1981, 43; LISTON, 1981, 168; KOCH, 1982, 405; VIITASAARI, 1982, 54; CHEVIN & TUSSAC, 1983, 52; SHINOHARA, 1985 a, 163; ACHTERBERG & AARTSEN, 1986, 36; CHEVIN *et al.*, 1986, 37; MAGIS, 1988, 6, 16, 38, 44; PESARINI & PESARINI, 1988, 165; SHINOHARA & TAEGER, 1990, 90.

Pamphilius (*Anoplolyda*) *theresae* PIC, 1941, 1. [N. syn.]

Pamphilius alternans var. *theresae*: BERLAND, 1947, 49.

For more references, see KLIMA (1937).

Distribution. Central and southern Europe: France, Belgium, the Netherlands, Germany, Italy, Switzerland, Austria, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria.

Specimens examined. Hungary: 1 ♀, "Mecsek hgs. Fehérkut," "1959. V. 19, leg. BAJÁRI" (BM). Yugoslavia: 1 ♀, "Dr. HENSCH, Krapina, Cro."; 1 ♂, same data (ZSM); 1 ♀, "Croat.," "Sljeme, 30. 5. 97"; 1 ♀, Laško, Slovenia, 10–11. V. 1976, A. SHINOHARA.

Remarks. BERLAND (1947) treated *Pamphilius* (*Anoplolyda*) *theresae* PIC as a "var." of *P. alternans*, pointing out that the only difference between the two is the presence of the double spots on the "prosternum" in the latter. All the specimens I have seen lack such marking; thus they will be identified with "var. *theresae*." I treat *alternans* and *theresae* as synonyms, however, because the presence or absence of such spots are safely considered to be individual variations occurring in the same population.

The little known males are similar to those of *P. marginatus* except for the following points: Length 8.5 mm; postocellar and postocular areas with rather dense, large punctures; antennal furrows deep; upper part of frons rather strongly convex, with distinct, sharply defined longitudinal groove running from ocellar basin to median fovea; 3rd antennal segment about 2.4 times as long as 4th; stigma yellow, with apical 1/3 blackish; 4th and 5th abdominal terga with small obscure reddish marking medially; 3rd abdominal tergum and segments beyond it mostly smooth above.

Pamphilius pugnax KONOW

(Figs. 1 B, G, 4 C–D, 5 C)

Pamphilius pugnax KONOW, 1897, 22, 24, 31; KLIMA, 1937, 61; OEHLKE & WUDOWENZ, 1984, 406; SHINOHARA, 1988 a, 110.

See KLIMA (1937) for more references.

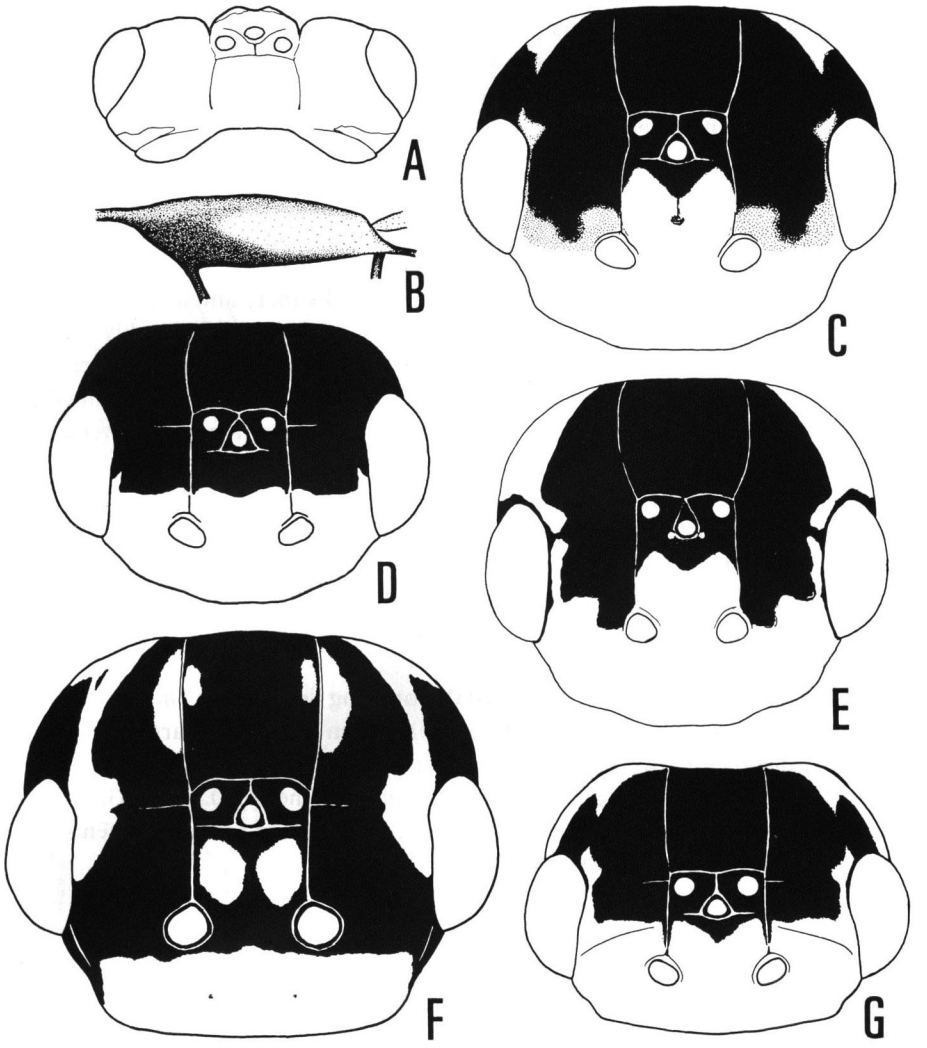

Fig. 5. Heads (A, C–G; A, dorsal view, C–G, dorsofrontal view) and left stigma (B). A–B, *Pamphilius alternans*, ♂, Krapina; C, *P. pugnax*, ♀, syntype; D, *P. turkomanus*, ♂, holotype; E, *P. cilix*, ♀, holotype; F, *P. kyutekparki*, ♀, paratopotype; G, do., ♂, holotype.

Female (syntype). Head black, with yellow marks as in Fig. 5 C; dorsal half of paraantennal field brownish; gena black, with ventral part yellow and posterior margin obscurely pale-marked along crassa; malar space entirely yellow; mandible yellow, with dark rufous apex; antenna missing. Thorax black, with broad posterolateral angle of dorsal pronotum and lateral pronotum (except for broad dorsoanterior part), tegula and ⌜-shaped mark at anterior margin of mesepisternum yellow, and

cervical sclerite with large pale marking; legs yellow, with coxal bases black. Wings hyaline, slightly stained with brown; veins C, Sc, R, R1, M+Cu1, basal half of 1A, and 3A pale yellow and other veins in forewing blackish brown; stigma pale yellow, with anterior margin brownish and apical half largely blackish brown. Abdomen orange dorsally, with propodeum, 6th to 8th segments (except for lateral margins) and 9th segment black; pale yellow ventrally, with 1st laterotergite and narrow anterolateral angle of 7th sternum black.

Upper frons below ocelli convex, with sharply defined longitudinal groove running from ocellar basin to median fovea; ocellar basin shallow, triangular in outline, without distinct anterolateral extensions; median fovea large, distinct; antennal furrow rather deep, sharply defined; frontoclypeal crest roundly swollen, with weakly developed frontal tubercle between antennal sockets; facial crest rounded. Upper part of head behind transverse and lateral transverse sutures smooth, with sparse, ill-defined punctures; frons, area from upper margin of paraantennal field to lateral transverse suture, and gena more or less roughened, with denser, ill-defined punctures; paraantennal field smooth and impunctate dorsally and with dense, small, indistinct punctures ventrally; clypeus roughened, with dense, irregular, large punctures; head before crassa pilose, except for impunctate dorsal area of paraantennal field. Left mandible with distinct middle tooth and right one tridentate as in Fig. 1 B. Tarsal claw as in Fig. 1 G. Forewing with cell C densely pilose all over. Sawsheath with slender, pilose peg.

Measurements (in mm): Length 10.0, forewing length 9.0, head width 3.00, thorax width 3.20, malar space 0.16, distance between proximal margins of antennal sockets 0.64, distance between antennal socket and inner orbit 0.64, vertex (length × width) 0.90×0.84, eye (shortest diameter×longest diameter) 0.83×1.03, hind tibia length 3.00, hind basitarsus length 0.75, length of 2nd–4th hind tarsal segments together 0.69, 5th tarsal segment length 0.45.

Male. Unknown.

Distribution. Azerbaijan, U. S. S. R.

Specimens examined. ♀ (syntype), "*Pamphilius pugnax* KONOW, Kauk. Kussari," "*P. alternans* COSTA, det. K. BENEŠ, 1971." (DEI).

Remarks. I have examined only one female specimen of this species, which is labeled "syntype." The number of the syntypes is not known, because KONOW (1897) did not mention it in his original description.

