
Systematics of the sycoecine fig wasps (Agaonidae, Chalcidoidea, Hymenoptera), V (*Philocaenus*, concluded; generic key; checklist)

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ABSTRACT

The revision of *Philocaenus* Grandi, an African genus of sycoecine fig wasps is completed. *Seres levis* Waterston is transferred to *Philocaenus*. A further eight new species are described: *P. bakeri* (Cameroun, ex *F. sansibarica macrosperma* (Mildbr. & Burr.) Berg), *P. bifurcus* (Kenya, ex *F. ottonifolia ulugarensis* (Mildbr. & Burr.) Berg), *P. rasplusi* (Gabon, ex *F. artocarpoides* Warb.), *P. clairae* (South Africa, ex *F. tremula tremula* Warb.), *P. warei* (South Africa, Malawi, Zambia, Zimbabwe, ex *F. glumosa* Delile), *P. quatuoridentatus* (South Africa, ex *F. craterostoma* Mildbr. & Burr. [?]), *P. zambesiacus* (Malawi, ex *F. bussei* Mildbr. & Burr.), *P. rotundus* (South Africa, Botswana, Malawi, Zimbabwe, ex *F. abutilifolia* (Miq.) Miq.). A key is provided to all *Philocaenus* species in both sexes and one to the sycoecine genera. A checklist of the Sycoecinae with host and pollinator relationships is compiled.

INTRODUCTION

Two species-groups, the *Philocaenus levis* and *P. liodontus* species-groups are treated here. The species in the first group are associated with the *Ficus* subsection *Caulocarpae* (section *Galoglychia*), pollinated by *Courtella* Kieffer species. This subsection also plays host to all *Seres* Waterston species and to a few *Crossogaster* Mayr species. Species in the *P. liodontus* group are associated with the subsections *Platyphyllae* and *Chlamyodorae* (both of section *Galoglychia*), pollinated by *Elisabethiella* Grandi, *Alfonsiella* Waterston, and *Nigeriella* Wiebes species, although no sycoecines have been collected from *Nigeriella* pollinated figs. These two sections also play host to *Crossogaster* species and to the *P. barbatus* species-group.

With the description of the eight new species of *Philocaenus* in this paper the revision of the Sycoecinae is completed. It is now possible to provide a key to the sycoecine genera and a checklist of the Sycoecinae detailing host relationships and agaonine associations. The majority of sycoecines appear to be host specific although there are more oligophagous species than in the Agaoninae. At a higher taxonomic level, four of the sycoecine genera and the *Philocaenus silvestrii* species-group each correspond with particular genera of the Agaoninae and are likewise restricted to specific *Ficus* sections or subsections. Notable exceptions are *Philocaenus* (the remaining species-groups) and *Crossogaster* which are each associated with more than a single pollinator genus and fig subsection. A systematic list of *Ficus* species utilised as hosts by the Sycoecinae is given in Table 1.

Morphological terminology, definitions and abbreviations are as defined in van Noort (1993a). All measurements are in millimetres. The following acronyms are used for institutions and collections housing *Philocaenus* specimens:

NHML - The Natural History Museum, London

RMNH - Rijksmuseum van Natuurlijke Historie, Leiden

SAMC - South African Museum, Cape Town

SANC - National Collection of Insects, Pretoria

SGCC - Collection of Dr. S.G. Compton, Leeds

KEY TO THE SPECIES OF *PHILOCAENUS*

[Figures with a [I] preceding the number are to be found in the first part of the *Philocaenus* revision, van Noort (1994b)].

