DEEL 124 AFLEVERING 1 1981

TIJDSCHRIFT VOOR ENTOMOLOGIE

UITGEGEVEN DOOR

DE NEDERLANDSE ENTOMOLOGISCHE VERENIGING

INHOUD

Tijdschrift voor Entomologie, deel 124, afl. 1 Gepubliceerd 20-VII-1981

A SURVEY OF THE DUTCH SPECIES OF THE SUBGENUS *HYLOPSALLUS* OF *PSALLUS* (HEMIPTERA-HETEROPTERA, MIRIDAE)

(Mededeling EIS-Nederland, no. 6)

by

BEREND AUKEMA

Instituut voor Taxonomische Zoölogie, Amsterdam

With 36 text-figures

ABSTRACT

The Dutch material of the subgenus *Psallus* (*Hylopsallus*) and of the related *Asthenarius quercus* (Kirschbaum, 1856) is extensively revised. The occurrence of *Psallus* (*Hylopsallus*) *perrisi* (Mulsant, 1852), *P.* (*H.*) *variabilis* (Fallén, 1829) and *A. quercus* in the Netherlands is confirmed, whereas *P.* (*H.*) *wagneri* Ossiannilsson, 1953 is recorded now for the first time from this country. It is shown that measurements of external morphological characters do not allow identification of the species, as is suggested in most keys of *Hylopsallus*. Of the Dutch species and *P.* (*H.*) *assimilis* Stichel, 1956, which may be expected, a key to the males, descriptions, and drawings of the male genitalia are given, and the distribution of the Dutch species in the Netherlands is figured. Finally the status of *P.* (*H.*) *wagneri* is discussed.

INTRODUCTION

The genus *Psallus* Fieber, 1858, belongs to the subfamily Phylinae Handlirsch, 1925, tribe Phylini Douglas & Scott, 1865. The subgenus *Hylopsallus* was established by Wagner in 1952, and in the same publication *Psallus variabilis* (Fallén, 1829) was designated as the type of the subgenus.

The Dutch species of *Hylopsallus* are characterized by the pale antennae (base of segment 1 more or less dark), the black, dark-brown, red-brown or red body, the dark-brown or red femora, which are pale only at their extreme apices and either unspotted or provided with a few obscure dark spots beneath, the pale tibiae having dark spines arising from dark spots (at least at hind tibiae), the tarsal segment 3 being shorter than segment 2, the male genital segment, which is ventrally distinctly keeled, and the shape and processes of the aedeagus.

Wagner (1975) included 10 species in *Hylopsallus*, of which *quercus* (Kirschbaum, 1856) was transferred to the genus *Asthenarius* Kerzhner, 1962, in a later publication of the same author (Wagner, 1975a). Four of the nine species constituting the subgenus now are found in the Netherlands or adjacent countries.

Probably because the identification of the species of *Hylopsallus* is difficult without examination of the male genitalia, Dutch entomologists have paid little

attention to the representatives of *Hylopsallus*. Reclaire (1932, 1948) included *quercus* and *variabilis* in his checklist of Dutch species and Meurer (1956) added *perrisi* (Mulsant, 1852).

My unsuccesful attempts to identify some Dutch material of *Hylopsallus* led to this critical evaluation of all Dutch material of the subgenus available (cf. collections mentioned under Acknowledgements). Because *Asthenarius quercus* closely resembles *Hylopsallus* and since this species was often confused with *variabilis* by Dutch entomologists I have incorporated this species in the present study.

This study confirms the occurrence of *P.* (*H.*) *perrisi*, *variabilis* and *quercus* in the Netherlands, whereas *wagneri* is recorded from this country for the first time. Another species which could be expected in the Netherlands is *P.* (*H.*) *assimilis* Stichel, 1956. This species was described after material from England and was later recorded from West Germany (Rieger, 1975, 1976). Since assimilis was not found in museum material from the Netherlands, I have undertaken special efforts to find *assimilis* on its host plant, common maple (*Acer campestre* L.). However, all attempts were unsuccessful.

Furthermore my study of the Dutch *Hylopsallus* material led to a critical evaluation of the characters used in the literature for separating the species. The genitalia of all available Dutch males of *Hylopsallus* were dissected and examined. For reasons of comparison some Swedish material of *wagneri* and some British material of *perrisi*, *wagneri*, *variabilis* and *assimilis* was examined. A key to the males, drawings of the male genitalia and descriptions of the species are included.

TAXONOMIC CHARACTERS

The species of *Hylopsallus* have a very similar general appearance, although *perrisi* and *wagneri* are somewhat different in size and colour from *assimilis* and *variabilis*.

Absolute as well as relative measurements of external morphological structures are most frequently used in separating species of *Hylopsallus*. Especially the ratio of width of vertex to width of eye, the ratio of length of antennal segment 2 to length of segment 1, the ratio of length of antennal segment 2 to width of pronotal base, and the absolute length of the body including the wings are used in keys for the identification of species in *Hylopsallus* (Kerzhner & Yachevski, 1964; Southwood & Leston, 1959; Stichel, 1956, 1958; Wagner, 1952, 1961, 1967 and 1975; Wagner & Weber, 1964; Woodroffe, 1957 and Zaytseva, 1969).

However, precise measurements of great numbers of specimens show that these measurements do not provide an reliable basis for identification because of the great intraspecific variation and the great interspecific overlap (tables 1—3). All the keys mentionned are more or less misleading in suggesting the possibility of identification on the ground of simple measurements. The ratio of width of vertex to width of eye for instance is used by Wagner (1952, 1961, 1967 and 1975) and Woodroffe (1957) to separate *perrisi/wagneri*, *assimilis*, *variabilis* and *quercus* from each other. Comparison of their ratios with the ratios from my mearurements (table 4) shows that their ratios do fall within the range of my measurements. On

Table 1. Measurements of Dutch specimens of *Psallus perrisi* and *P. wagneri*, males and females (n = number of specimens measured; r = range of measurements; $\bar{x}$ = average of measurements; s.d. = standard deviation of measurements; c.v. = coëfficient of variation).

	♂ *perrisi*					♂ *wagneri*					♀ *perrisi/wagneri*				
	n	r	$\bar{x}$	s.d.	c.v.	n	r	$\bar{x}$	s.d.	c.v.	n	r	$\bar{x}$	s.d.	c.v.
length of body	122	3.06—4.04	3.55	0.19	5.46	27	3.21—3.78	3.55	0.15	4.10	71	3.02—4.06	3.59	0.43	11.98
width of body	117	1.24—1.68	1.44	0.08	5.74	28	1.19—1.55	1.42	0.15	6.40	69	1.30—1.69	1.53	0.07	4.48
width of head	139	0.69—0.87	0.75	0.02	3.31	29	0.69—0.78	0.75	0.02	3.18	81	0.71—0.81	0.76	0.02	2.80
width of vertex	139	0.32—0.43	0.35	0.02	4.50	29	0.31—0.37	0.35	0.02	4.75	81	0.34—0.40	0.38	0.01	3.36
length of ant. segment 1	127	0.19—0.25	0.22	0.03	12.49	28	0.19—0.24	0.22	0.01	6.00	80	0.20—0.25	0.22	0.01	4.64
length of ant. segment 2	125	0.81—1.03	0.93	0.05	5.15	28	0.86—1.03	0.92	0.05	4.98	80	0.81—1.08	0.97	0.05	4.89
length of ant. segment 3	94	0.40—0.62	0.53	0.04	7.04	10	0.50—0.55	0.53	0.02	—	77	0.47—0.63	0.55	0.04	7.55
length of ant. segment 4	61	0.25—0.43	0.36	0.03	7.94	8	0.33—0.38	0.36	—	—	61	0.30—0.43	0.36	0.02	6.92
length of antennae	59	1.71—2.20	2.05	0.10	4.80	7	1.95—2.17	2.04	—	—	61	1.79—2.26	2.10	0.09	4.51
width of pronotal base	129	1.06—1.39	1.22	0.06	4.70	29	1.03—1.29	1.19	0.06	5.28	79	1.08—1.39	1.26	0.06	4.58
length of body: width of body	117	2.18—2.92	2.45	0.13	5.29	27	2.28—2.83	2.50	0.13	5.02	67	2.20—2.56	2.38	0.08	3.56
width of vertex: width of eye	139	1.54—2.12	1.76	0.10	5.78	29	1.60—2.00	1.76	0.10	5.82	81	1.70—2.38	1.97	0.11	5.38
length of ant.: length of body	56	0.49—0.65	0.58	0.04	6.40	6	0.55—0.61	0.58	—	—	54	0.52—0.64	0.58	0.03	5.07
length of ant. segment 2: length of ant. segment 1	123	3.77—4.75	4.24	0.20	4.62	28	3.79—4.83	4.17	0.28	6.75	80	4.00—5.00	4.45	0.23	5.17
length of ant. segment 2: length of ant. segments 3 + 4	61	0.87—1.26	1.04	0.08	7.56	7	0.97—1.09	1.04	—	—	61	0.88—1.22	1.07	0.07	6.33
length of ant. segment 2: width of pronotal base	117	0.65—0.89	0.77	0.04	5.42	28	0.70—0.87	0.77	0.04	5.83	79	0.71—0.87	0.77	0.03	4.30
length of rostrum	7	1.21—1.33	1.29	—	—	—	—	—	—	—	22	1.34—1.46	1.42	0.04	—
length of rostrum: length of body	7	0.33—0.36	0.35	—	—	—	—	—	—	—	21	0.36—0.40	0.38	0.01	—

Table 2. Measurements of Dutch males of *Psallus variabilis* and *Asthenarius quercus* and British males of *P. assimilis*. As table 1.