As noted in OEHLKE and WUDOWENZ (1984), the syntype in DEI bears BENEŠ's determination label, "*P. alternans* COSTA, det. K. BENEŠ, 1971," although BENEŠ's view on this synonymy has not been published. The two "species" resemble closely and may be conspecific as BENEŠ considered them to be. I keep them apart here, however, because, so far as I know, *alternans* and *pugnax* are distinguishable by the characters given in the key and I have no positive evidence for regarding the differences as representing intraspecific (geographic) variations. The relationship of the two "species" should be reexamined, when more material becomes available.

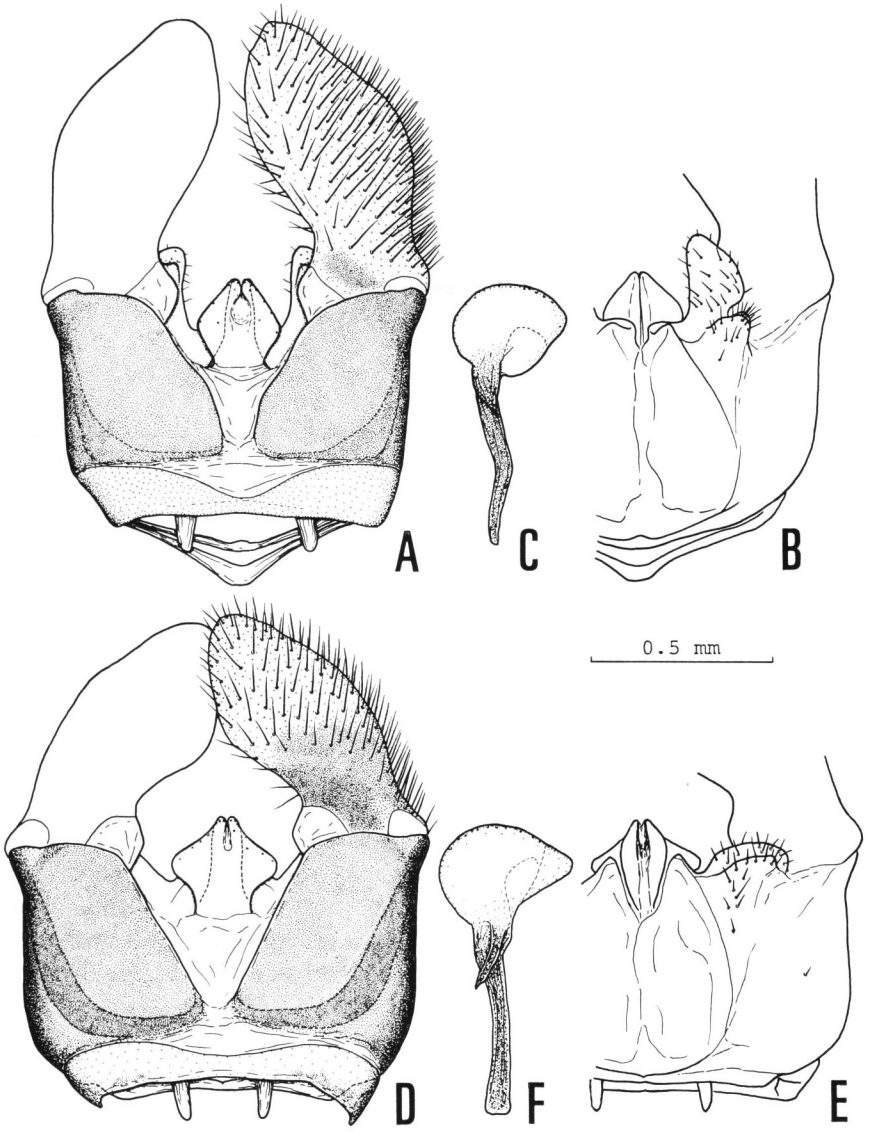

Fig. 6. Male genitalia, *Pamphilius alternans*, Krapina (A–C) and *P. ignymontiensis*, paratopotype (D–F). A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view.

Pamphilius caucasicus GUSSAKOVSKIJ

(Fig. 1 H)

Pamphilius caucasicus GUSSAKOVSKIJ, 1935, 170, 379; KLIMA, 1937, 40; BENEŠ, 1974, 313; BENEŠ, 1976, 159; SHINOHARA, 1988 a, 108.

Distribution. Western Caucasus, U. S. S. R.

Remarks. This species is known only from the female holotype, which was recently redescribed by SHINOHARA (1988 a). The deep, sharply defined longitudinal groove on the upper part of frons is characteristic of *P. caucasicus*, although it was not clearly shown in SHINOHARA's (1988 a) fig. 7. The presence of this structure may suggest its close affinity to *P. alternans* and *P. pugnax* (see comments on the character 7 in the "relationships" section).

Pamphilius ignymontiensis LACOURT

(Figs. 1 J, 4 E–H, 6 D–F)

Lyda aurantiaca: ZADDACH, in BRISCHKE & ZADDACH, 1865, 172 (nec GIRAUD, 1857).
Pamphilius aurantiacus: KIRBY, 1882, 339 (nec GIRAUD, 1857); KLIMA, 1937, 50; BERLAND, 1947, 57; STRITT, 1951, 137; STRITT, 1952, 39, 40, 43; LORENZ & KRAUS, 1957, 278; PAPP, 1962, 100; WOLF, 1965, 458 (*aurentiacus*!); SCOBIOLA-PALADE, 1968, 378; MÓCZÁR & ZOMBORI, 1973, 34; ?ZOMBORI, 1975, 90; PESARINI & PESARINI, 1976, 64; SCHEDL, 1980, 4; LISTON, 1981, 168.
Pamphilius ignymontiensis LACOURT, 1973, 693; BENEŠ, 1976, 159; LACOURT, 1977, 124; CHEVIN & BARBIER, 1978, 119; CHEVIN, 1981, 43; VIITASAARI, 1982, 54; ACHTERBERG & AARTSEN, 1986, 40; CHEVIN *et al.*, 1986, 37; LACOURT & CHEVIN, 1987, 66; MAGIS, 1988, 6, 20; PESARINI & PESARINI, 1988, 165.
For more references, see KLIMA (1937).

Distribution. Central and southern Europe: France, Belgium, the Netherlands, Germany, Italy, Austria, Hungary, Rumania, Yugoslavia.

Specimens examined. France: 1 ♀, 2 ♂ (paratypes), Montigny-les-Cormeilles, 30. IV. 1967, 25. IV. and 1. V. 1968, respectively.

Host-plants. Acer platanoides, A. campestre (STRITT, 1951)

Remarks. For over a century, this species was referred to "*P. aurantiacus*" in the literature. LACOURT (1973) pointed out that GIRAUD's (1857) *aurantiacus* was in fact a different species then known as *P. neglectus* (the latter being a junior synonym) and described "*P. aurantiacus*" of authors as new under the name of *P. ignymontiensis*. For a detailed comparison of *P. ignymontiensis* and *P. aurantiacus*, see STRITT (1951) and LACOURT (1973).

Pamphilius armeniacus SHINOHARA

(Fig. 1 K)

Pamphilius aurantiacus: ZHELOCHOVTSEV, 1941, 233 (nec GIRAUD, 1857).
Pamphilius armeniacus SHINOHARA, 1988 a, 105.

Distribution. Armenia, U. S. S. R.

Remarks. This recently described species is known only from two females. Probably, it is most closely allied to *P. ignymontiensis*, although no synapomorphy uniting the two species has been found (Fig. 3).

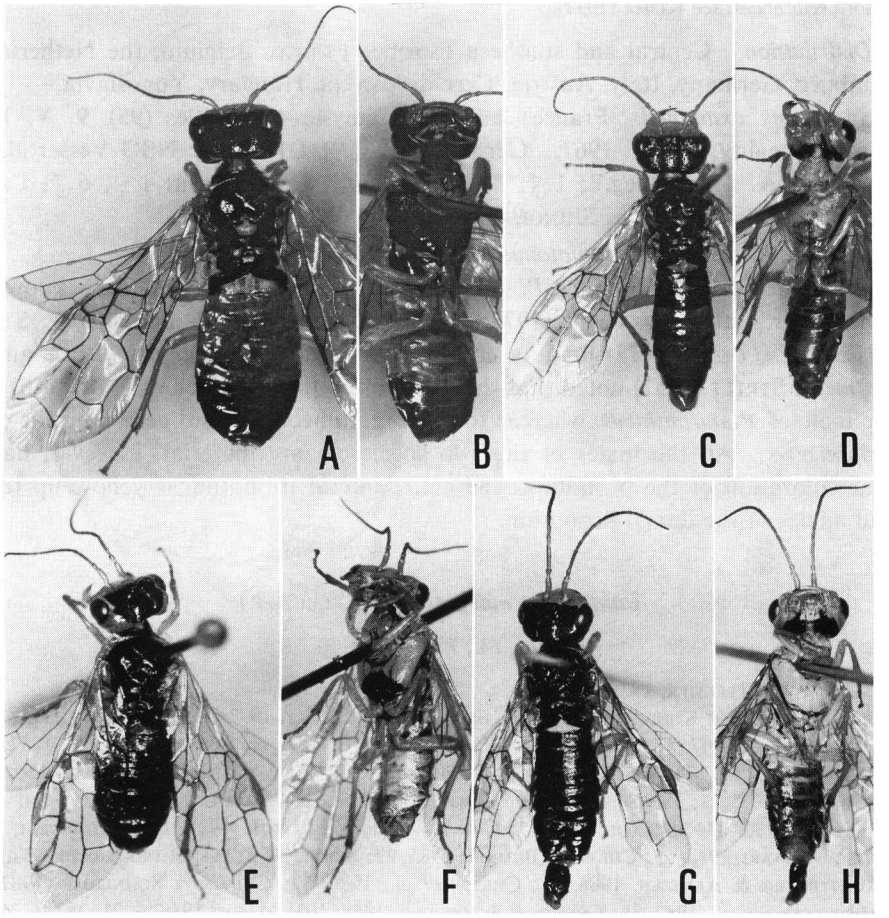

Fig. 7. A–B, *Pamphilius aurantiacus*, ♀, Laško; C–D, do., ♂, Laško; E–F, *P. marginatus*, ♀, Březová; G–H, do, ♂, Březová.