FEMALES

1. Mandible with two apical teeth and a single large ventral tooth (figs. 2, 4 & 8); head always elongate and subovate, with a broadly bifurcate epistomal margin (figs. 1, 5, 7, 15 & 16); MPS on antennae numerous and in close apposition (figs. 3 & 12) 19
 - Mandible with two apical teeth and two or more ventral teeth; head may be square or elongate; epistomal margin otherwise; MPS less numerous and more widely spaced (figs. 21 & [I]4) 2
2. Mandible with two to four ventral teeth apically situated (figs. 26 & 33); mandible narrow and elongate, projecting forwards and downwards away from the epistomal margin; epistomal margin broadly concave, often with a medial convexity (figs. 17, 28, 32 & 34) 10
 - Mandible with a row of at least 9 teeth on ventral edge (e.g. fig. [I]20), or a ventral plate of teeth; mandible broader, in close apposition with the epistomal margin 3
3. Four well spaced teeth anterior to a ventral row of 13–20 teeth (fig. [I]34) 4
 - Mandible otherwise 5
4. Epistomal margin distinctly bilobed, projecting further than paraclypeal margins (fig. [I]33); mandible with 18–20 ventral teeth (fig. [I]34); tibial armature a comb of 7–8 teeth, with 1–2 teeth dorsal to the comb, ex *Ficus* spec. K. *P. jinjaensis*
 - Slight lateral projections on epistomal margin, the margin not projecting further than the paraclypeal margins (fig. [I]30); mandible with 13–15 ventral teeth; tibial armature a comb of 5–6 teeth, with a single tooth dorsal to the comb (fig. [I]32), ex *F. natalensis* *P. geminus*
5. Mandible with at least two rows of ventral teeth. If only two rows are present the anterior row is uneven (fig. [I]45), usually many rows forming a plate of teeth (e.g. figs. [I]49–51) 6
 - Mandible with a single row of ventral teeth (e.g. fig. [I]48). A second row of teeth may be present, but it is then inconspicuous and in a straight line (fig. [I]3) 14

Table 1. The host fig trees and their agaonine pollinating fig wasps associated with sycoecine species and subspecies. Classification of *Ficus* after Corner (1965) and the subdivision of Section *Galoglychia* after Berg (1986). Agaoninae associations after Wiebes (1982; 1989a; 1991), Wiebes & Compton (1990) and Compton, pers. comm.

FICUS, SUBSECTION	AGAONINAE	SYCOECINAE
Section <i>Conosycea</i>		
<i>Dictyoneuron</i>		
1. <i>F. glaberrima</i> Bl. var. <i>bracteata</i> Corner	<i>Waterstoniella williamsi</i> Wiebes	<i>Diaziella falcata</i> Wiebes
Section <i>Galoglychia</i>		
<i>Galoglychia</i>		
2. <i>F. saussureana</i> D.C.	<i>Allotriozoon prodigiosum</i> Grandi	<i>Philocaenus cavus</i> van Noort
3. <i>F. chlamydocarpa</i> Mildbr. & Burr.	<i>Allotriozoon nigeriense</i> Wiebes	<i>Philocaenus comptoni</i> van Noort
4. <i>F. lutea</i> Vahl	<i>Allotriozoon heterandromorphum</i> Grandi	<i>Philocaenus silvestrii</i> (Grandi)
<i>Platyphyllae</i>		
5. <i>F. platyphylla</i> Delile	<i>Elisabethiella near pectinata</i>	<i>Philocaenus barbatus</i> Grandi
6. <i>F. bussei</i> Mildbr. & Burr.	<i>Elisabethiella</i> sp.	<i>Philocaenus zambesiacus</i> sp. nov.
7. <i>F. vasta</i> Forssk	<i>Elisabethiella socotrensis</i> (Mayr)	<i>Crossogaster triformis</i> Mayr
8. <i>F. glumosa</i> Delile	<i>Elisabethiella glumosae</i> Wiebes	<i>Crossogaster quadrata</i> van Noort <i>Crossogaster stigma</i> van Noort <i>Philocaenus warei</i> sp. nov.
9. <i>F. stuhlmannii</i> Warb	<i>Alfonsiella binghami</i> Wiebes	<i>Philocaenus liodontus</i> (Wiebes) <i>Philocaenus barbarus</i> (Grandi) <i>Crossogaster odorans</i> Wiebes
10. <i>F. abutilifolia</i> (Miq.) Miq.	<i>Elisabethiella comptoni</i> Wiebes	<i>Philocaenus rotundus</i> sp. nov.
11. <i>F. trichopoda</i> Baker	<i>Elisabethiella b. bergi</i> Wiebes	<i>Crossogaster robertsoni</i> van Noort <i>Philocaenus hippopotomus</i> van Noort
	<i>Elisabethiella b. breviceps</i> Wiebes	<i>Crossogaster robertsoni</i> van Noort <i>Philocaenus hippopotomus</i> van Noort
<i>Chlamydorae</i>		
12. <i>F. craterostoma</i> Mildbr. & Burr.	<i>Alfonsiella michaloudi</i> Wiebes <i>Alfonsiella</i> sp.	<i>Philocaenus liodontus</i> (Wiebes) <i>Philocaenus insolitus</i> van Noort <i>Philocaenus quatuordentatus</i> sp. nov.
13. <i>F. l. lingua</i> Wild. & Dur.	<i>Alfonsiella michaloudi</i> Wiebes	<i>Crossogaster odorans</i> Wiebes <i>Philocaenus liodontus</i> (Wiebes)