	♂ *assimilis*				♂ *variabilis*					♂ *quercus*				
	n	r	x̄	s.d.	n	r	x̄	s.d.	c.v.	n	r	x̄	s.d.	c.v.
length of body	10	3.37—3.83	3.69	0.14	61	3.47—4.40	3.92	0.19	4.95	64	3.83—4.71	4.31	0.21	4.93
width of body	9	1.50—1.66	1.58	—	57	1.29—1.68	1.54	0.08	4.87	58	1.53—1.81	1.66	0.06	3.88
width of head	14	0.73—0.78	0.76	0.01	65	0.73—0.82	0.77	0.02	2.49	67	0.75—0.84	0.79	0.02	2.79
width of vertex	14	0.36—0.38	0.38	0.01	65	0.30—0.40	0.36	0.02	4.89	67	0.30—0.38	0.34	0.02	4.70
length of ant. segment 1	13	0.21—0.25	0.23	0.01	65	0.21—0.27	0.24	0.01	4.80	65	0.24—0.30	0.26	0.01	4.53
length of ant. segment 2	13	0.93—1.06	1.01	0.03	66	0.91—1.16	1.02	0.05	4.62	63	1.11—1.36	1.26	0.05	4.26
length of ant. segment 3	12	0.54—0.63	0.59	0.03	42	0.48—0.66	0.59	0.04	6.37	43	0.63—0.81	0.72	0.05	6.55
length of ant. segment 4	11	0.38—0.43	0.40	0.02	32	0.35—0.45	0.39	0.02	5.22	35	0.35—0.48	0.41	0.03	7.66
length of antennae	11	2.12—2.36	2.24	0.08	32	2.13—2.37	2.26	0.06	2.81	35	2.41—2.86	2.64	0.10	3.78
width of pronotal base	14	1.20—1.34	1.27	0.04	59	1.16—1.39	1.29	0.05	4.24	62	1.21—1.44	1.31	0.05	3.46
length of body: width of body	9	2.23—2.50	2.33	—	57	2.31—2.81	2.55	0.12	4.88	58	2.29—2.90	2.58	0.14	5.35
width of vertex: width of eye	14	1.90—2.11	1.98	0.08	65	1.39—2.16	1.78	0.13	7.17	67	1.30—2.00	1.47	0.12	8.21
length of ant.: length of body	9	0.55—0.63	0.60	—	32	0.53—0.64	0.58	0.03	4.97	34	0.55—0.69	0.61	0.04	6.28
length of ant. segment 2: length of ant. segment 1	13	4.00—4.71	4.41	0.23	65	3.60—4.78	4.23	0.23	5.53	63	4.24—5.38	4.89	0.24	4.87
length of ant. segment 2: length of ant. segments 3 + 4	11	0.95—1.10	1.02	0.04	32	0.93—1.14	1.03	0.05	4.46	35	1.04—1.26	1.11	0.06	5.49
length of ant. segment 2: width of pronotal base	12	0.76—0.84	0.80	0.03	59	0.72—0.87	0.78	0.03	4.29	58	0.87—1.06	0.97	0.04	4.09
length of rostrum	—	—	—	—	7	1.41—1.52	1.47	—	—	2	1.58—1.62	—	—	—
length of rostrum: length of body	—	—	—	—	7	0.35—0.39	0.36	—	—	2	0.33—0.36	—	—	—

Table 3. Measurements of Dutch females of *Psallus variabilis* and *Asthenarius quercus* and British females of *P. assimilis*. As table 1.

	♀ *assimilis*					♀ *variabilis*					♀ *quercus*				
	n	r	x̄	s.d.	c.v.	n	r	x̄	s.d.	c.v.	n	r	x̄	s.d.	c.v.
length of body	24	3.52—4.04	3.73	0.13	—	68	3.28—4.26	3.85	0.19	4.84	53	3.52—4.32	3.88	0.21	5.51
width of body	18	1.53—1.71	1.64	0.06	—	64	1.30—1.77	1.66	0.07	4.26	53	1.48—1.81	1.65	0.07	4.01
width of head	29	0.73—0.81	0.77	0.02	2.96	73	0.73—0.83	0.79	0.02	2.28	58	0.67—0.85	0.79	0.03	3.30
width of vertex	29	0.36—0.42	0.40	0.01	3.47	73	0.36—0.42	0.40	0.01	3.33	58	0.35—0.42	0.39	0.01	3.23
length of ant. segment 1	28	0.21—0.27	0.24	0.01	5.42	73	0.23—0.27	0.25	0.01	3.15	59	0.23—0.28	0.25	0.01	4.72
length of ant. segment 2	29	0.96—1.06	1.02	0.03	3.00	73	0.91—1.16	1.05	0.04	3.82	59	1.06—1.31	1.21	0.06	4.73
length of ant. segment 3	24	0.55—0.67	0.61	0.03	5.07	70	0.52—0.69	0.61	0.04	5.95	51	0.61—0.86	0.71	0.05	7.52
length of ant. segment 4	20	0.38—0.45	0.41	0.02	—	61	0.35—0.44	0.39	0.02	5.69	34	0.38—0.58	0.42	0.04	9.44
length of antennae	20	2.16—2.41	2.28	0.07	—	61	2.17—2.51	2.30	0.08	3.65	34	2.34—2.90	2.59	0.12	4.61
width of pronotal base	28	1.13—1.41	1.29	0.07	5.38	70	1.11—1.45	1.34	0.06	4.32	56	1.16—1.44	1.28	0.06	4.40
length of body: width of body	18	2.15—2.43	2.27	0.08	—	63	2.12—2.62	2.33	0.09	3.79	53	2.06—2.73	2.35	0.14	5.75
width of vertex: width of eye	29	1.90—2.41	2.16	0.11	5.18	73	1.80—2.22	2.04	0.10	4.74	58	1.72—2.26	2.00	0.10	5.07
length of ant.: length of body	17	0.57—0.64	0.61	0.02	3.90	58	0.54—0.65	0.60	0.03	4.68	29	0.56—0.75	0.67	0.04	6.26
length of ant. segment 2: length of segment 1	28	3.76—4.71	4.28	0.23	5.38	73	3.85—4.60	4.21	0.18	4.37	59	4.18—5.33	4.85	0.23	4.84
length of ant. segment 2: length of segments 3 + 4	20	0.93—1.09	1.00	0.04	—	61	0.95—1.15	1.04	0.05	4.68	34	0.94—1.30	1.08	0.08	7.38
length of ant. segment 2: width of pronotal base	25	0.75—0.91	0.80	0.04	4.87	70	0.73—0.85	0.78	0.03	3.88	56	0.86—1.02	0.92	0.12	12.98
length of rostrum	3	1.39—1.41	1.39	—	—	23	1.41—1.65	1.53	0.05	—	15	1.62—1.90	1.75	0.08	—
length of rostrum: length of body	1	0.38	—	—	—	23	0.34—0.45	0.39	0.02	—	15	0.39—0.49	0.44	0.03	—

Table 4. Comparison between the ratio of width of vertex to width of eye according to Woodroffe (1975), Wagner (1975) and the measurements presented in this paper.

Species	sex	Woodroffe 1957	Wagner 1975	measured range	measured average
perrisi	♂	~ 2.0	1.9—2.0	1.54—2.12	1.76
perrisi/wagneri	♀	~ 2.0	2.0—2.2	1.70—2.38	1.97
wagneri	♂	~ 2.0	1.9—2.0	1.60—2.00	1.76
assimilis	♂	>2.0	—	1.90—2.11	1.98
variabilis	♂	<2.0	1.70—1.75	1.39—2.16	1.78
	♀	—	1.80—1.85	1.80—2.22	2.04
quercus	♂	~ 1.3	1.5	1.30—2.00	1.47
	♀	~ 1.3	1.75	1.72—2.26	2.00

the other hand identification on species level on account of the ratio of width of vertex to width of eye proved to be impossible.

Measurements were made according to the method followed by Wagner (1966: 10, 1970: 20—21) with a Zeiss stereo microscope at magnifications of 20 times (length and width of the body including the wings), 40 times (length of antennae and antennal segments, length of rostrum and width of pronotal base) and 50 times (width of head and width of vertex). The ratio of width of vertex to width of eye was calculated as: width of vertex: 0.5 times (width of head — width of vertex), whereas width of head and width of vertex were measured as shown in fig. 1.

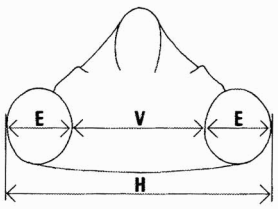
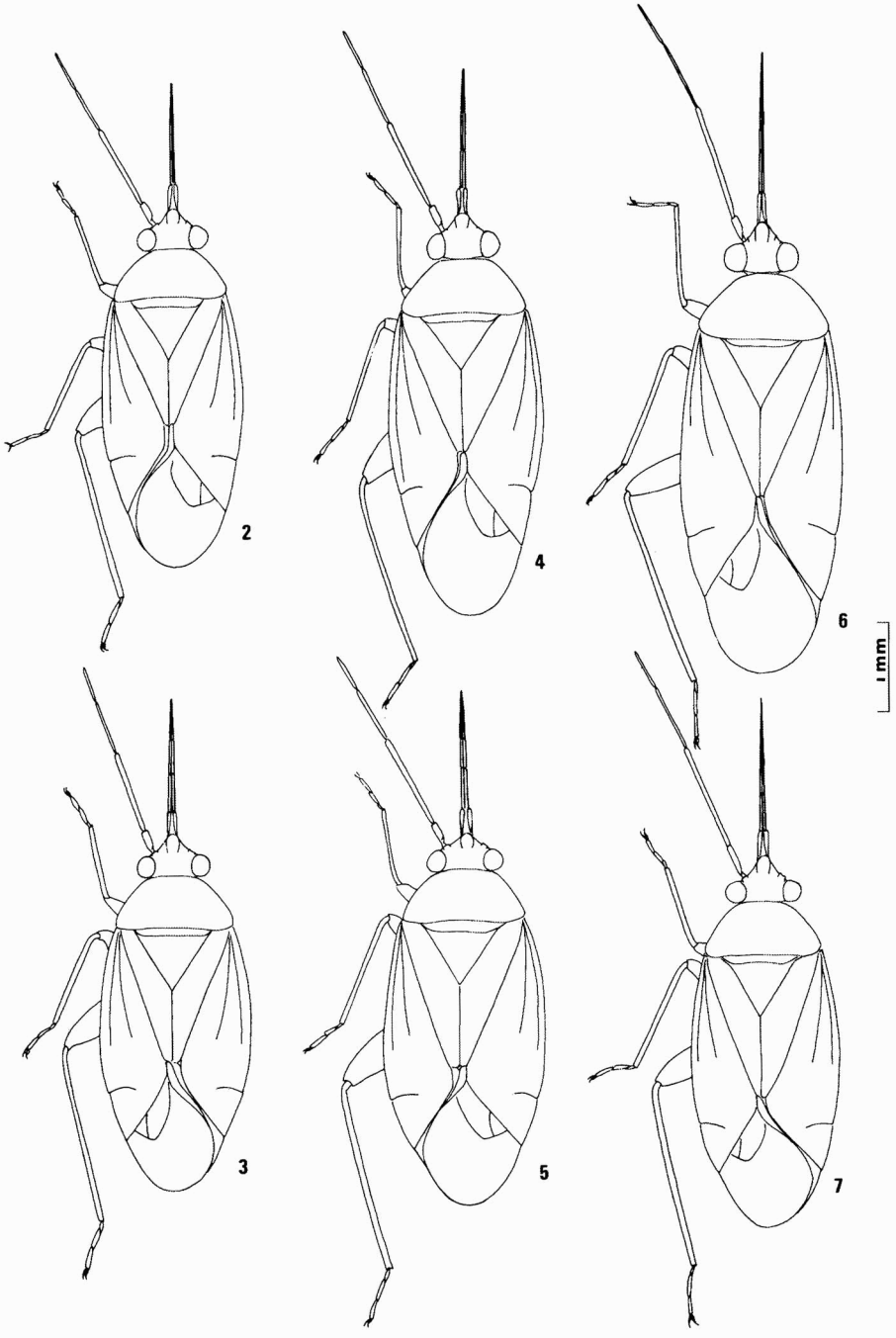


Fig. 1. Measurements of the head: V = width of vertex; E = width of eye; H = width of head.