Pamphilius aurantiacus (GIRAUD)

(Figs. 1 I, 2 E, 7 A–D, 8 A–C)

Lyda aurantiaca GIRAUD, 1857, 183.

Lyda neglecta ZADDACH, in BRISCHKE & ZADDACH, 1865, 174.

Pamphilius neglectus: KIRBY, 1882, 339; STRITT, 1934, 20; KLIMA 1937, 59; GREGOR & BAŤA, 1940, 219; BERLAND, 1947, 57; STRITT, 1951, 137; STRITT, 1952, 39, 43; LORENZ & KRAUS, 1957, 278; PAPP, 1962, 100; WOLF, 1965, 459; ERMOLENKO, 1966, 61; WEIFFENBACH, 1967, 99; WOLF, 1971, carte 264; SCHEDL, 1972, 95, 100; MÓCZÁR & ZOMBORI, 1973, 33; PESARINI & PESARINI, 1976, 63; SCHEDL, 1980, 5; LISTON, 1981, 168; ČINGOVSKI, 1982, 98.

Pamphilius aurantiacus: LACOURT, 1973, 693; BENEŠ, 1976, 159; LACOURT, 1977, 124; CHEVIN, 1981, 43; VIITASAARI, 1982, 54; SHINOHARA, 1985 a, 163; ACHTERBERG & AARTSEN, 1986, 37; LACOURT & CHEVIN, 1987, 66; MAGIS, 1988, 6, 16, 38, 44; PESARINI & PESARINI, 1988, 165.

For more references, see KLIMA (1937).

Distribution. Central and southern Europe: France, Belgium, the Netherlands, Luxemburg, Germany, Italy, Austria, Czechoslovakia, Hungary, Yugoslavia.

Specimens examined. France: 1 ♀, Montigny-les-Cormeilles (95), 9. V. 1967; 1 ♂, same locality, 27. IV. 1967. Germany: 1 ♀, "DDR: Suhl: NSG Vessertal, 29–30. 6. 1987, A. TAEGER leg."; 1 ♂, "1. 5. 20, Ros." Yugoslavia: 1 ♀, 6 ♂, Laško, Slovenia, 10–11. V. 1976, A. SHINOHARA.

Host-plant. Acer pseudoplatanus (STRITT, 1934).

Remarks. As noted under *P. ignymontiensis*, this species was long known as "*P. neglectus*," until LACOURT (1973) synonymized it with *P. aurantiacus*. STRITT (1951) and LACOURT (1973) made a comparative study of *P. ignymontiensis* and *P. aurantiacus*. STRITT (1951) noted that the "Pronotum [ist] ganz schwarz" (p. 140, l. 5) in the male of *P. aurantiacus*, whereas the "Pronotumecken [sind] gelb" in that of *P. ignymontiensis*. All the males of the two species in my material, however, have a similar coloration of the pronotum; the entire lateral pronotum is yellow up to the lateral angles of the dorsal pronotum.

Pamphilius marginatus (LEPELETIER)

(Figs. 1 L, 7 E–H, 8 D–F)

Lyda marginata LEPELETIER, 1823, 12.

Pamphilius marginatus: KIRBY, 1882, 336; KLIMA, 1937, 58; STRITT, 1937, 20; GREGOR & BAŤA, 1940, 217; BERLAND, 1947, 51; BARENDRECHT, 1949, 3; STRITT, 1952, 43; LORENZ & KRAUS, 1957, 275; PRECUPEȚU, 1959, 132; WOLF, 1965, 459; ČINGOVSKI, 1971, 41; WOLF, 1971, carte 263; MÓCZÁR & ZOMBORI, 1973, 33; BENEŠ, 1976, 159; OOSTSTROOM, 1976, 5; LACOURT, 1977, 124; CHEVIN & BARBIER, 1980, 274; SCHEDL, 1980, 5; CHEVIN, 1981, 43; LISTON, 1981, 168; ČINGOVSKI, 1982, 98; VIITASAARI, 1982, 55; CHEVIN & BRUNEL, 1985, 22; KOCH, 1985, 253; SHINOHARA, 1985 a, 164; ACHTERBERG & AARTSEN, 1986, 41; CHEVIN *et al.*, 1986, 37; CHEVIN & SCHNEIDER, 1987, 13; MIDTGAARD *et al.*, 1987, 36; CHEVIN & SCHNEIDER, 1988, 103; MAGIS, 1988, 6, 21, 38, 46.

For more references, see KLIMA (1937).

Distribution. Europe: Sweden, Denmark, France, Belgium, the Netherlands, Luxemburg, Germany, Switzerland, Austria, Czechoslovakia, Hungary, Rumania, Yugoslavia.

Specimens examined. France: 1 ♀, Montigny-les-Cormeilles, 1. V. 1968. Czechoslovakia: 1 ♀, 2 ♂, Březová, south of Prague, 15–17. V. 1976, A. SHINOHARA. [?]: 1 ♀, "25/5 96, [illegible]," "coll. KONOW."

Host-plant. Corylus avellana (STRITT, 1937); *Carpinus betulus* (LORENZ & KRAUS, 1957).

Remarks. This species is somewhat isolated within the *alternans* subgroup. It is well characterized by the largely yellow mesepisternum and the black abdominal dorsum of the female and the weakly developed lateral process of the valviceps in the male genitalia. So far as is known, the host-plant of *P. marginatus* is peculiar within the *alternans* group (see comments on p. 28), and it is the only representative of the

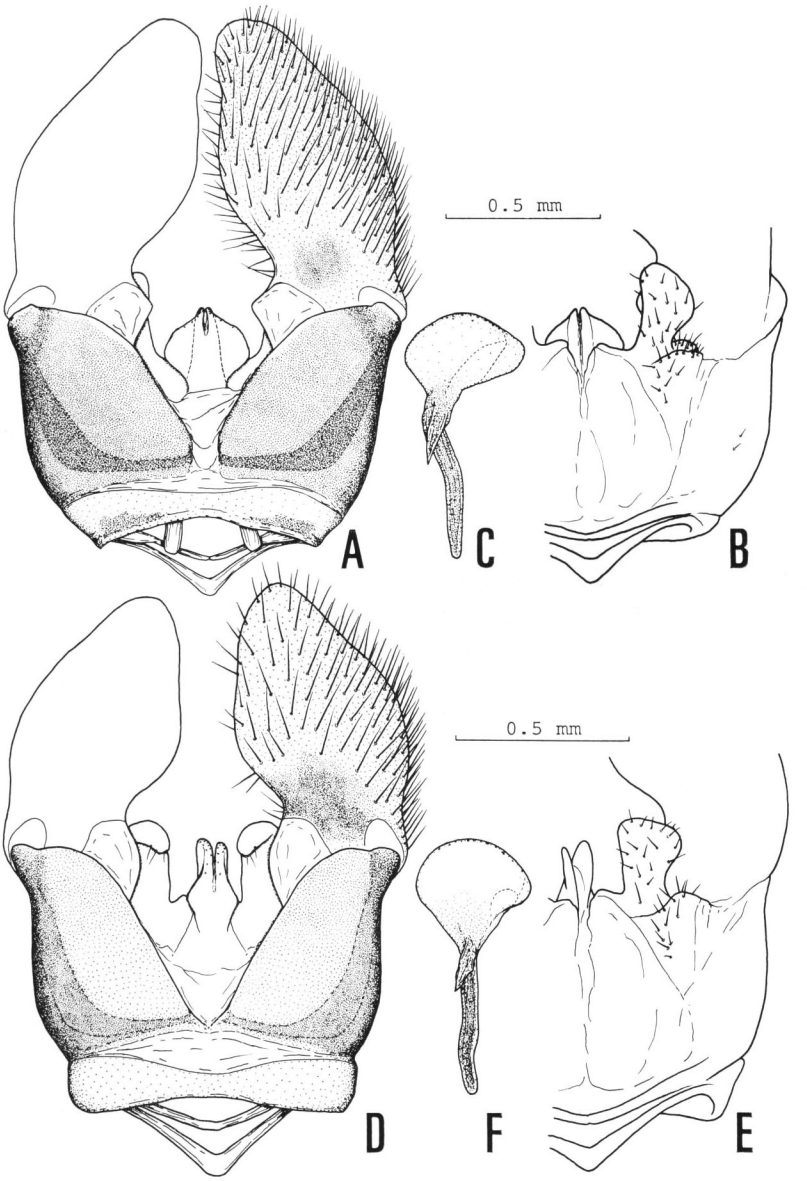

Fig. 8. Male genitalia, *Pamphilius aurantiacus*, Laško (A–C) and *P. marginatus*, Březová (D–F). A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view.

species-group extending its range into northern Europe.