Table 1. Continued.

FICUS, SUBSECTION	AGAONINAE	SYCOECINAE
14. <i>F. n. natalensis</i> Hochst.	<i>Alfonsiella longiscapa</i> Joseph <i>Elisabethiella socotrensii</i> Mayr	<i>Philocaenus medius</i> van Noort <i>Crossogaster lurida</i> van Noort <i>Philocaenus barbarus</i> (Grandi)
15. <i>F. n. leprieurii</i> (Miq.) Berg	<i>Alfonsiella fimbriata</i> Waterston	<i>Philocaenus liodontus</i> (Wiebes)
16. <i>F. burtt-davyi</i> Hutch.	<i>Elisabethiella baijnathi</i> Wiebes	<i>Philocaenus liodontus</i> (Wiebes)
17. <i>F. antandronarum</i> <i>bernardii</i> Berg	<i>Elisabethiella</i> sp.	<i>Philocaenus comorensis</i> van Noort
18. <i>F. reflexa</i> Thunb.	<i>Elisabethiella reflexa</i> Wiebes	<i>Philocaenus bouceki</i> (Wiebes)
19. <i>F. thonningii</i> Bl.	<i>Elisabethiella stuckenbergi</i> Grandi <i>Alfonsiella brongersmai</i> Wiebes	<i>Philocaenus barbarus</i> (Grandi) <i>Crossogaster odorans</i> Wiebes <i>Philocaenus barbarus</i> (Grandi) <i>Crossogaster odorans</i> Wiebes <i>Philocaenus liodontus</i> (Wiebes) <i>Philocaenus medius</i> van Noort <i>Philocaenus liodontus</i> (Wiebes)
20. <i>F. kamerunensis</i> Mildbr. & Burr.	<i>Alfonsiella fimbriata</i> Waterston	<i>Philocaenus liodontus</i> (Wiebes)
Cyathistipulae		
21. <i>F. tessellata</i> Warb.	<i>Agaon taiense</i> Wiebes	<i>Sycoecus bergi</i> van Noort
22. <i>F. c. cyathistipula</i> Warb.	<i>Agaon fasciatum</i> Waterston	<i>Sycoecus thaumastocnema</i> Waterston
23. <i>F. c. pringsheimiana</i> (Braun & Schum.)	<i>Agaon kiellandi</i> Wiebes	<i>Sycoecus oculabulbus</i> van Noort
24. <i>F. cyathistipuloides</i> De Wild.	<i>Agaon obtusum</i> Wiebes	<i>Sycoecus wiebesi</i> van Noort
25. <i>F. scott-elliottii</i> Mildbr. & Burr.	<i>Agaon</i> sp.	<i>Sycoecus ivoryensis</i> van Noort
26. <i>F. lyrata</i> Warb.	<i>Agaon spatulatum</i> Wiebes	<i>Sycoecus crinitus</i> van Noort
27. <i>F. sagittifolia</i> Mildbr. & Burr.	<i>Agaon c. cicatiferens</i> Wiebes	<i>Sycoecus lamtoensis</i> van Noort
28. <i>F. subsagittifolia</i> Berg	<i>Agaon c. multum</i> Wiebes	<i>Sycoecus wiebesi</i> van Noort
Caulocarpae		
29. <i>F. ottoniifolia lucanda</i> (Ficalho) Berg	<i>Courtella scobinifera</i> (Waterston)	<i>Philocaenus levis</i> (Waterston)
30. <i>F. o. ulugarensis</i> (Mildbr. & Burr.) Berg	<i>Courtella camerunensis</i> (Wiebes)	<i>Philocaenus bifurcus</i> sp. nov.
31. <i>F. t. tremula</i> Warb.	<i>Courtella wardi</i> Compton	<i>Philocaenus clairae</i> sp. nov.
32. <i>F. artocarpoides</i> Warb.	<i>Courtella penicula</i> (Wiebes) <i>Courtella hladikae</i> (Wiebes) ?	<i>Seres longicalcar</i> van Noort <i>Crossogaster michaloudi</i> van Noort <i>Crossogaster michaloudi</i> van Noort <i>Philocaenus rasplusi</i> sp. nov.
33. <i>F. p. polita</i> Vahl	<i>Courtella bekiliensis bispinosa</i> (Wiebes)	<i>Seres solweziensis</i> van Noort