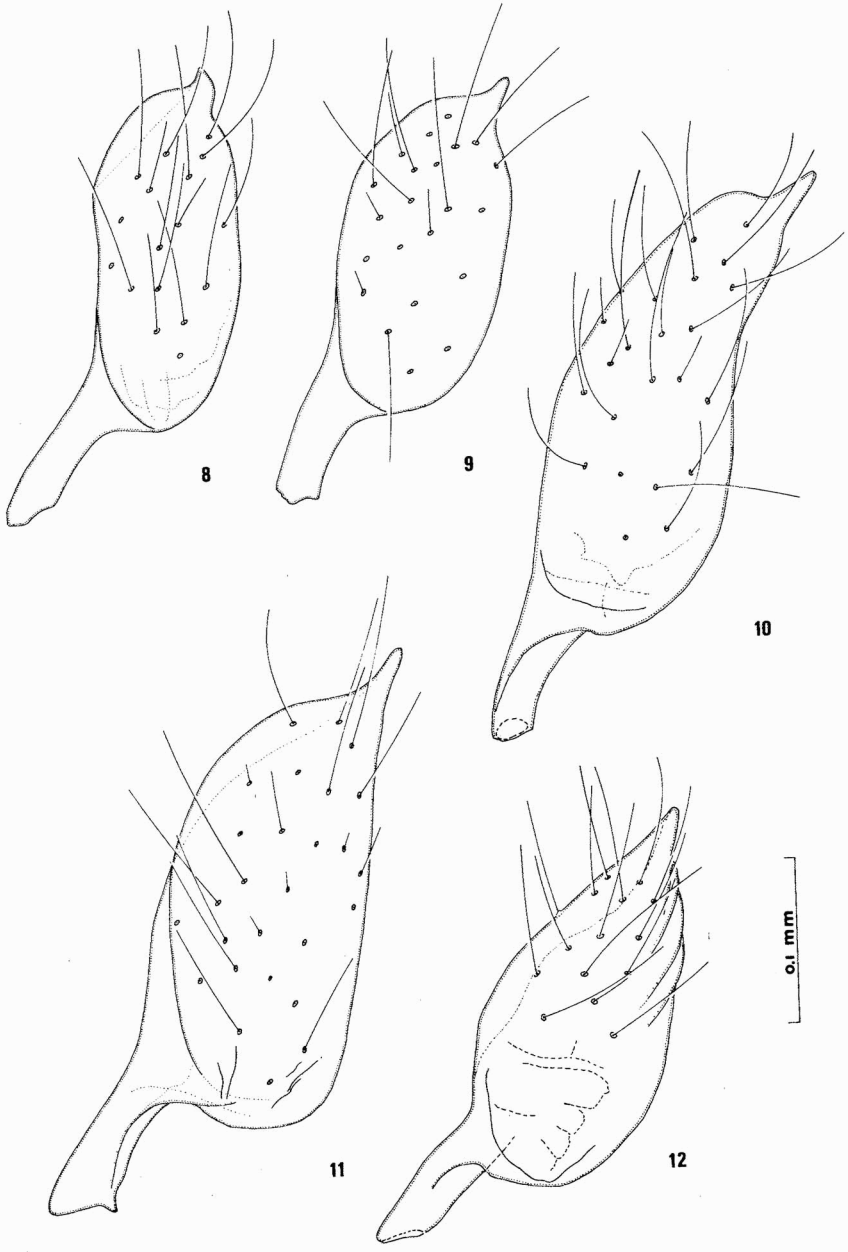
The length of the rostrum in relation to the coxae, used by Stichel (1956) as a distinguishing character, does not provide a reliable character since the extension of the rostrum depends on the slant of the head, on the position of the coxae and on the curvation of the abdomen. Neither does the actual length of the rostrum in relation to the length of the body provide a reliable distinction since a few measurements already show an overlap (tables 1—3).

Small differences between *Hylopsallus* species as regards the shape of the claws have been described (e.g. Wagner, 1952), but these differences are too subtle.

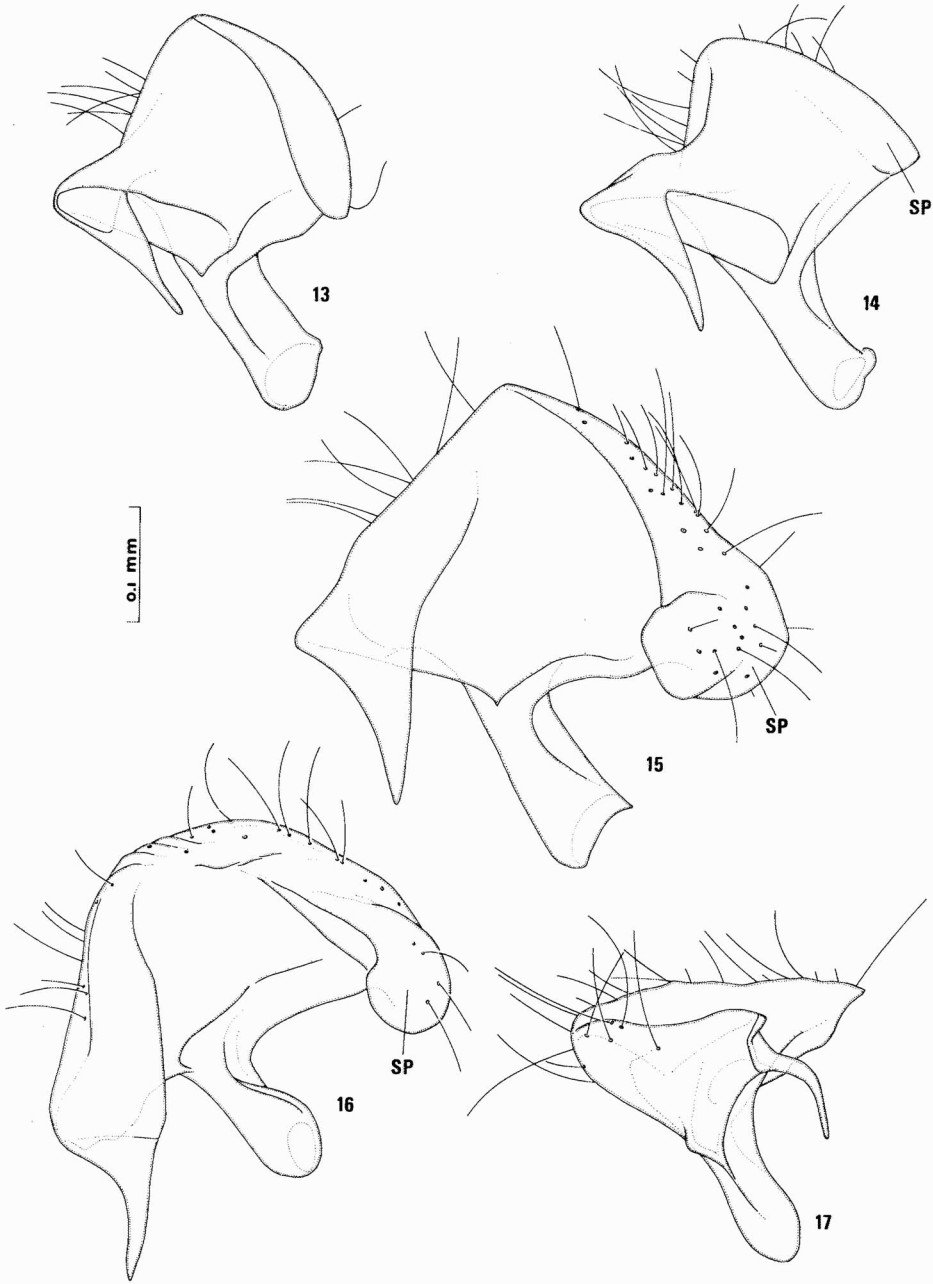
The differences shown by the aedeagi (figs. 23—26) present the only reliable characters for separating all species of *Hylopsallus* concerned. The right parameres (figs. 8—11) are very similar throughout the subgenus, whereas the left parameres (figs. 13—16, 18—21) and the thecas (figs. 28—31) only enable separation of the



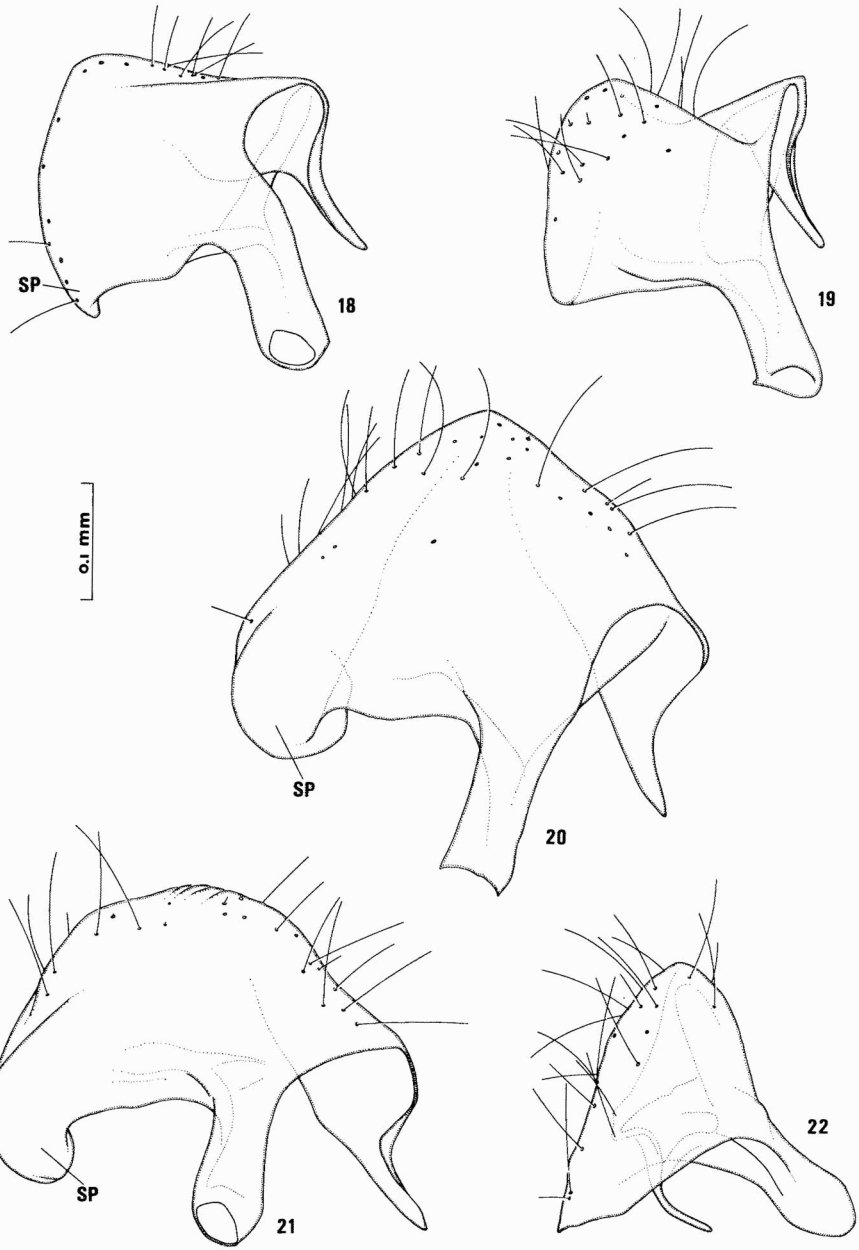
Figs. 2—7. Habitus. 2—3. *Psallus perrisi*, male, female (Amsterdam, the Netherlands); 4—5. *P. variabilis*, male, female (Amsterdam, the Netherlands); 6—7. *Asthenarius quercus*, male, female (Heerde, the Netherlands).