PIC (1935) described *Pamphilius marginatus* var. *atricornis* from France. I have not seen PIC's type material, but judging from the description, *atricornis* and *mar-*

ginatus are most probably distinct at the species level; they differ in coloration of the antennae and legs (*atricornis* has black antennae and basally black femora), which usually offers good diagnostic characters for species distinction in *Pamphilius*.

Pamphilius lethierryi (KONOW)

(Figs. 1 N, 9 A–E, 10 A, 11 A–C)

Lyda lethierryi KONOW, 1887, 4.

Pamphilius lethierryi: KONOW, 1897, 23, 27, 32; KLIMA, 1937, 58; GREGOR & BAŤA, 1940, 218; BERLAND, 1947, 52; STRITT, 1952, 40, 43; STRITT, 1962, 50; WOLF, 1965, 459; ERMOLENKO, 1966, 61; ČINGOVSKI, 1967, 83; WOLF, 1971, carte 262; LACOURT, 1973, 693; MÓCZÁR & ZOMBORI, 1973, 29; LACOURT, 1977, 124; ZINOVJEV, 1978, 148; OOSTSTROOM, 1979, 97; PESARINI & PESARINI, 1980, 80; SCHEDL, 1980, 5; CHEVIN, 1981, 43; SHINOHARA, 1982, 554; VIITASAARI, 1982, 55; OEHLKE & WUDOWENZ, 1984, 393; ACHTERBERG & AARTSEN, 1986, 41; CHEVIN *et al.*, 1987, 26; MAGIS, 1988, 6, 20, 38, 46; PESARINI & PESARINI, 1988, 165; SHINOHARA, 1988 a, 110; SHINOHARA & TAEGER, 1990, 90.

For more references, see KLIMA (1937).

Distribution. Central and southern Europe: France, Belgium, the Netherlands, Germany, Italy, Austria, Czechoslovakia, Hungary, Yugoslavia. Caucasia.

Specimens examined. France: ♀ (holotype), "Raismes.," "Gall.," "coll. KONOW," "Typus." (DEI); 1 ♀, Montigny-les-Cormeilles, 12. V. 1960; 1 ♂, same locality, 11. V. 1967. Italy: 1 ♀, "Toscana, Pratomagno, 15-8-45, Castra, L. CERESA" (BM). [?]: 1 ♀, "25. 5. 1912, Sartsenburg."

Remarks. Among the European members of *Pamphilius*, this species superficially resembles *P. betulae* (LINNAEUS) and *P. festivus* PESARINI et PESARINI. The latter two species, however, belong to the *histrio* group (s. str.) and differ from *P. lethierryi* in having glabrous upper part of the head, distinct median tooth in the left mandible, entirely pale antennal scape, femora and tarsi, strongly convex mesoscutellum, very large inner tooth of the tarsal claw, larger dark marking of the wings, and pale basal abdominal sterna of the females. The male genitalia of *P. betulae* (the male of *P. festivus* is undescribed) lack the characteristics of the *alternans* group and the *lethierryi* subgroup (apomorphies 1, 2 and 2-b in Fig. 3) but possess autapomorphies of the *histrio* group instead.

For diagnosis of the male, see also LACOURT (1973) and SHINOHARA and TAEGER (1990).

Pamphilius cilix KONOW

(Figs. 1 O, 2 A, 5 E, 9 F–H, 10 B)

Pamphilius cilix KONOW, 1897, 242, 248, 254; KLIMA, 1937, 54; SHINOHARA, 1982, 554; OEHLKE & WUDOWENZ, 1984, 373.

For more references, see KLIMA (1937).

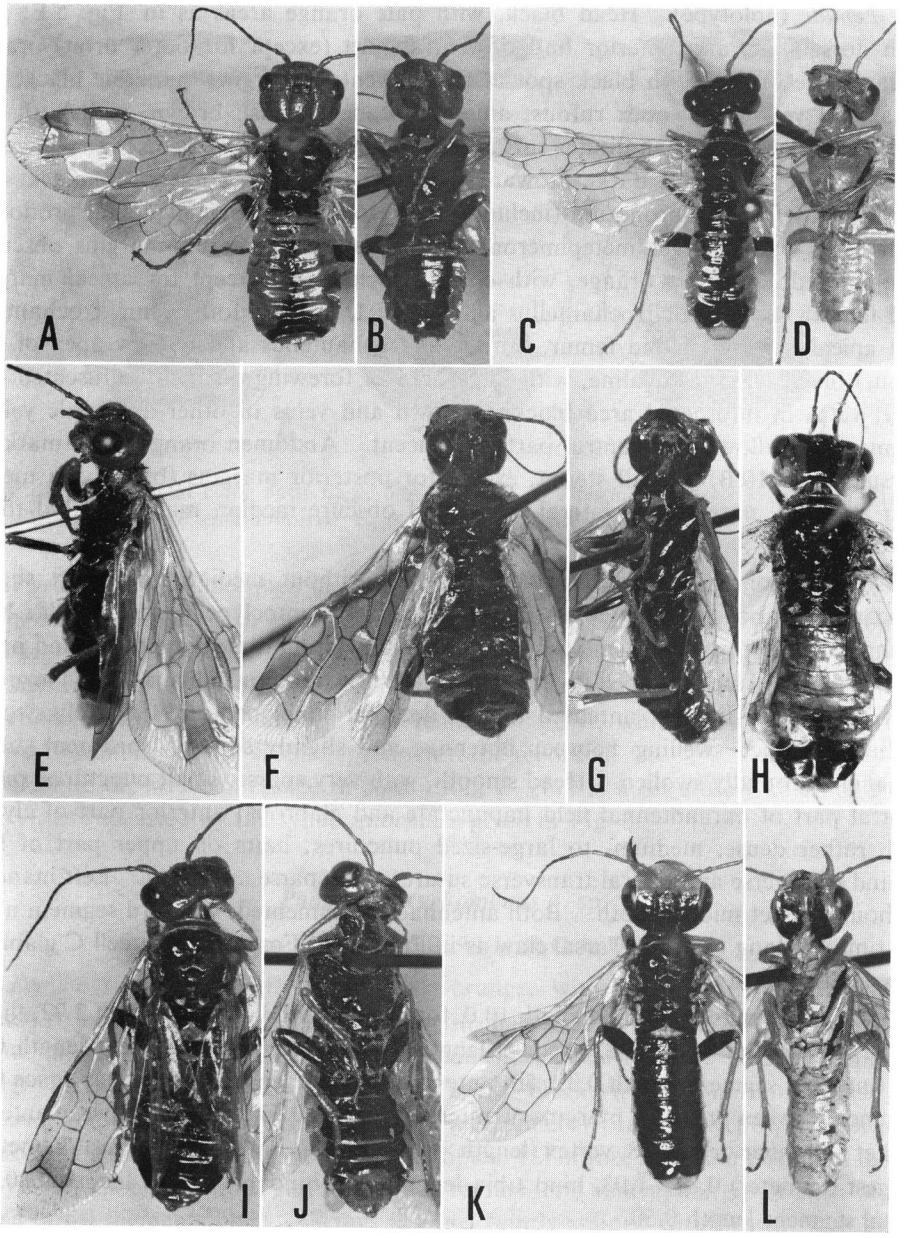

Fig. 9. A–B, *Pamphilius lethierryi*, ♀, Montigny-les-Cormeilles; C–D, do., ♂, same locality; E, do., ♀, holotype; F–G, *P. cilix*, ♀, holotype; H, do., Taurus; I–J, *P. turkomanus*, ♀, paratopotype; K–L, do., ♂, holotype.

Female (holotype). Head black, with pale orange areas as in Fig. 5 E; gena with dorsal part and anterior half of ventral part (except for outer orbit) orange; malar space orange with black spot at posteroventral margin; mandible black, with basal half yellow and apex rufous; antennal scape blackish brown, with both ends (including all radicula) and outer surface pale orange to yellow; pedicel and flagellum pale orange, becoming darker toward blackish brown apex. Thorax black, with dorsal half of lateral pronotum (including posterolateral corner of dorsal pronotum) and tegula pale orange; metepimeron with dorsal and posterior margins obscurely pale-marked; legs pale orange, with coxae, trochanters (except for apical margins) and femora (except for trochantellus and apical 1/3–1/2 of fore femur, trochantellus and apical 1/5–1/4 of mid femur, border of trochantellus and narrow apex of hind femur) black. Wings hyaline, with large area of forewing distinctly infuscated (Fig. 9 F); veins in infuscated area blackish brown and veins in other area pale yellow; stigma pale yellow, with central part translucent. Abdomen orange, with marks on dorsum (Fig. 10 B) and all sterna, except for posterior margins (broadly in median part and very narrowly in lateral parts) and obscure median marks on 2nd to 4th sterna black.