Table 1. Continued.

FICUS, SUBSECTION	AGAONINAE	SYCOECINAE
34. <i>F. s. sansibarica</i> Warb.	<i>Courtella armata</i> (Wiebes)	<i>Seres solweziensis</i> van Noort
35. <i>F. s. macrosperma</i> (Mildbr. & Burr.) Berg	<i>Courtella armata</i> (Wiebes)	<i>Seres armipes</i> subsp.?A <i>Seres armipes</i> subsp.?B <i>Seres solweziensis</i> van Noort <i>Crossogaster lachaisei</i> van Noort <i>Crossogaster inusitata</i> van Noort <i>Philocaenus bakeri</i> sp. nov.
36. <i>F. bubu</i> Warb.	<i>Courtella michaloudi</i> (Wiebes)	<i>Seres wardi</i> van Noort
37. <i>F. ovata</i> Vahl	<i>Courtella h. hamifera</i> Kieffer <i>Courtella h. modesta</i> (Wiebes)	<i>Seres a. armipes</i> Waterston <i>Seres a. breviceps</i> Wiebes <i>Seres solweziensis</i> van Noort <i>Crossogaster ovata</i> van Noort
Section <i>Malvanthera</i>		
38. <i>F. xylosydia</i> Diels	<i>Pleistodontes rieki</i> Wiebes	<i>Robertsia mandibularis</i> Bouček <i>Robertsia xylosydiae</i> Bouček