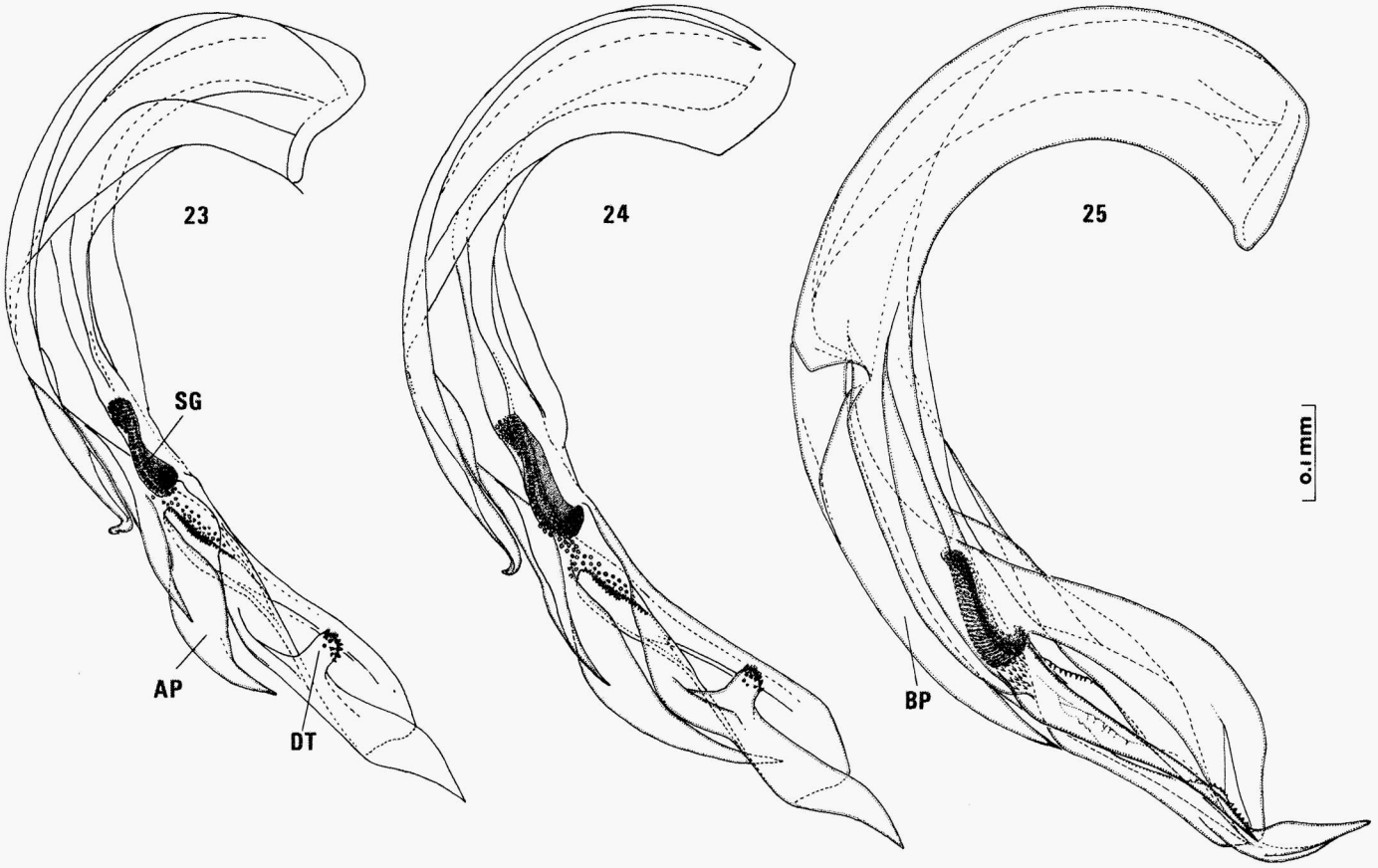
Figs. 8—12. Right parameres. 8. *Psallus perrisi* (Amsterdam, the Netherlands); 9. *P. wagneri* (Heerde, the Netherlands); 10. *P. variabilis* (Amsterdam, the Netherlands); 11. *P. assimilis* (Wychwood, N.B., Oxon, England); 12. *Asthenarius quercus* (Heerde, the Netherlands).



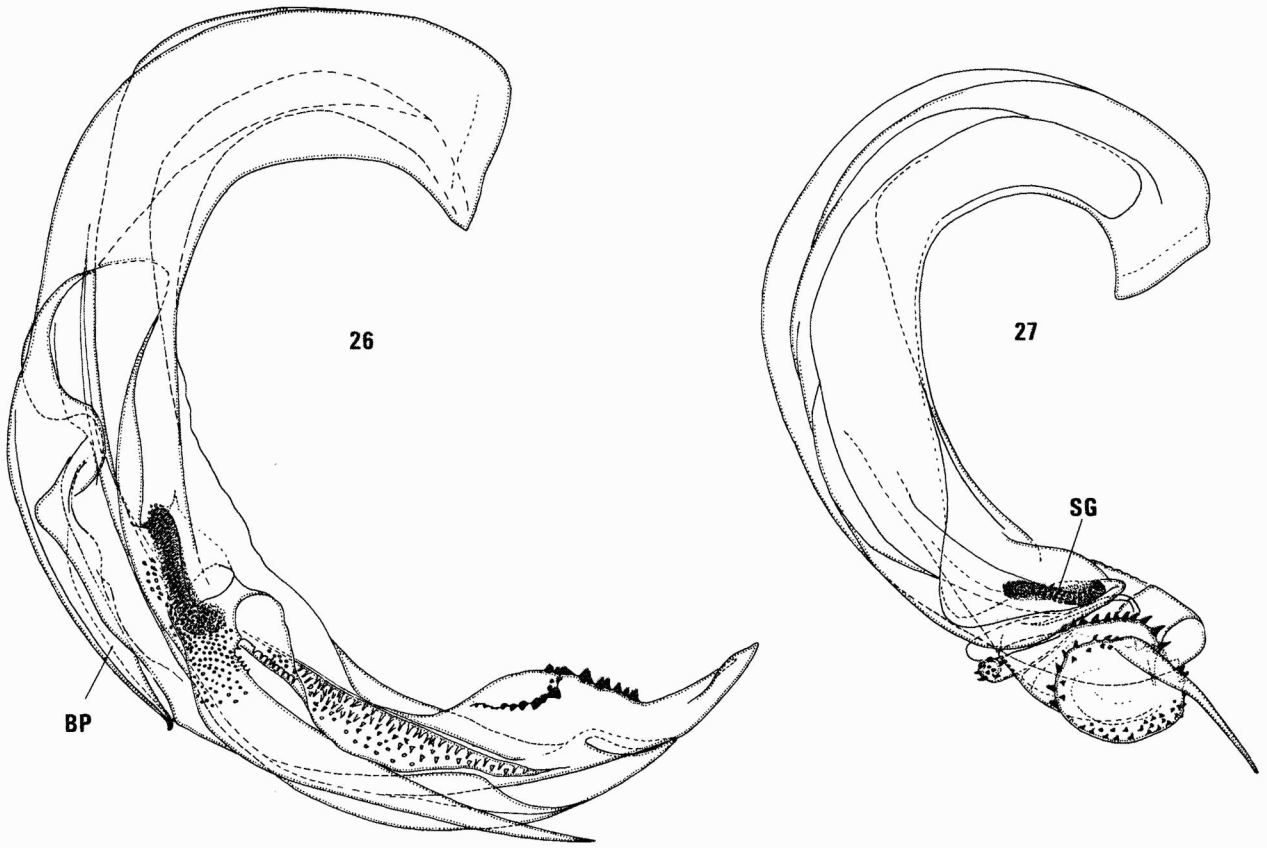
Figs. 13—17. Left parameres, SP = sensorial process. 13. *Psallus perrisi* (Amsterdam, the Netherlands); 14. *P. wagneri* (Heerde, the Netherlands); 15. *P. variabilis* (Amsterdam, the Netherlands); 16. *P. assimilis* (Wychwood, N.B., Oxon, England); 17. *Asthenarius quercus* (Heerde, the Netherlands).