Upper frons below ocelli weakly convex, without median notch but slightly concave just above median fovea or dorsal end of frontoclypeal crest; ocellar basin triangular in outline, represented by shallow furrow around median ocellus and paired pits in front of median ocellus, and anterolateral extension indistinct; median fovea very small and shallow; antennal furrow deep; frontoclypeal crest roundly swollen, without distinct swelling between antennae and slightly sunk at epistomal suture; facial crest roundly swollen. Head smooth, with very sparse, small punctures, pilose; ventral part of paraantennal field impunctate and glabrous; anterior part of clypeus with rather dense, medium- to large-sized punctures; hairs on upper part of head behind transverse and lateral transverse sutures very sparse and short. Left mandible without distinct middle tooth. Both antennae 24-segmented, with 3rd segment about 2.3 times as long as 4th. Tarsal claw as in Fig. 1 O. Forewing with cell C glabrous. Sawsheath as in Fig. 2 A.

Measurements (in mm): Length 10.0, forewing length 9.0, head width 2.92, thorax width 3.00, scape length 0.83, pedicel length 0.35, 3rd antennal segment length 0.88, 4th antennal segment length 0.39, 5th antennal segment length 0.39, malar space 0.20, distance between proximal margins of antennal sockets 0.53, distance between antennal socket and inner orbit 0.58, vertex (length × width) 1.03 × 0.94, eye (shortest diameter × longest diameter) 0.81 × 1.03, hind tibia length 3.04, hind basitarsus length 0.80, 5th tarsal segment length 0.50.

Male. Unknown.

Distribution. Turkey (Cilician Taurus).

Specimens examined. ♀ (holotype), "Asia minor, Gülek, Taur. Cilic., 1897, HOLTZ," "coll. KONOW," "Holotype" (DEI); 1 ♀ "Gülek Taurus, H. KOLLE, Berlin, S. W. 11," "Sammlung Dr. ENSLIN," "*Pamphilius cilix* KNW ♀" (ZSM).

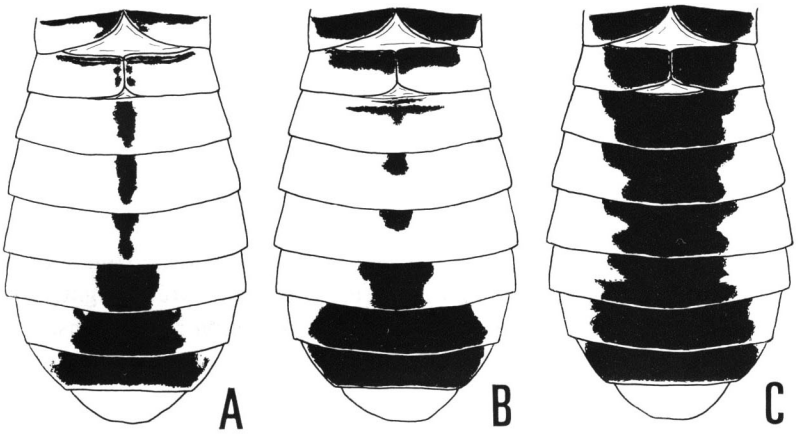

Fig. 10. Abdominal color pattern, ♀, dorsal view. A, *Pamphilius lethierryi*, Montigny-les-Cormeilles; B, *P. cilix*, holotype; C, *P. turkomanus*, paratopotype.

Variation. The specimen in ZSM is similar to the holotype, but the black areas on the head and abdomen are smaller (Fig. 9 H); one intact antenna of the specimen is 24-segmented, with the 3rd segment about 2.2 times as long as the 4th.

Remarks. This conspicuous species was known only from the holotype from "cilicischen Taurus" in Turkey. The female in ZSM, which came also from the Taurus Mountains, is the second specimen to be recorded.

Despite the wide difference in coloration, *P. cilix* is most closely allied to *P. lethierryi*, as suggested by the synapomorphies given in Fig. 3.

Pamphilius turkomanus n. sp.

(Figs. 1 C, P, 2 B, 5 D, 9 I–L, 10 C, 11 D–F)

Female (paratopotype). Head dark orange, with black transverse mark restricted to ocellar area, and clypeus yellowish, particularly in anterior part; mandible yellow, darkened toward dark rufous apex and marked with black medially; antenna orange, becoming darker toward apex. Thorax black, with pronotum, tegula, and posterior and very narrow dorsal margins of metepimeron orange to yellow; legs orange, with coxae, trochanters, femora (except for apical 1/3 of fore femur, apex of mid femur, and elliptic spot on ventral surface of hind femur), and ventral margin of each of 2nd to 4th tarsal segments black. Wings hyaline, faintly stained with brown, with apical half of cell 2Rs (and narrow neighboring area) distinctly infuscated; veins and stigma yellow, with costal end of vein 1r and veins in and near infuscated part of wing blackish. Abdomen (Fig. 10 C) black, with broad lateral margin of each of 1st to 7th terga (including laterotergites), narrow posterior margin of each sternum, and caudal part, including 8th laterotergite (except for anterior part), 9th tergum, posteromedian part

of 7th sternum and sawsheath orange to yellow.

Upper frons below ocelli very weakly convex, without median notch; ocellar basin small and shallow, triangular in outline, without distinct anterolateral extensions; median fovea very shallow, indistinct; antennal furrow rather shallow but sharply defined; frontoclypeal crest roundly swollen, arising near median fovea or just above it, continuing onto clypeus, with weakly developed frontal tubercle between antennae, and very slightly sunk at epistomal suture; facial crest rather weakly developed, rounded. Upper part of head behind transverse and lateral transverse sutures, and paraantennal field very smooth, with very sparse small punctures; frons and area from upper margin of paraantennal field to lateral transverse suture slightly roughened, with more punctures, but still shining; clypeus smooth, with rather dense, large punctures, except for sparsely punctate dorsomedian part; gena shallowly rugose and punctate; head before crassa covered with rather dense, short hairs, except for very sparsely pilose upper part of head behind transverse and lateral transverse sutures and ventral part of paraantennal field. Mandibles as in Fig. 1 C. Both antennae 24-segmented, with 3rd segment about 2.3 times as long as 4th. Tarsal claw as in Fig. 1 P. Forewing with cell C pilose all over. Sawsheath as in Fig. 2 B.

Measurements (in mm): Length 10.5, forewing length 9.0, head width 3.02, thorax width 3.10, scape length 0.83, pedicel length 0.33, 3rd antennal segment length 0.93, 4th antennal segment length 0.40, 5th antennal segment length 0.39, malar space 0.21, distance between proximal margins of antennal sockets 0.58, distance between antennal socket and inner orbit 0.59, vertex (length×width) 0.95×0.88, eye (shortest diameter×longest diameter) 0.85×1.09, hind tibia length 3.24, hind basitarsus length 0.79, length of 2nd–4th hind tarsal segments together 0.75, 5th tarsal segment length 0.59.

Male (holotype). Head black, with pale yellow areas as in Fig. 5 D; malar space and gena entirely pale yellow; mandible pale yellow, with dark rufous apex and large black mark along inner margin; antenna orange, darkened toward apex. Thorax black, with most of lateral pronotum, ventral surface of cervical sclerite, tegula, mesepisternum (except for dorsal part and narrow posterior margin), posterior margin of mesepimeron, most of metepisternum (except for dorsal part), and posterior margin of metepimeron pale yellow; legs pale yellow, with narrow coxal bases, dorsal surface of each trochanter and femur largely black, and ventral margin of each of 2nd to 4th tarsal segments also black. Wings hyaline, faintly stained with brown, with cell 2Rs and narrow bordering area of cells 3R1 and 3Rs weakly infuscated. Abdomen black dorsally, with narrow lateral margin pale yellow; pale yellow ventrally, with broad anterior margin of 2nd sternum and two obscure lateral spots along anterior margin of each of 3rd to 6th sterna black.

Upper frons below ocelli only weakly convex, without median notch; ocellar basin and median fovea indistinct; frontoclypeal crest as in female; facial crest convex, very bluntly carinate. Upper part of head behind transverse and lateral transverse sutures smooth, with sparse, distinct punctures; area between lateral transverse suture