6. Head square; epistomal margin weakly produced (fig. [I]46); two rows of ventral teeth on the mandible (fig. [I]45), ex *F. craterostoma* *P. insolitus*
 – Head elongate, more than 1.25X longer than wide; epistomal margin strongly produced; more than two rows of ventral teeth on the mandible 7
7. Toruli situated completely between the eyes (figs. [I]38 & [I]43); ventral tentorial pits situated in the posterior end of a medial groove (figs. [I]49 & [I]50) 8
 – Toruli situated on an imaginary line joining the anterior margins of the eyes (figs. [I]52 & [I]58); no medial groove present on the underside of the head (fig. [I]51) 9
8. Head 1.34X longer than wide, medial concavity of the epistomal margin as deep as broad (fig. [I]38); three to four uneven rows of ventral teeth on the mandible, posterior row with ca. 26 teeth (fig. [I]49), ex *F. natalensis natalensis* *P. medius*
 – Head 1.55X longer than wide, medial concavity of the epistomal margin deeper than broad (fig. [I]43); more than three rows of ventral mandibular teeth forming an extensive plate of teeth, posterior row with ca. 44 teeth (fig. [I]50), ex *F. 'natalensis'*, *F. 'thonningii'* and *F. 'dekekena'*
 *P. ugandensis*
9. Eye length 1.5X cheek length; epistomal margin with a broad v-shaped medial indentation (fig. [I]52); hypostoma present (fig. [I]51), ex *F. trichopada* *P. hippopotomus*
 – Eye length twice cheek length; epistomal margin with a narrow v-shaped medial indentation, flanked by a step on each side (fig. [I]58); hypostoma absent (fig. [I]59), ex *F. platyphylla*
 *P. barbatus*
10. Ovipositor valves more than half as long as the gaster, ex *F. bussei* *P. zambesiacus*
 – Valves a third or less than a third of gaster length 11
11. Epistomal margin smooth and deeply concave (fig. 17); two ventral teeth on mandible (fig. 19), ex *F. glumosa* *P. warei*
 – Epistomal margin with a medial convexity and only slightly concave (fig. 34); three ventral teeth on mandible (figs. 27 & 36) **or four!**
 12
12. Four ventral teeth on mandible (fig. 33), ex *F. craterostoma* (?) *P. quatuoridentatus*
 – Three ventral teeth on mandible (figs. 19 & 36) 13

13. Four teeth on the dorso-apical margin of the fore tibia (fig. 37); paraclypeal margin/cheek junction rounded (fig. 34), ex *F. abutilifolia* *P. rotundus*
 – Three teeth on the dorso-apical margin of the fore tibia (as in fig. 20); paraclypeal margin/cheek junction quadrate, ex *F. burtt-davyi*, *F. thonningii*, *F. l. lingua*, *F. stuhlmannii*, *F. craterostoma* and *F. natalensis leprieurii* *P. liodontus*
14. Malar sulcus absent; toruli either situated completely below the eyes or in line with the anterior margin of the eyes, if in line then epistomal margin with a deep medial incision (figs. [I]1, [I]9 & [I]23) 15
 – Malar sulcus distinct for complete cheek length; toruli situated completely between the eyes, epistomal margin never with a medial incision (figs. [I]18, [I]28 & [I]29) 17
15. Head square (fig. [I]29), ex *F. thonningii* *P. barbarus*
 – Head elongate, at least 1.3X longer than wide (figs. [I]18 & [I]28) 16
16. Eye 1.5X longer than cheek; epistomal margin convex (fig. [I]28), ex *F. reflexa* *P. bouceki*
 – Eye length equal to cheek length; epistomal margin with shallow medial concavity (fig. [I]18), ex *F. antandronarum bernardii* *P. comorensis*
17. Comb of six teeth present on dorso-apical margin of tibia; epistomal margin with a deep medial incision (fig. [I]23), ex *F. lutea* *P. silvestrii*
 – Plate of teeth present for most of dorso-antiaxial length of tibia (figs. [I]5, [I]12 & [I]13); epistomal margin with only a shallow medial concavity (figs. [I]1 & [I]9) 18
18. Tibial plate subequal in length to first tarsal segment (figs. [I]12 & [I]13); antennal funicle segments longer than wide (fig. [I]11), ex *F. saussureana* *P. cavus*
 – Tibial plate 2.5X as long as first tarsal segment (fig. [I]5); antennal funicle segments broader than long (fig. [I]4), ex *F. chlamydocarpa* *P. comptoni*
19. Eye length twice or more than twice as long as cheek 20
 – Eye length less than 1.6X as long as cheek 21
20. Head 1.6X longer than wide, eye length 2.4X longer than cheek; epistomal margin broadly and shallowly concave (fig. 7), ex *F. t. tremula* *P. clairae*
 – Head 1.4X longer than wide, eye length twice as long as cheek; epistomal margin concavity less broad and more medially situated (fig. 15), ex *F. ottonifolia lucanda* *P. levis*
21. Epistomal margin concavity deeper than the paraclypeal margins (fig. 1); head 1.5X longer than wide; eye length 1.37X longer than cheek, ex *F. ottonifolia ulugarensis* *P. bifurcus*
 – Epistomal margin concavity shallower than the paraclypeal margins (fig. 5 & 16); head either 1.25X or 1.65X longer than wide; eye length 1.56X longer than cheek 22
22. Head 1.65X longer than wide; epistomal margin broad, width 0.4X head width (fig. 16); fore tibial armature on dorso-apical margin bidentate (fig. 11), ex *F. artocarpoides* *P. rasplusi*
 – Head 1.25X longer than wide; epistomal margin narrow, width 0.26X head width (fig. 5); fore tibial armature on dorso-apical margin tridentate, ex *Ficus s. macrosperma* *P. bakeri*