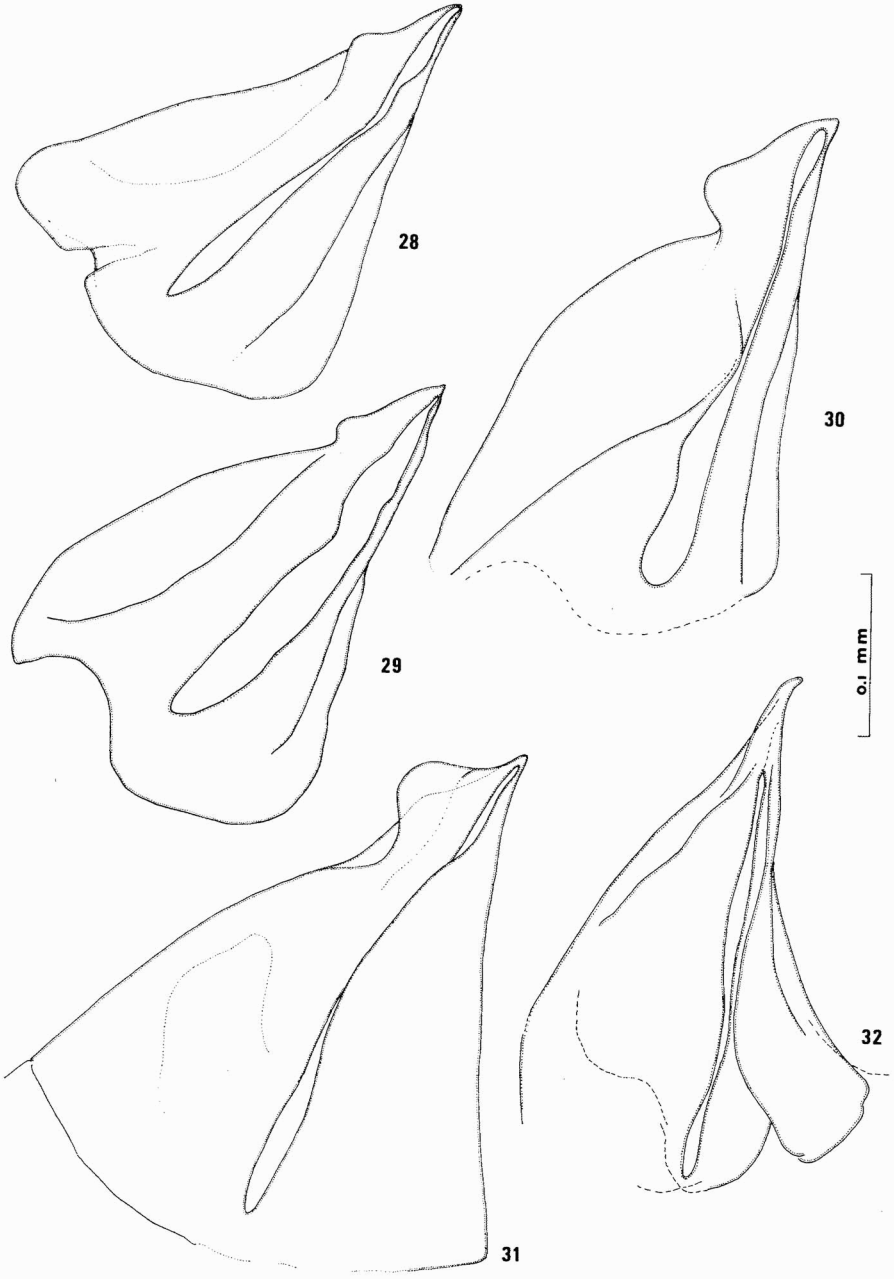
Figs. 18—22. Left parameres from opposite view, SP = sensorial process. 18. *Psallus perrisi* (Amsterdam, the Netherlands); 19. *P. wagneri* (Heerde, the Netherlands); 20. *P. variabilis* (Amsterdam, the Netherlands): 21. *P. assimilis* (Wychwood, N.B., Oxon, England); 22. *Asthenarius quercus* (Heerde, the Netherlands).



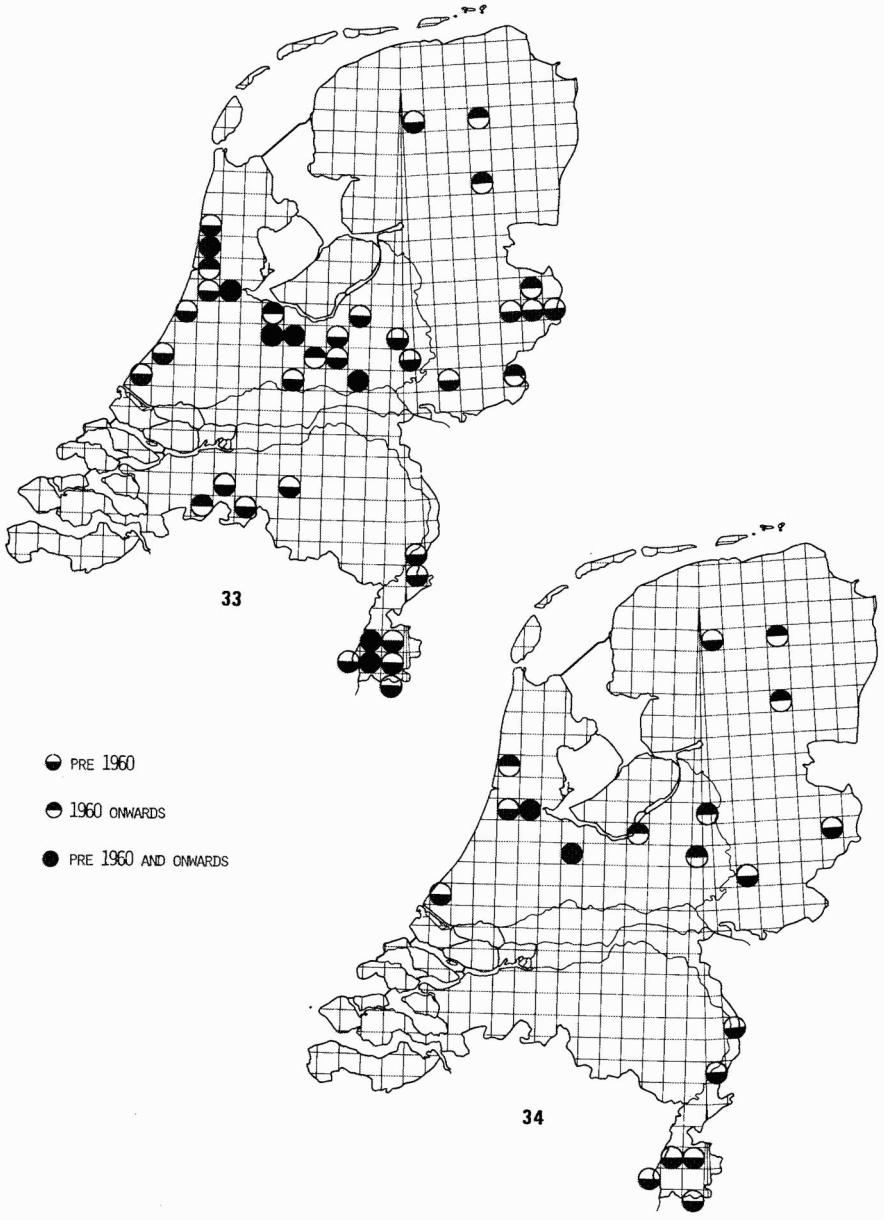
Figs. 23—25. Aedeagi, SG = secondary gonophore, BP = basal process, AP = apical process, DT = denticulate tubercle. 23. *Psallus perrisi* (Amsterdam, the Netherlands); 24. *P. wagneri* (Heerde, the Netherlands); 25. *P. assimilis* (Wychwood, N.B., Oxon, England).



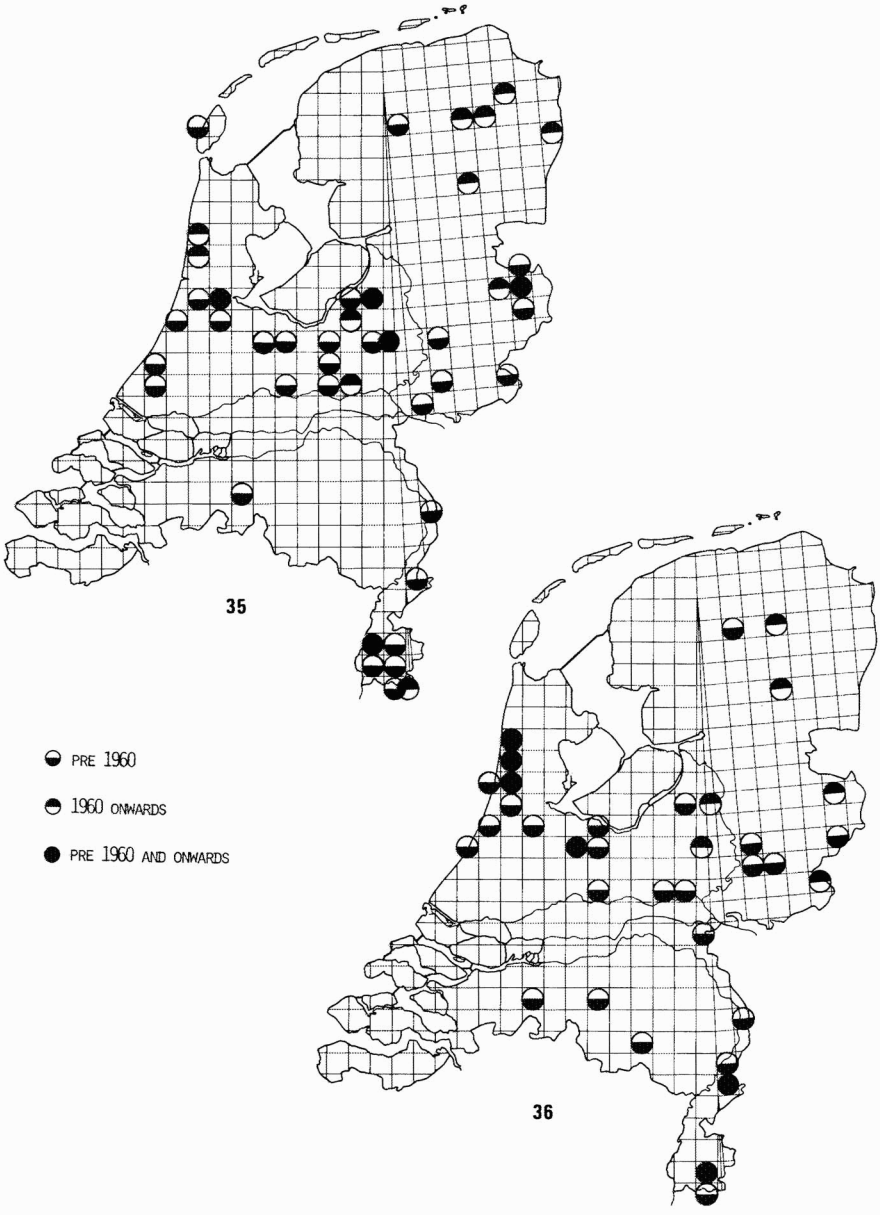
Figs. 26—27. Aedeagi, SG = secondary gonophore, BP = basal process. 26. *Psallus variabilis* (Amsterdam, the Netherlands); 27. *Asthenarius quercus* (Heerde, the Netherlands).