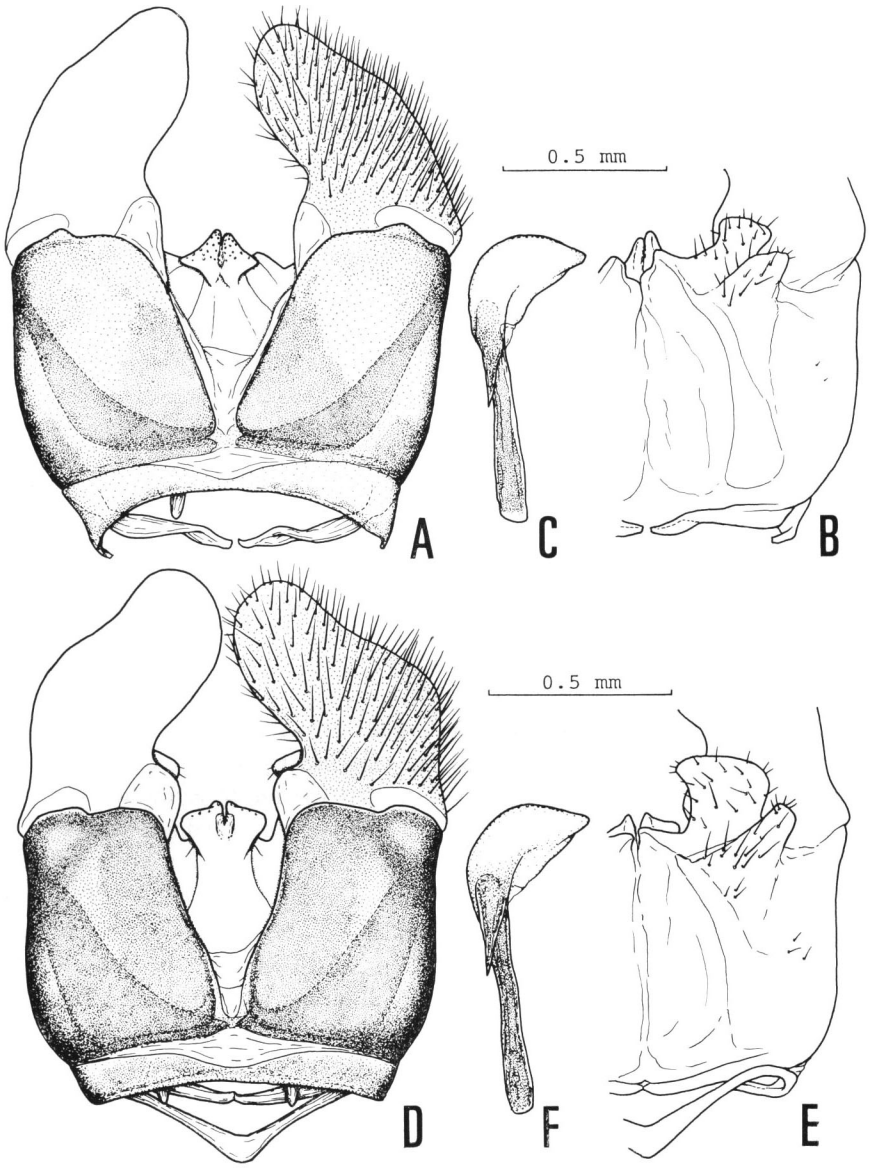

Fig. 11. Male genitalia, *Pamphilius lethierryi*, Montigny-les-Cormeilles (A–C) and *P. turkomanus*, paratopotype (D–F). A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view.

and facial crest, and frons slightly roughened, with denser but rather ill-defined punctures; paraantennal field smooth, nearly impunctate ventrally, and with dense, small punctures dorsally; median part of clypeus smooth, with rather sparse large punctures;

lateral part of clypeus and gena slightly rugose, with rather dense, large punctures; head before crassa pilose, except for glabrous ventral part of paraantennal field. Mandibles, tarsal claw, and pilosity of cell C in forewing as in female. Both antennae 22-segmented, with 3rd segment about 2.2 times as long as 4th. Subgenital plate with apical margin broadly rounded. Genitalia as in Fig. 11 D–F.

Measurements (in mm): Length 9.0, forewing length 7.5, head width 2.68, thorax width 2.50, scape length 0.71, pedicel length 0.30, 3rd antennal segment length 0.81, 4th antennal segment length 0.38, 5th antennal segment length 0.38, malar space 0.16, distance between proximal margins of antennal sockets 0.48, distance between antennal socket and inner orbit 0.53, vertex (length×width) 0.70×0.75, eye (shortest diameter ×longest diameter) 0.85×1.00, hind tibia length 2.56, hind basitarsus length 0.73, length of 2nd–4th hind tarsal segments together 0.70, 5th tarsal segment length 0.49.

Distribution. Turkmenistan (Kopet Dag).

Holotype. ♂, "Aj-dere, Kopetdag, Turkm., Budris, 27. IV. 986," "Terrasy v dol. Aj-dere, 800 m, na klene i dr." Deposited in ZIL.

Paratypes. 2 ♀, 5 ♂, same data as for holotype (ZIL & NSMT); 2 ♂, "Aj-dere, Kopetdag, Turkm., Budris, 30. IV. 986," "Poščiny na plato 950 m" (ZIL); 1 ♀, "Aj-dere, Kopetdag, Turkm., Budris, 3. V. 986," "Terrasy v dol. Aj-dere, 800 m" (ZIL); 1 ♀, same data, except for "5. V. 986" (ZIL); 1 ♀, same data, except for "6. V. 986" (ZIL).

Variation. Lengths of the five females examined are nearly the same, whereas the eight males examined vary from 8.0 to 9.0 mm. The female antennae are 22- to 24-segmented, with the 3rd segment about 2.2–2.3 times as long as the 4th, and the male antennae have 19 to 23 (usually 22) segments, with the 3rd segment about 2.1–2.3 times as long as the 4th. Coloration of the specimens examined shows little variation, but the black mark on mandibles often becomes reduced and the lateral pronotum in females is sometimes marked with black along the posterior margin.

Remarks. This new species, probably the first Pamphiliidae recorded from Turkmenistan, resembles *P. lethierryi* in coloration, but differs from it in the points given in the key. It is interesting that *P. turkomanus*, distributed at the periphery of the range of the *lethierryi* subgroup, retains such plesiomorphic character states of the subgroup as the presence of a large middle tooth in the left mandible and the pilose cell C of the forewing.

The holotype and seven paratypes bear the labels showing that the specimens were swept from maples ("na klene"), which may prove to be the host-plant.

Pamphilius komonensis TAKEUCHI

Pamphilius komonensis TAKEUCHI, 1930, 12; SHINOHARA & OKUTANI, 1983, 278.

Distribution. Japan.

Host-plant. *Acer mono* MAXIM. (SHINOHARA & OKUTANI, 1983).

Remarks. This species will be fully dealt with in a separate paper.

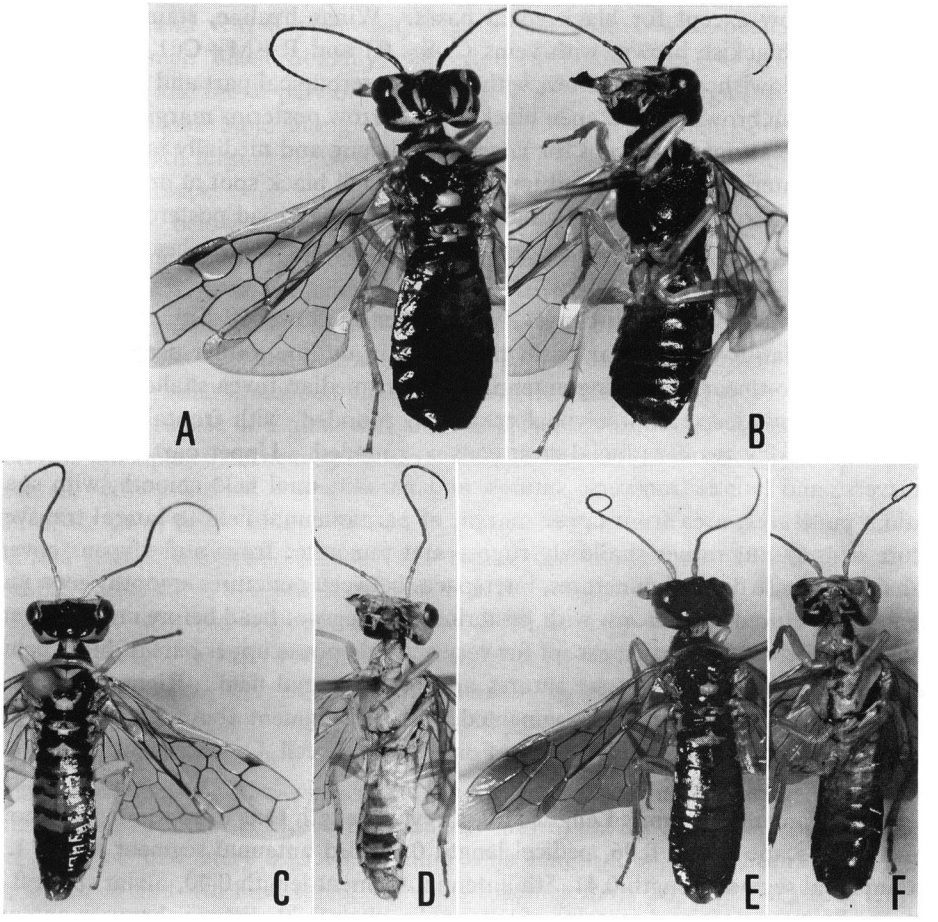

Fig. 12. A–B, *Pamphilius kyutekparki*, ♀, paratopotype; C–D, do., ♂, holotype; E–F, *P. croceus*, ♂, Mt. Odaesan.

Pamphilius kyutekparki n. sp.

(Figs. 1 D, M, 2 C, 5 F–G, 12 A–D, 13 A–C)

Pamphilius jucundus: KIM, 1980, 3, pl. v, HYPA01 (nec TAKEUCHI, 1930).