MALES*

1. Mandibular apical teeth subequal, outer tooth less than twice the length of the inner (measured along the opposing inner edges); antennal flagellum shorter than the scape 2
 – Outer mandibular apical tooth more than twice the length of the inner; antennal flagellum longer than the scape 4
2. Toruli situated in line with the anterior margin of the eyes; deep medial incision in the epistomal margin; inner mandibular tooth truncate (fig. [I]27), ex *F. lutea* *P. silvestrii*
 – Toruli situated completely below the eyes; epistomal margin with only a shallow medial concavity (fig. [I]6 & [I]15); inner mandibular tooth pointed (figs. [I]7 & [I]16) 3

* The males of *P. geminus*, *P. insolitus*, *P. bakeri*, *P. bifurcus*, *P. levis*, and *P. quatuordecimatus* are unknown.

3. Head ca. square, 1: w = 1.02; vertex rounded (fig. [I]15), ex *F. saussureana* *P. cavus*
 – Head broad, 1: w = 0.90; vertex subquadrate (fig. [I]6) ex *F. chlamydocarpa* *P. comptoni*
4. Epistomal margin smoothly concave (figs. [I]22, 22 & 29) 5
 – Epistomal margin less concave with a medial convexity, which may be indistinct (e.g. figs. [I]39, [I]44, [I]53, 13 & 38) 8
5. Vertex rounded (fig. 22), mesoscutum, scutellum and vertex dark brown, ex *F. glumosa* . *P. warei*
 – Vertex straight (fig. [I]22), head and body testaceous 6
6. Head elongate, 1.5X longer than wide (fig. [I]22), ex *F. antandronarum bernardii* ... *P. comorensis*
 – Head ca. square, 1: w = 0.97-1.1 7
7. Head slightly longer than wide 1: w = 1.1; small species, total length, with head in orthognathous position = 1.2 mm, ex *F. reflexa* *P. bouceki*
 – Head broad, 1: w = 0.97 (fig. 29); larger species, total length, with head in orthognathous position = 1.84 mm, ex *F. bussei* *P. zambesiacus*
8. Posterior two-thirds of head dark brown, almost black, ex *F. platyphylla* *P. barbatus*
 – Head testaceous 9
9. Toruli in line with the anterior margin of the eyes (figs. [I]44 & [I]53) 10
 – Toruli situated completely between the eyes, even if only just (fig. [I]39) 11
10. Head slightly elongate, 1: w = 1.1; vertex straight (fig. [I]44), ex *Ficus* spec. *P. ugandensis*
 – Head square, 1: w = 1.0; vertex more rounded (fig. [I]53), ex *F. trichopoda* *P. hippopotomus*
11. Anterior edge of the toruli situated above the anterior margin of the eyes by at least the length of a torulus (fig. 38) 12
 – Anterior edge of the toruli situated on or just above the anterior margin of the eyes by less than the length of a torulus 13
12. Mandible broad, width a third of total length; larger species—total length = 1.67 mm, ex *F. abutilifolia* *P. rotundus*
 – Mandible narrower, width a quarter of total length; smaller species—total length = 1.3 mm, ex *F. n. leprieurii*, *F. craterostoma*, *F. burtt-davyi*, *F. thoningii*, *F. stuhlmannii* *P. liodontus*
13. Toruli very slightly separated (fig. 13), ex *F. t. tremula* *P. clairae*
 – Toruli touching along inner edges 14
14. Toruli situated distinctly above the line joining the anterior margins of the eyes; epistomal margin slightly concave, ex *F. thoningii* *P. barbarus*
 – Toruli situated with their anterior margins on the line joining the anterior margins of the eyes; epistomal margin straighter with a slight medial convexity 15
15. Cheek length 0.42X the eye length (fig. [I]36), ex *Ficus* spec. *P. jinjaensis*
 – Cheek length 0.30X the eye length (fig. [I]39), ex *F. n. natalensis* *P. medius*