Figs. 28—32. Thecas. 28. *Psallus perrisi* (Amsterdam, the Netherlands); 29. *P. Wagneri* (Heerde, the Netherlands); 30. *P. variabilis* (Amsterdam, the Netherlands); 31. *P. assimilis* (Wychwood, N.B., Oxon, England); 32. *Asthenarius quercus* (Heerde, the Netherlands).



Figs. 33—34. Maps of Dutch distributions. 33. *Psallus perrisi*; 34. *P. wagneri*.



Figs. 35—36. Maps of Dutch distributions. 35. *Psallus variabilis*; 36. *Asthenarius quercus*.

males of *perrisi* and *wagneri* from those of *assimilis* and *variabilis*.

Females can only be assigned to either *perrisi/wagneri* or *assimilis/variabilis* by the colour of the hemelytra, the colour of the base of antennal segment 1 and the colour of the femora. Whether the sclerotized rings of the bursa copulatrix might present a good character for separating the species is not known since these structures have not been studied for *Hylopsallus*.

A key to the males of *Hylopsallus* and *Asthenarius quercus* is presented hereafter. A key to the females was not constructed because I am unable to separate the females of *wagneri* from those of *perrisi* and the females of *assimilis* from those of *variabilis*. The differential characters for separating the females of *perrisi* and *wagneri* from those of *assimilis* and *variabilis* can be read from the descriptions of the different species. The presented key resembles mostly the key of Woodroffe (1957) minus the use of ratios.

KEY TO THE MALES

1. Scale pubescence white. Coxae and trochanters greyish white. Aedeagus short and C-shaped, secondary gonophore close to the apex; apex with a long twisted denticulate band ending in a long and narrow apical process (fig. 27) *quercus*
— Scale pubescence golden. Coxae and trochanters red-brown, dark-brown or black. Aedeagus differently shaped, with lateral processes; secondary gonophore distant from the apex (figs. 23—26) 2
2. Body black-brown to black, only immature specimens lighter. Basal one fourth of first antennal segment dark-brown to black. Femora red-brown to dark-brown or black, its extreme apices often yellowish. Sensorial process of left paramere apically acutely angled (figs. 13—14, 18—19). Aedeagus long and slender, provided with three lateral processes and a denticulate tubercle near its apex (figs. 23—24) 3
— Body yellow-brown, red-brown or bright orange-red, sometimes dark-brown. First antennal segment basally only very small dark. Femora dark-brown, their apices broadly red to orange-red. Sensorial process of left paramere apically broadly rounded (figs. 15—16, 20—21). Aedeagus robust, with two lateral processes (figs. 25—26) 4
3. Aedeagus with apical process short and hook-shaped, strongly expanded before apex, its apex just reaching the denticulate tubercle (fig. 23) . . *perrisi*
— Aedeagus with apical process long and narrow, its apex always reaching far beyond the denticulate tubercle (fig. 24) . . . . . *wagneri*
4. Aedeagus with basal process larger, apically not hooked (fig. 25) . . *assimilis*
— Aedeagus with basal proces smaller, hooked apically (fig. 26) . . . . *variabilis*

SPECIES ACCOUNTS

In the next section the descriptions of the species are preceded by references to the most important literature and synonyms, and by a list of material examined; they are followed by remarks on biology and distribution.

Psallus (Hylopsallus) perrisi (Mulsant, 1852)
(figs. 2—3, 8, 13, 18, 23, 28, 33)

Mulsant & Rey, 1852: 139—140; Wagner, 1952: 90—94, figs. 1—2; Wagner, 1952a: 176—177, figs. 108, 109a; Stichel, 1956: 287—288, figs. 741—742; Woodroffe, 1957: 258, 260, 262, 267, figs. 1, 23, 43b, 46b; Southwood & Leston, 1959: 221, 224, figs. 76, 85; Wagner, 1967: 145—146, figs. 98F, 99D; Wagner, 1975: 181, 186, figs. 751d, 752b, 753d. — *Apocremnus anticus* Reuter, 1876: 22; Wagner, 1959: 348—349.

Material examined. — The Netherlands: 246 specimens from 58 localities (159 ♂/49 loc., 87 ♀/29 loc.). Great Britain: 17 specimens from 13 localities (8 ♂/6 loc., 9 ♀/8 loc.), coll. British Museum (Natural History), London.

Description

A rather small-sized species, oval in shape (figs. 2—3), body of males and females 2.2—2.6 as long as wide. Black-brown to black, only immature specimens lighter. Pubescence consisting of both shiny golden scales, which are easily rubbed off, and semi-erect black hairs.

Head. — Dark-brown to black, hind margin of vertex often yellowish-brown. Width vertex/width eye ♂: 1.5—2.1, ♀: 1.7—2.4. Antennae light yellow-brown, basal one fourth of segment 1 dark-brown to black; length segment 2/length segment 1 ♂: 3.8—4.7, ♀: 4.0—5.0; length segment 2/length segments 3 + 4 ♂: 0.9—1.3, ♀: 0.9—1.2; length segment 2/width pronotal base ♂: 0.6—0.9, ♀: 0.7—0.9. Rostrum dark-brown to black, segments 2 and 3 often yellow-brown and base of segment 1 ventrally reddish; length ♂: 1.2—1.4 mm, ♀: 1.3—1.5 mm.

Thorax. — Pronotum dark-brown to black. Mesoscutum dark-brown, outer margins often with a reddish tinge. Scutellum dark-brown, sometimes yellow-brown. Hemelytra dark-brown to black. Anterior parts of clavus, corium and embolium more or less brown and tinged with red. Corium near fracture tinged with red and along fracture sometimes whitish. Cuneus red-brown to dark-brown, its central part often darker, basally broadly and apically narrowly whitish. Wing membrane dark-grey with a clear spot just behind outer cell; base and central part sometimes colourless too; veins colourless, sometimes tinged with light-yellow-brown. In females basal part of hemelytra usually totally yellow-brown, sharply contrasting with the darker pronotum and head. Femora red-brown to dark-brown, or black, their extreme apices often yellowish. Hind femora sometimes with a few obscure dark spots beneath. Tibiae yellow, with black spines which arise especially on hind tibiae from dark-brown to black spots. Tarsi yellow, segment 3 dark. Claws yellow-brown, slender; pseudarolia very small.

Ventral surface. — Dark-brown to black, but sometimes more reddish-brown, especially in females. Margins of propleura, sternum and episternum, basalar plate, thoracic spiracle and hind margin of ostiolar peritreme yellowish-white, sometimes tinged with red.

Male genitalia. — Genital segment of male with distinct ventral keel. Right paramere small, oblong (fig. 8). Left paramere small, with sensorial process acutely angled apically (figs. 13, 18). Aedeagus long and slender, its apical process

short, hook-shaped and strongly expanded before the apex, just reaching the denticulate tubercle (fig. 23). Theca small, triangular and more or less equally tapering apically, with a small elevation just before the apex (fig. 28).

Length of body ♂: 3.1—4.0 mm, ♀: 3.0—4.1 mm.

Biology. — In the Netherlands very common on *Quercus*, especially on *Quercus robur* L. Most records from other plants are probably due to stray specimens. Probably phytophagous as well as zoophagous. Imagines are found from mid-May until early August. There is one generation a year and the eggs overwinter in cracks in the bark of year-old oak wood (Southwood & Leston, 1959).

Distribution. — *Psallus perrisi* is a widespread West Palearctic species, thusfar recorded from Finland, Sweden, Norway, Denmark, West Germany, England, the Netherlands (fig. 33), France, Austria, Bulgaria, Greece, South Russia, Asia Minor, Syria and Palestina (Coulianos & Ossiannilsson, 1976; Josifov, 1970; Stichel, 1958; Wagner, 1959, and Wagner & Weber, 1964).

Psallus (Hylopsallus) wagneri Ossiannilsson, 1953
(figs. 9, 14, 19, 24, 29, 34)

Ossiannilsson, 1953: 2—3, figs. 1—5; Stichel, 1956: 288; Woodroffe, 1957: 258, 260, 262, 267, figs. 2, 24; Wagner, 1967: 146, figs. 98E, 99E; Wagner, 1975: 182, 186; Zaytseva, 1969: 526, 529—530, figs. 22—23.

Material examined. — Holotype: Uppland, Djursholm, Ösbysjön, 20.vi.1943, F. Ossiannilsson, ♂, coll. Zoological Institute, University of Lund (Mus. Lund). Paratypes: Uppland, Solna, 23.vii.1942, F. Ossiannilsson, ♂, coll. Mus. Lund; Östergötland, Tjänste, Haglund, ♂, coll. Swedish Museum (Natural History), Stockholm; Bohuslän, 15.vi, A. Tullgren, ♂, and Uppland, Experimentalfältet, 22.vi.1917, A. Tullgren, ♂, both in the coll. of the Swedish Plant Protection Institute, Solna; Bohuslän, Ljung, Lyckorna, B. Tjeder, ♂, and same data but 24.vi.1946, ♂, both in the coll. of B. Tjeder. The Netherlands: 39 males from 19 localities. Great Britain: 9 males from 9 localities, coll. British Museum (Natural History), London. Sweden: 3 males from 2 localities, coll. F. Ossiannilsson.

Description

This species is very similar to *perrisi*. Females are thusfar indistinguishable from those of *perrisi*. Males can only be separated from those of *perrisi* on account of the different shape and size of the apical process of the aedeagus. A description of these distinguishing features of the present species is given below. The measurements of *wagneri* are provided, since the range of variation in *wagneri* appeared to be somewhat different from those of *perrisi*.

Males.

Body 2.3—2.8 as long as wide, 3.1—3.9 mm long.

Head. — Width vertex/width eye: 1.5—2.0. Antennae: length segment 2/length

segment 1: 3.8—4.8; length segment 2/length segments 3 + 4: 0.9—1.1; length segment 2/width pronotal base: 0.7—0.9.

Male genitalia. — Right paramere (fig. 9) small and oblong, as in *perrisi*. Left paramere (figs. 14, 19) with sensorial process acutely angled apically as in *perrisi*. Aedeagus (fig. 24) as in *perrisi* (fig. 23), but with apical process long and narrow, its apex always reaching well beyond the denticulate tubercle. Theca (fig. 29) as in *perrisi*.

Biology. — In the Netherlands fairly common on *Quercus*, especially *Quercus robur* L. Often together with *perrisi* imagines are found from mid-May until the end of July. There is one generation a year and the eggs overwinter.

Distribution. — *Psallus wagneri* is a West Palearctic species, thusfar recorded from Finland, Sweden, Denmark, West Germany, the Netherlands (fig. 34), the Baltic States, Bulgaria and Central and South Russia (Coulianos & Ossiannilsson, 1976; Josifov, 1970; Stichel, 1958; Wagner, 1959; Wagner & Weber, 1964 and Zaytseva, 1969). Probably a widespread species, which is however often confused with *perrisi* and *variabilis*.