Female (paratopotype). Head black, with pale yellow marks as in Fig. 5 F; gena with pale yellow mark along ventral margin; malar space entirely black; mandible black, yellow basally and rufous apically; antenna with scape black and pedicel and flagellum blackish brown to black. Thorax black, with broad posterior margin (medially narrowed) of dorsal pronotum, spot at ventral margin of lateral pronotum, posterior half of prescutum, tegula, mesoscutellum, small spot at anterodorsal corner of mesepisternum, large median part of metascutum, and metascutellum pale yellow;

legs pale yellow except for black coxal bases. Wings hyaline, stained faintly with brown; veins blackish brown, with veins C, Sc, R1 and R+M+Cu1, and basal part of vein 1A yellowish; stigma yellow, with large posteroapical part and anterior margin basally blackish brown. Abdomen black, with narrow posterior margin of 1st tergum, and 2nd to 5th segments (except for laterally widening and medially interrupted black band along anterior margin of 2nd tergum, and small black spot at anterolateral part of 3rd and 5th terga) orange, and caudal part, including broad posteromedian margin of 7th sternum, posteromedian margin of 9th laterotergite, sawsheath, and narrow posterior margin of 10th tergum yellow to orange.

Upper frons below ocelli convex, with rather shallow but distinct median notch reaching median fovea; ocellar basin triangular in outline, rather deep, with anterolateral extension nearly reaching antennal furrow; median fovea shallow, punctiform; antennal furrow deep; frontoclypeal crest low, rounded, with frontal tubercle indistinct, very weakly swollen; facial crest convex, rounded. Upper part of head behind transverse and lateral transverse sutures, and paraantennal field smooth, with sparse distinct punctures; area from upper margin of paraantennal field to lateral transverse suture densely but rather shallowly rugose and punctate; frons and clypeus covered with rather dense distinct punctures, interspaces between punctures smooth; gena more sparsely punctured than frons, with posterior part rugose; head before crassa covered with rather dense short hairs, except for very sparsely pilose upper part of head behind transverse and lateral transverse sutures and paraantennal field. Right mandible as in Fig. 1 D. Both antennae 24-segmented, with 3rd segment about 2.8 times as long as 4th. Tarsal claw as in Fig. 1 M. Forewing with cell C densely pilose all over. Sawsheath as in Fig. 2 C.

Measurements (in mm): Length 11.0, forewing length 11.0, head width 3.44, thorax width 3.24, scape length 0.96, pedicel length 0.41, 3rd antennal segment length 1.16, 4th antennal segment length 0.41, 5th antennal segment length 0.40, malar space 0.29, distance between proximal margins of antennal sockets 0.70, distance between antennal socket and inner orbit 0.71, vertex (length × width) 1.20 × 0.98, eye (shortest diameter × longest diameter) 0.93 × 1.14, hind tibia length 3.44, hind basitarsus length 0.85, length of 2nd–4th hind tarsal segments together 0.69, 5th tarsal segment length 0.50.

Male (holotype). Head black, with pale yellow areas as in Fig. 5 G; malar space and gena entirely pale yellow; mandible pale yellow, with dark rufous apex; antenna pale yellow, gradually becoming dark brown toward apex. Thorax black, with following pale yellow parts: ventral half of cervical sclerite, broad posterior margin (medially narrowed) of dorsal pronotum, most of lateral pronotum, tegula, posterior half of prescutum, mesoscutellum and large oblong spot on mesonotum anterolateral to mesoscutellum, entire mesepisternum (including mesopreepisternum), broad dorsal and posterior margin of mesepimeron, entire lateral side of metepisternum, dorsal (except for anterior part) and posterior parts of metepimeron; legs pale yellow, except for very narrowly black coxal bases. Wings hyaline, very slightly stained with brown; veins blackish brown, with veins C, Sc, R1 and R+M+Cu1, and basal part of vein

1A pale yellow, and vein R yellowish; stigma pale yellow, with posteroapical part blackish. Abdomen black dorsally, with narrow lateral margin yellowish, broad posterior margin and mesal part of 2nd tergum, and 3rd to 5th terga (except for medially interrupted black band along anterior margin of each segment) orange, and posterior margin of 8th tergum yellowish; venter pale yellow, with narrow anterior margin of 2nd sternum black.

Upper frons below ocelli strongly convex, with deep sharply defined median notch reaching median fovea; ocellar basin triangular in outline, rather deep, with anterolateral extension not reaching antennal furrow; median fovea indistinct; frontoclypeal crest flattened; facial crest strongly convex, bluntly carinate. Upper part of head behind transverse and lateral transverse sutures and paraantennal field smooth, with very sparse, rather ill-defined punctures; area from facial crest to lateral transverse suture shallowly rugose and punctate; frons and clypeus with rather dense large deep punctures, interspaces between punctures smooth; gena rather irregularly shallowly punctured, with posterior part somewhat rugose; head before crassa covered with rather dense short hairs, except for nearly glabrous upper part of head behind transverse and lateral transverse sutures and rather sparsely pilose paraantennal field. Mandible, tarsal claw, and pilosity of cell C in forewing as in female. Both antennae 24-segmented, with 3rd segment about 2.8 times as long as 4th. Subgenital plate with apical margin broadly rounded. Genitalia as in Fig. 13 A–C.

Measurements (in mm): Length 9.0, forewing length 8.0, head width 2.72, thorax width 2.32, scape length 0.78, pedicel length 0.33, 3rd antennal segment length 0.98, 4th antennal segment length 0.35, 5th antennal segment length 0.35, malar space 0.23, distance between proximal margins of antennal sockets 0.55, distance between antennal socket and inner orbit 0.58, vertex (length×width) 0.78×0.76, eye (shortest diameter×longest diameter) 0.75×0.95, hind tibia length 2.60, hind basitarsus length 0.70, length of 2nd–4th hind tarsal segments together 0.61, 5th tarsal segment length 0.40.

Distribution. Soviet Far East (Primorskij Kraj); Korea.

Holotype. ♂, Mirugam (Pugdaesa), 1,300 m alt., Mt. Odaesan, Kangweon-do, Korea, 10. VI. 1987, A. SHINOHARA. Deposited in KWU.

Paratypes. Primorskij Kraj: 1 ♀, Vladivostok, Lesnaja, Zaimka, 26. VI. 1982, A. ZINOVJEV (ZIL); 1 ♀, Khasan, r-n Zanadvorovka, 5. VI. 1972, A. PONOMARENKO (MU). Korea: 2 ♀, 9 ♂, same data as for holotype; 1 ♀, same data except for 8. VI. 1987; 3 ♂, same data except for 11. VI. 1987; 13 ♀, same data except for 27. V. 1989; 4 ♂, same data except for 28. V. 1989; 7 ♂, same data except for 30. V. 1989; 1 ♂, Chongpyongsa, nr. Chuncheon, Kangweon-do, 1. VI. 1987, A. SHINOHARA; 1 ♂, Kwangneung, Gyeonggi-do, 14. V. 1980, A. SHINOHARA; 1 ♀, same locality, 18. VI. 1974, Y.-J. KWON (EWU).

Variation. Females:— Length ranges from 9.0 to 11.0 mm. The antennae are 23- or 24-segmented, with the 3rd segment about 2.5–2.8 times as long as the 4th. Coloration varies as follows: paired yellowish spots on frons fused into one large

mark in one specimen; yellowish spot along lateral suture nearly absent in one specimen; yellowish mark on gena usually missing; yellowish marks on lateral pronotum and mesepisternum sometimes missing; mesoscutum sometimes with oblong yellowish mark anterolateral to mesoscutellum and minute yellowish spot along lateral margin of prescutum; stigma dark-colored in two specimens from Primorskij Kraj (dark brown to blackish brown, with basal 1/5–1/3, except for anterior margin, and anterior margin in apical half yellow). Males:— Length ranges from 7.5 to 10.0 mm. The antennae have 20 to 25 (usually 22 or 23) segments, with the 3rd segment about 2.3–3.0 times as long as the 4th. Coloration varies as follows: postocular stripe usually interrupted medially, whereas in pale specimens it is complete and black area on upper outer orbit reduced, and in very dark specimens anterior part of postocular stripe (or spot at upper inner orbit) entirely missing; mesoscutum often with oblong yellow spot along lateral margin of prescutum, and yellow mark anterolateral to mesoscutellum variable in size, though never missing in the material examined; posttergite often marked with yellow; orange area on dorsum of abdomen variable in extent, with, in the palest specimen, all terga orange except for broad anterior margin of each segment, while in the darkest specimen, only 4th and 5th terga and small spot at posterior margin of 3rd tergum orange.

Remarks. This new species is most closely allied to *P. komonensis* from Japan. The two species can be separated by the characters given in the key.

Most of the specimens collected in Korea were swept from the leaves of *Acer*, which is the host-plant of *P. komonensis*. *Acer* may possibly be the host-plant of the new species.

The specific name is dedicated to Prof. Kyu-Tek PARK of Kangweon National University, Chuncheon, who has greatly helped my studies on sawflies in Korea.

Pamphilius takeuchii BENEŠ

Pamphilius jucundus TAKEUCHI, 1930, 16 (nec EVERSMANN, 1847).
Pamphilius takeuchii BENEŠ, 1972 a, 46; SHINOHARA & OKUTANI, 1983, 279.

Distribution. Japan.

Host-plant. *Acer mono* MAXIM. (SHINOHARA & OKUTANI, 1983).

Remarks. This species will be fully dealt with in a separate paper.

Pamphilius croceus SHINOHARA

(Figs. 1 E, 2 F, 12 E–F, 13 D–F)

Pamphilius takeuchii: BENEŠ, 1974, 304 (in part).
Pamphilius croceus SHINOHARA, 1986, 425.

Female. Description given by SHINOHARA (1986).