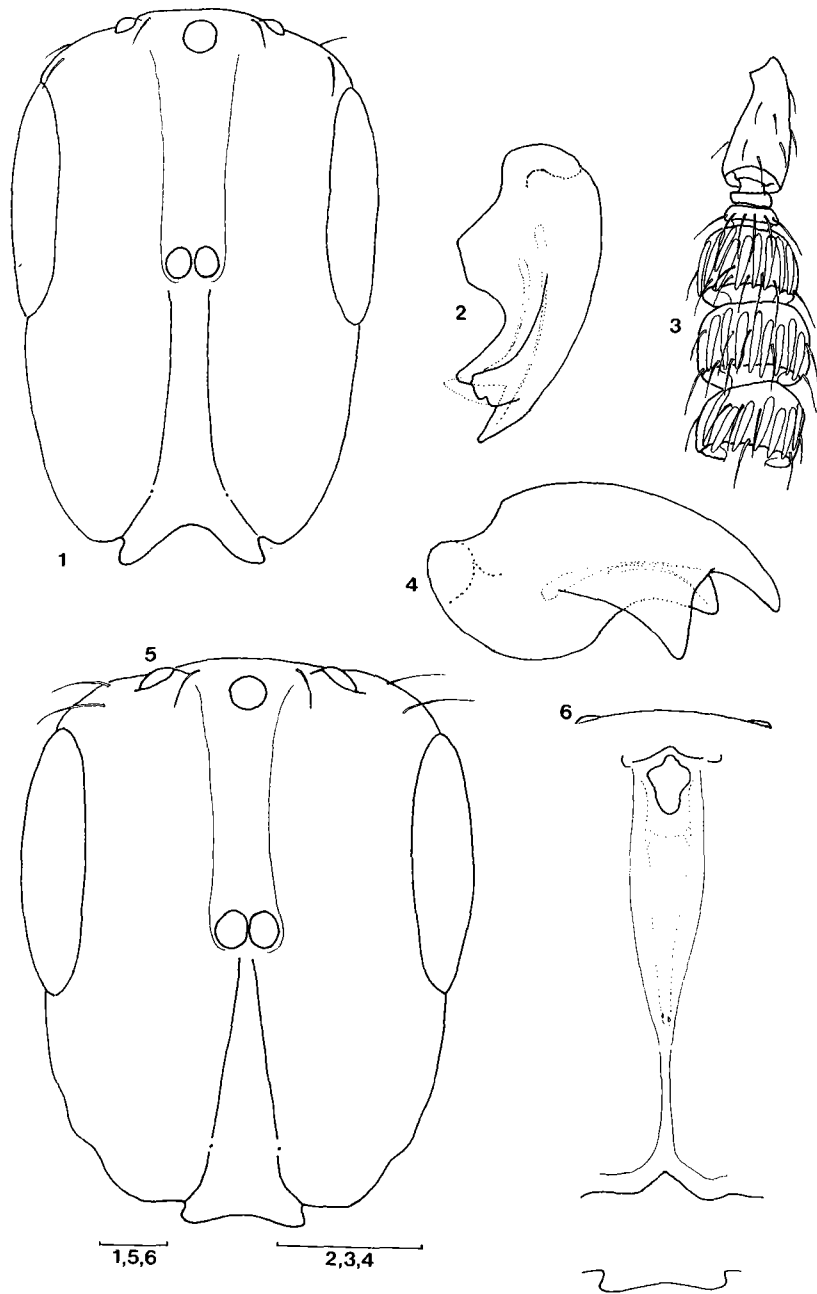
PHILOCAENUS LEVI SPECIES-GROUP

This species-group is characterised by the presence of a single large ventral tooth on the female mandible, numerous MPS on the female antennae that are in close apposition, suboval head shape and a broadly bifurcate epistomal margin.