Psallus (Hylopsallus) variabilis (Fallén, 1829)
(figs. 4—5, 10, 15, 20, 26, 30, 35)

Fallén, 1829: 98; Wagner, 1952: 90—94, figs. 1—2; Wagner, 1952a: 177—178, figs. 108, 109b; Stichel, 1956: 289; Stichel, 1958: 794, figs. 744, 973; Woodroffe, 1957: 258, 260, 262, 267, figs. 6, 26; Carvalho, 1958: 33; Southwood & Leston, 1959: 221, 225, figs. 77, 82; Wagner, 1967: 145, figs. 97G, 98C, 99C; Wagner, 1975: 181, 185, figs. 751c, 752a, 753c.

Material examined. — The Netherlands: 229 specimens from 57 localities (81 ♂/34 loc., 148 ♀/50 loc.). Great Britain: 7 specimens from 5 localities (3 ♂/2 loc., 4 ♀/3 loc.), coll. British Museum (Natural History), London.

Description

A small species, oval in shape (figs. 4—5), body of males 2.3—2.8 and females 2.1—2.6 as long as wide. Yellow-brown, red-brown, bright-orange-red, sometimes dark-brown. Pubescence as in *perrisi*.

Head. — Dirty yellow-brown to dark-brown, sometimes with a reddish tinge. Width vertex/width eye ♂: 1.4—2.2, ♀: 1.8—2.2. Antennae yellow-brown, segment 1 basally only very small dark; length segment 2/length segment 1 ♂: 3.6—4.8, ♀: 3.8—4.6; length segment 2/length segments 3 + 4 ♂, ♀: 0.9—1.1; length segment 2/width pronotal base ♂, ♀: 0.7—0.9. Rostrum yellow-brown, segments 1 and 4 more or less dark-brown, and base of segment 1 ventrally whitish with a red tinge; length ♂: 1.4—1.5 mm, ♀: 1.4—1.6 mm.

Thorax. — Pronotum light-yellow-brown to dark-brown, tinged with black and sometimes anteriorly and/or posteriorly with dark markings. Pronotum especially in females sometimes tinged with red or orange-red. Mesoscutum and scutellum coloured as pronotum; lateral margins of both mesoscutum and scutellum and

apex of scutellum usually somewhat lighter. Hemelytra light-yellow-brown to dark-brown, especially near apex more or less tinged with red or orange-red. Central parts sometimes dark-brown to blackish, especially in males. Cuneus yellow-brown, red-brown to deep-red, basally more or less white along fracture. Wing membrane dark-grey to black, with a clear spot just behind the outer cell. Veins colourless to greyish, usually tinged with red. Femora dark-brown, apically broadly red to orange-red, sometimes with a few indistinct dark spots beneath. Tibiae light-yellow with black spines arising from distinct dark spots, especially on hind tibiae. Tarsi yellow, segment 3 dark apically. Claws yellow-brown, slender; pseudarolia very small.

Ventral surface. — Light-red-brown to dark-brown, with the same yellowish-white parts as in *perrisi*, sometimes with a red tinge.

Male genitalia. — Genital segment of male with a distinct ventral keel. Right paramere large and oblong (fig. 10). Left paramere large, with sensorial process broadly rounded apically (figs. 15, 20). Aedeagus oblong and robust, with two lateral processes; basal process short and apically hooked (fig. 26). Theca somewhat larger than in *perrisi* and *wagneri*, with a more distinct elevation just before the apex (fig. 30).

Length of body ♂: 3.5—4.4 mm, ♀: 3.3—4.3 mm.

Biology. — In the Netherlands common on oak, especially on *Quercus robur* L. Imagines are found from mid-May until early August. There is one generation a year and the eggs overwinter.

Distribution. — A widespread West Palearctic species, known from Finland, Sweden, Norway, the Baltic States, West Russia, Poland, Germany, Denmark, Scotland, Ireland, England, the Netherlands (fig. 35), Belgium, France, Spain, Algeria, Italy, Switzerland, Austria, Czechoslovakia, Hungary, Yugoslavia, Albania, Greece, Bulgaria, Roumania, South Russia and Turkestan (Stichel, 1958; Zaytseva, 1969).

Psallus (Hylopsallus) assimilis Stichel, 1956
(figs. 11, 16, 21, 25, 31)

Stichel, 1956: 289; Woodroffe, 1957: 258, 260, 262, 267, figs. 3, 27; Stichel, 1958: 795, fig. 973; Southwood & Leston, 1959: 221, 224, fig. 87; Wagner, 1967: 145, figs. 98b, 99F.

Remarks. — Woodroffe (1957) pointed out that *Apocremnus simillimus* Douglas & Scott, 1865 (nec Kirschbaum, 1856) represents a good species. Since the publication of Reuter (1878) *simillimus* Douglas & Scott, 1865, was considered a variety of *Psallus* (*Hylopsallus*) *variabilis* (Fallén, 1829), which was renamed f. *assimilis* by Stichel in 1956 since Douglas & Scott's name was a homonym of the earlier Kirschbaum species. Following Stichel (1956) Woodroffe (1957) used the name *Psallus* (*Hylopsallus*) *assimilis* Stichel, 1956, for the species originally described by Douglas & Scott. When I tried to establish the identity of the specimens after which Douglas & Scott described their *Apocremnus simillimus* it

appeared that the three specimens in the Hope Department of Entomology, Oxford University Museum collected by Douglas from Maple at Box Hill, Surrey, are females. Consequently the identity of *simillimus* remains uncertain. The fact however that the specimens of Douglas were collected in England and on Maple strongly supports Woodroffe's interpretation of *simillimus*. Whether or not Stichel's interpretation of *simillimus* was correct, I regard the name *assimilis* Stichel, 1956 as a valid replacement name for *simillimus*.

Material examined. Great Britain: 48 specimens from 19 localities (15 ♂/9 loc., 33 ♀/17 loc.). Coll. Hope Department of Entomology, Oxford University Museum: Box Hill, Surrey, J. W. Douglas, Maple, 3 ♀; 1870, J. W. Douglas, 3 ♀; Reigate, vi, 1882, 1 ♂, 2 ♀; Renhold, Beds., 6.vii.1962, D. Leston, Maple, 3 ♂, 3 ♀; the same, 30.vi.1963, 1 ♂ (slide Xk4). Coll. British Museum (Natural History), London: Chingford, 10.vi.1911, E. A. Butler, 1 ♀; East Malling, Kent, 27.vi.1945, A. M. Massee, 1 ♀; Stondon Massey, Essex, 12.vi.1953, A. M. Massee, 1 ♀; Epping Forest, Essex, 15.vi.1953, A. M. Massee, 1 ♀; Ditton, 24.vi.1954, Poplar, 1 ♀; the same, 1.vii.1954, 1 ♀; Eaglefieldern, 10.vii.1954, G. E. Woodroffe, Maple, 1 ♂, 1 ♀; Hedgerley, vi.1955, Maple, 1 ♀; Runnymede, 10.vi.1955, G. E. Woodroffe, 3 ♂, 3 ♀; Windsor Forest, Berks., 16.vi.1955, G. E. Woodroffe, Maple, 1 ♂, 3 ♀; Ham Street, Kent, 12.vi.1960, A. M. Massee, 2 ♀; Old Burghclere, Beacon Hill, Hants., 23.vii.1962, G. E. Woodroffe, Maple, 1 ♂, 3 ♀; Aston Ravent, N. R., 1.vii.1965, G. E. Woodroffe, 1 ♂; 88—11, 7.vi.1966, Scott, 1 ♂; Wychwood, N. B., Oxon, 6.vii.1966, G. E. Woodroffe, 1 ♂; the same, 8.vii.1969, Maple, 1 ♂, 2 ♀; Power, Birch Wood, 69—31, Birch, 1 ♂.

Description

This species is very similar to *variabilis*. Males only can be separated on account of differences in the aedeagi, but I am not able to separate the females from those of *variabilis*. Woodroffe (1957) also separated the males of *assimilis* from those of *variabilis* by the thickening of antennal segment 2: distinctly thickened in *variabilis* and only slightly so in *assimilis*. Basing myself upon the material available for this study I believe that such a difference does not exist. In Britain however, where *variabilis* is seemingly rare, the host plant may be a valuable guide for identification.

In the following lines I give a differential diagnosis for *assimilis*, including the ranges of variation of the measurements, which are somewhat different from those of *variabilis*.

Length body/width body ♂: 2.2—2.5, ♀: 2.1—2.4; length of body ♂: 3.4—3.8 mm, ♀: 3.5—4.0 mm.

Head. — Width vertex/width eye ♂: 1.9—2.1, ♀: 1.9—2.4; length antennal segment 2/length segment 1 ♂: 4.0—4.7, ♀: 3.8—4.7; length segment 2/length segments 3 + 4 ♂, ♀: 0.9—1.1; length segment 2/width pronotal base ♂: 0.8, ♀: 0.7—0.9.

Male genitalia. — Right paramere (fig. 11) and left paramere (figs. 16, 21) as in

variabilis. Aedeagus (fig. 25) with basal process longer than in *variabilis*, not hooked apically. Theca (fig. 31) as in *variabilis*.

Biology. — Host plant: *Acer campestre* L. In England imagines are found from early June until the end of July. There is one generation a year and eggs overwinter.

Distribution. — *Psallus assimilis* is thusfar recorded only from England and West Germany (Stichel, 1958; Rieger, 1975; 1976). The occurence of *assimilis* in Finland as mentioned by Stichel (1958) has not been confirmed (Coulianos & Ossiannilsson, 1976).

Asthenarius quercus (Kirschbaum, 1856)
(figs. 6, 7, 12, 17, 22, 27, 32, 36)

Kirschbaum, 1856: 253; Wagner, 1952: 176, fig. 108; Stichel, 1956: 290, fig. 745; Woodroffe, 1957: 258, 260, 262, 265, figs. 4, 25; Carvalho, 1958: 128—129; Southwood & Leston, 1959: 220, 225, figs. 75, 83; Kerzhner, 1962: 232; Wagner, 1967: 145, figs. 98D, 99B; Zaytseva, 1969: 526, 528—529, figs. 10—14; Wagner, 1975: 183—184, figs. 751b, 753b; Wagner, 1975a: 242—243, fig. 6. — *Capsus simillimus* Kirschbaum, 1856: 233; Wagner, 1943: 34—36.

Material examined. — The Netherlands: 170 specimens from 46 localities (74 ♂/30 loc., 96 ♀/38 loc.).