Male (hitherto undescribed; description based on a specimen from Mt. Odaesan). Head black, with anterior part before line connecting facial crests and swellings in

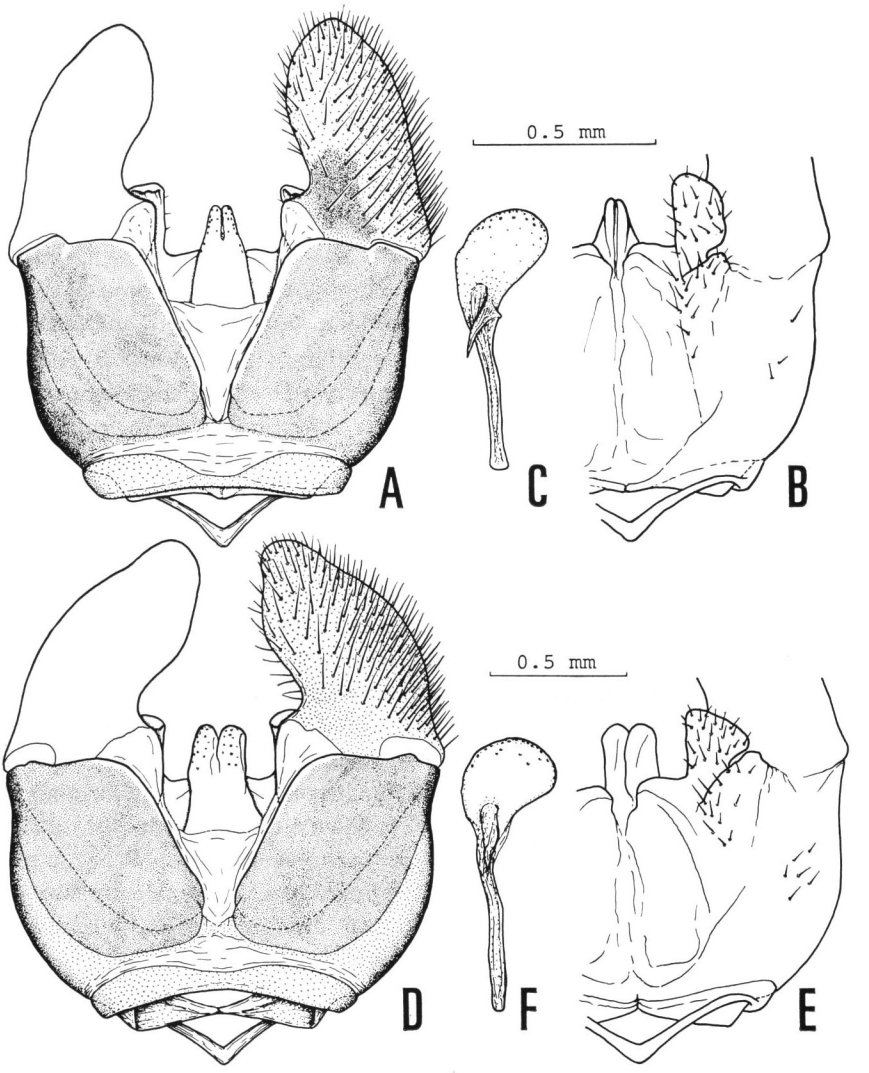

Fig. 13. Male genitalia, *Pamphilius kyutekparki*, paratopotype (A–C) and *P. croceus*, Mt. Odaesan (D–F). A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view.

upper part of frons, malar space, and gena yellow; mandible yellow, becoming darker toward dark rufous apex; antenna with scape yellow and pedicel and flagellum orange, gradually becoming darker toward blackish brown apex. Thorax black, with following parts pale yellow: most of lateral pronotum extending dorsally to cover broad posterolateral corner of dorsal pronotum, ventral half and narrow dorsomesal margin of cervical sclerite, tegula, mesoscutellum, mesepisternum (except for narrow dorsal

and posterior margins), mesopreepisternum (except for streak along median line and narrow posterior margin), small spot near dorsal margin and narrow posterior margin of mesepimeron, metascutellum, lateral surface of metepisternum, and large dorsal and posterior part of metepimeron; mesonotal lateral lobe with large dark brown marking; legs pale yellow, except for narrow coxal bases. Wings hyaline, rather strongly stained with blackish brown, infuscation weaker basally and along anterior margin; veins blackish brown, with veins C, Sc, R1 and R+M+Cu1, and basal part of vein 1A yellowish, and veins R and M+Cu1 dark orange; stigma orange, paler centrally, and posterior margin (except for basal part) blackish brown. Abdomen black dorsally, with narrow lateral margin yellow and narrow posteromedian area of 3rd tergum and 4th and 5th terga (except for black marking along anterior margin) orange; venter pale yellow.

Upper frons below ocelli very strongly convex, with rather shallow median notch reaching median fovea; ocellar basin triangular in outline, deep in front of median ocellus but shallow posteriorly, with anterolateral extension nearly reaching antennal furrow; median fovea set in large, rather deep basin-like depression; frontoclypeal crest low, rounded in supraclypeal area and bluntly carinate on clypeus; facial crest very strongly convex, rather sharply carinate. Upper part of head behind transverse and lateral transverse sutures, and upper part of frons smooth, partly very weakly coriaceous, with very sparse, rather ill-defined punctures; area from facial crest to lateral transverse suture shallowly rugose; paraantennal field smooth, very shallowly rugose dorsally, without distinct punctures; supraclypeal area shallowly rugose and punctate; clypeus smooth, with lateral part shallowly rugose, and anterior, median, and lateral parts bearing rather dense distinct punctures; gena generally smooth, with sparse shallow punctures in anterior part, and weakly rugose and rather densely punctate in posterior part; head nearly glabrous before crassa, except for rather densely pilose gena and punctate area of clypeus and very sparsely pilose paraantennal field. Mandibles as in Fig. 1 E. Both antennae 24-segmented, with 3rd segment about 2.3 times as long as 4th. Tarsal claw with large rounded basal lobe and inner tooth distinctly shorter than outer one. Forewing with cell C glabrous. Subgenital plate with apical margin broadly rounded and subtruncate at apex. Genitalia as in Fig. 13 D–F.

Measurements (in mm): Length 13.0, forewing length 10.5, head width 3.68, thorax width 3.32, scape length 0.98, pedicel length 0.41, 3rd antennal segment length 1.13, 4th antennal segment length 0.50, 5th antennal segment length 0.48, malar space 0.35, distance between proximal margins of antennal sockets 0.68, distance between antennal socket and inner orbit 0.78, vertex (length×width) 1.19×1.05, eye (shortest diameter×longest diameter) 0.95×1.20, hind tibia length 3.34, hind basitarsus length 0.93, length of 2nd–4th hind tarsal segments together 0.80, 5th tarsal segment length 0.54.

Distribution. Soviet Far East (Primorskij Kraj); Korea [new record].

Specimens examined. Primorskij Kraj: 1 ♀, Spassk, 11. VI. 1961, A. N. ZHELO-

CHOVTSEV (MU); 1 ♂, Suputinsk. Zapov., ot. A. RASNITSINA (MU). Korea: 1 ♂, Huibangsa, 750 m, Mt. Sobaeksan, Kyongsangbuk-do, 18. V. 1987, A. SHINOHARA; 1 ♂, Mirugam (Pugdaesa), 1,300 m, Mt. Odaesan, Kangweon-do, 10. VI. 1987, A. SHINOHARA.

Variation. The female from Spassk is similar to the holotype described by SHINOHARA (1986), showing but some differences as follows: Length 14.5 mm; blackish marking in ocellar area nearly missing; transverse small pit between antennal sockets missing; both antennae 25-segmented, with 3rd segment about 2.3 times as long as 4th, pale yellow, with apical segments (approximately beyond 18th) becoming blackish; blackish marking on cervical sclerite and mesonotum somewhat reduced; mesepisternum with large transverse dark orange marking extending from anterior margin to posterior margin (medially interrupted), and yellowish anterodorsal corner; median part of metanotum largely yellow; blackish marking on lateral part of metepisternum almost missing; 6th abdominal tergum with anterior margin and posterolateral part marked with dark orange.

The three males examined show considerable variation. The specimen from Suputinsk. Zapov. is small (length about 11.5 mm) and dark-colored: mesoscutum entirely black; wings rather uniformly infuscated, infuscation not distinctly weaker basally. The antennae of this specimen lack apices; the 3rd antennal segment is about 2.7 times as long as the 4th. The specimen from Mt. Sobaeksan is large (length about 13.5 mm) and pale-colored: lateral surface of cervical sclerite, dorsal pronotum, prescutum, mesoscutum, metanotum and metapostnotum richly marked with dark orange; wings with basal 3/5 much less strongly infuscated than apical 2/5; broad anterior and narrow posterior margins of propodeum, inverted T-shaped marking on 2nd tergum, and anterior and posterior margins of 3rd tergum and 3 vertical stripes connecting them orange. Both antennae of the specimen are 28-segmented, with the 3rd segment about 2.7 times as long as the 4th.

Remarks. This species was previously known from only a single female from Primorskij Kraj, and this is the first record from Korea. The nearest relative of this species is *P. takeuchii* from Japan. The two species are distinguishable by the characters given in the key.

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