Description

A relatively large species; males elongate, rather parallel-sided (fig. 6), females smaller, elongate-oval (fig. 7). Length body/width body ♂: 2.3—2.9, ♀: 2.1—2.7. Dark-brown to red-brown, females often lighter than males. Pubescence consisting of both shiny white scales, which are easily rubbed off, and semi-erect black hairs.

Head. — Dark-brown to red-brown, sometimes blackish. Width vertex/width eye ♂: 1.3—2.0, ♀: 1.7—2.3. Antennae yellow-brown, especially in segments 1 and 2 tinged with red. Segment 1 basally very small dark. Length segment 2/length segment 1 ♂: 4.2—5.4, ♀: 4.2—5.3; length segment 2/length segments 3 + 4 ♂: 1.0—1.3, ♀: 0.9—1.3; length segment 2/width pronotal base ♂: 0.9—1.1, ♀: 0.9—1.0. Rostrum dark-brown to red-brown, base of segment 1 ventrally white with reddish tinge; length ♂: 1.6 mm (only 2 specimens measured), ♀: 1.6—1.9 mm.

Thorax. — Pronotum dark-brown to red-brown, sometimes blackish, but posterior angles or entire hind margin often lighter. Mesoscutum and scutellum coloured as pronotum, laterally often lighter. Hemelytra dirty grey-brown to dark-brown, basally often lighter, sometimes greyish-yellow. Apex and lateral margin more or less tinged with red. Cuneus red-brown, with base along fracture narrowly whitish. Wing membrane greyish to black-grey with a clear spot just behind outer cell. Veins colourless, sometimes tinged with red-brown or red. Femora basally

dark-brown to red-brown, apically coloured lighter, bright-red or yellow-brown with a red tinge. Hind femora sometimes with a few obscure dark spots beneath. Coxae and trochanters greyish-white in males and white in females. Tibiae yellow with red tinge, especially in hind tibiae; apices small blackish. Tibiae with strong black spines arising from large black to dark-brown spots, which are however smaller in mid and fore tibiae. Tarsi yellow-brown, segment 3 mainly dark. Claws yellow-brown; pseudarolia small.

Ventral surface. — Red-brown to dark-brown; thoracic spiracle, epimeron, ostiolar peritreme, basalar plate and margins of propleura whitish with a red tinge.

Male genitalia. — Genital segment with a distinct ventral keel. Right paramere small and oblong (fig. 12); left paramere small, with sensorial process acutely angled apically (figs. 17, 22). Aedeagus short and C-shaped, without lateral processes, its apex with a long twisted denticulate band ending in a long and narrow apical process (fig. 27). Secondary gonophore situated near apex. Theca small and strongly tapering apically without elevation before apex (fig. 32).

Length of body ♂: 3.8—4.7 mm, ♀: 3.5—4.3 mm.

Biology. — In the Netherlands common on its host plant oak, especially on *Quercus robur* L. Imagines are found from mid-May until the end of July. There is one generation a year and eggs overwinter.

Distribution. — A very widespread West Palearctic species, known from Finland, Norway, Poland, Germany, Denmark, Scotland, England, the Netherlands (fig. 36), Belgium, France, Spain, Portugal, Italy, Switzerland, Austria, Czechoslovakia, Hungary, Yugoslavia, Bulgaria, Roumania and South Russia (Stichel, 1958).

CONCLUDING REMARKS

Very little is known of the biology of the Dutch species of *Hylopsallus*, whereas knowledge of that kind is essential for understanding processes of speciation within such a group of closely related species. Especially in the case of *perrisi* and *wagneri*, which differ only in size and shape of the aedeagus, and occur on the same host plant in the same period of the year, it is difficult to understand their relationships. The same applies for *Psallus* (*Hylopsallus*) *kiritshenkoi*, which is described by Zaytseva (1969) from South Russia. This species differs from *perrisi* and *wagneri* only in size and shape of the apical process of the aedeagus, which is intermediate between those of *perrisi* and *wagneri*!

It is clear that further study of the biology of these species and rearing and cross-breeding experiments are necessary to unravel the relationships of these morphologically ill-defined species.

ACKNOWLEDGEMENTS

For the loan of specimens I am greatly indebted to the following institutions and persons: British Museum (Natural History), London (Mr. W. R. Dolling); Hope

Department of Entomology, Oxford University Museum (Dr. I. Lansbury); Dr. B. Tjeder (Lund); Dr. F. Ossiannilsson (Uppsala); National Institute for Plant Protection, Solna (Dr. G. Nordlander); Swedish Museum of Natural History, Stockholm (Dr. P. I. Persson); Zoologiska Institutionen, Lund; Mr. J. S. Beernink (Zaandam); Mr. W. H. Gravestein (Amsterdam); Mr. P. Poot (Maastricht); Mr. J. H. Woudstra (Zaandam); Landbouwhogeschool, Wageningen (Dr. Ir. R. H. Cobben); Natuurhistorisch Museum, Maastricht (Mrs. F. N. Dingemans-Bakels); Rijksmuseum van Natuurlijke Historie, Leiden (Dr. P. H. van Doesburg).

Furthermore I am greatly indebted to Dr. J. P. Duffels (Instituut voor Taxonomische Zoölogie, Zoölogisch Museum, Amsterdam) for giving me the opportunity to do this investigation, for his valuable help and advise and for correcting the English text.

REFERENCES

Carvalho, J. C. M., 1958. Catálogo dos Mirideos do mundo. — Archos Mus. nac. Rio de J. 45 (2): 1—216.

Coulianos, C. C. & F. Ossiannilsson, 1976. Hemiptera-Heteroptera. In: Catalogus Insectorum Sueciae. 2nd Ed. VII. — Ent. Tidskr. 97: 135—173.

Douglas, J. W. & J. Scott, 1865. Hemiptera-Heteroptera. In: The British Hemiptera. I: xii + 627 pp. — Ray Soc., London.

Fallén, C. F., 1829. Hemiptera Sueciae: viii + 186 pp. — Lund.

Josifov, M., 1970. Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Institutes. — Beitr. Ent. 20: 825—956.

Kerzhner, I. M., 1962. Materials on the taxonomy of Capsid bugs (Heteroptera, Miridae) in the fauna of the USSR. — Ent. Obozr. 41: 372—387.

Kerzhner, I. M. & T. L. Yachevski, 1964. Heteroptera. In: Bei-Bienko, Key to insects of the European part of the USSR: 1: 1—936.

Kirschbaum, C. L., 1856. Die Capsinen der Umgebung Wiesbadens. — Jb. Ver. Naturk. Wiesbaden 10: 163—348.

Meurer, J. J., 1956. Waarnemingen van Wantsen (Hem.-Het.) met behulp van een vanglamp. — Ent. Ber., Amst. 16: 54—63.

Mulsant, E. & C. Rey, 1852. Description de quelques Hémiptères Hétéropteres nouveaux ou peu connus. — Annls Soc. Linn. Lyon 1: 76—141.

Ossiannilsson, F., 1953. *Psallus* (*Hylopsallus*) *wagneri* n. sp. A new Mirid (Hemipt. Heteropt.) from Sweden. — Opusc. ent. 18: 122—123.

Reclaire, A., 1932. Naamlijst der in Nederland en het omliggend gebied waargenomen wantsen (Hemiptera-Heteroptera). — Tijdschr. Ent. 75: 59—258.

———, 1948. 5e Vervolg op de Naamlijst der in Nederland en omliggend gebied waargenomen wantsen (Hemiptera-Heteroptera). — Tijdschr. Ent. 89: 39—64.

Rieger, Chr., 1975. Nachweiss des *Psallus masseei* Woodroffe in Süddeutschland (Heteroptera, Miridae). — NachrBl. bayer. Ent. 24: 57—58.

———, 1976. Die Wanzenfauna des mittleren Neckartales und der angrenzenden Albhochfläche (Landkreis Nürtingen, Reutlingen, Tübingen). 3. Nachtrag. — Veröff. Naturschutz Landespflege Bad.-Württ. 43: 162—169.

Reuter, O. M., 1876. Diagnoses praecursoriae. — Petites Nouv. Ent. 2 (144): 21—22.

———, 1878. Hemiptera Gymnocerata Europae. I. — Acta Soc. Sci. Fenn. 13: 1—187, 8 pls.

Southwood, T. R. E. & D. Leston, 1959. Land and water bugs of the British Isles: ix + 436 pp., 63 pls. — London.

Stichel, W., 1956—1958. Illustrierte Bestimmungstabellen der Wanzen. II. Europa. 2: 170—907. Berlin.

Wagner, E., 1943. Zwei Kirschbaumsche Arten, die sind nicht aufrecht erhalten lassen. — Mitt. ent. Ges. Halle 20: 33—36.

———, 1952. Zur Systematik von *Psallus variabilis* (Fall.) (Hem. Het. Miridae). — Opusc. ent. 17: 92—94.
———, 1952a. Blindwanzen oder Miriden. In: Tierwelt Deutschlands 41: iv. + 218 pp. — Jena.
———, 1959. Ueber einige Mediterrane Miridae (Hem. Het.). — Acta ent. Mus. natn. Pragae 33 (553): 339—358.
———, 1961. Heteroptera-Hemiptera. In: Tierwelt Mitteleuropas IV (Xa): 1—173. — Leipzig.
———, 1966. Wanzen oder Heteropteren. I. Pentatomorpha. In: Tierwelt Deutschlands 54: vi + 235 pp. — Jena.
———, 1966a. *Phylidea* Reuter, 1899 und *Psallus* Fieber, 1858 (Hemiptera, Heteroptera, Miridae). — Reichenbachia 8: 11—20.
———, 1967. Wanzen oder Heteropteren. II. Cimicomorpha. In: Tierwelt Deutschlands 55: iv + 179 pp. — Jena.
———, 1970. Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera, Heteroptera). I. — Ent. Abh. Mus. Tierk. Dresden 37, Suppl.: iii + 484 pp.
———, 1975. Idem. III. — Ent. Abh. Mus. Tierk. Dresden 40, Suppl. 1: 1—483.
———, 1975a. Ueber *Asthenarius* Kerzhner, 1962 (Hemiptera, Heteroptera, Miridae). — Reichenbachia 15 (28): 233—244.
Wagner, E. & H. H. Weber, 1964. Hétéroptères Miridae. In: Fauna de France 67: 592 pp. — Paris.
Woodroffe, G. E., 1957. A preliminary revision of the British *Psallus* Fieber (Hem., Miridae), with a description of a new species. — Entomologist's mon. Mag. 93: 258—271.
Zaytseva, I. F., 1969. A survey of species of the genus *Psallus* Fieber (Heteroptera, Miridae) from the Caucasus. — Ent. Rev. Washington 47: 526—533.