Philocaenus bakeri spec. nov. (figs. 4–6)

Etymology: Named after R.G.E. Baker, the collector of the holotype.

Type material: Holotype ♀ (slide mounted): Cameroun, S.W. Province, Bomana, 22 January 1982, leg. R.G.E. Baker, no. 21, C1008, ex *F. sansibarica macrosperma* (Mildbr. & Burr.) Berg. Paratypes, 2 ♀♀ (card mounted): same data as holotype. Holotype and paratypes in SAMC.



Figs. 1-3. *Philocaenus bifurcus* spec. nov., female: 1, head, dorsal view; 2, mandible, ventral view; 3, antenna - pedicel, anelli and the first three funicle segments, antiaxial view. Figs. 4-6. *Philocaenus bakeri* spec. nov., female: 4, mandible, ventral view; 5, head, dorsal view; 6, head, ventral view. Scale bars = 0.1 mm.

FEMALE. Metallic black, tibia and tarsi testaceous. Total length with head in orthognathous position, excluding ovipositor valves = 2.5 mm.

Head (figs. 5 & 6) elongate, parallel sided ($l = 0.83$, $w = 0.67$), dorso-ventrally compressed ($h = 0.21$). Eye very elongate ($l = 0.39$, $w = 0.13$, $h = 0.09$), 0.46X as long as the head. Cheek length 0.64X eye length. Occipital carina in a straight line below the ocelli, curved ventrally at lateral ends, parallels the ventral invagination of the vertex; slight excavation lateral of the lateral ocelli. POL = 0.20, OOL = 0.13. TE 1.12X as long as scrobe length (TE = 0.40, SL = 0.36). Clypeus equilateral in area. Epistomal margin projects, laterally angular, with a broad, shallow medial concavity. Ventral tentorial pits in close apposition (fig. 6). Mandible (fig. 4) with two apical teeth, and a single large ventral tooth, two glands. Two labial palp segments, segments subequal. Three maxillary palp segments, proximal segment longest. Antenna much as in *P. bifurcus* (fig. 3), funicle segments subequal in size, flagellum length = 0.49. Scape narrow, 7.3X longer than wide ($l = 0.29$). Pedicel relatively short, 0.35X scape length. MPS numerous, eighteen to twenty per segment, often offset from one another.

Thorax. Pronotum $l = 0.38$, $w = 0.47$. Propodeum $l = 0.23$, $w = 0.48$. Mesoscutum $l = 0.36$, $w = 0.56$. Scutellum, including axillae $l = 0.40$, $w = 0.45$. Fore femur 3.1X longer than wide ($l = 0.50$). Fore tibia much as in *P. clairae* (fig. 11), except the armature on the dorso-apical margin is tridentate. Fore leg coxa ca. three-quarters of femur length (C = 0.37, TR = 0.14, TI = 0.20, TA = 0.25). Fore wing 2.5X longer than wide, $l = 1.84$, pilose, fringe short. Postmarginal vein shorter than stigmal (SM = 0.69, M = 0.28, PM = 0.12, S = 0.15). Marginal vein 9.3X longer than wide. Hind wing 4.1X longer than wide, $l = 1.38$.

Gaster, posterior edge of tergites very crenulated, with three medial incisions. Eighth urotergite spiracle normal. Ovipositor 3.6X longer than the ovipositor valves (valve $l = 0.55$).

Comments. *P. bakeri* can be distinguished by the shape of the cheek margin and paraclypeal margin in dorsal view, which is not continually smoothly rounded as in other members of the group. The epistomal margin is also narrower relative to head width than in the other species.

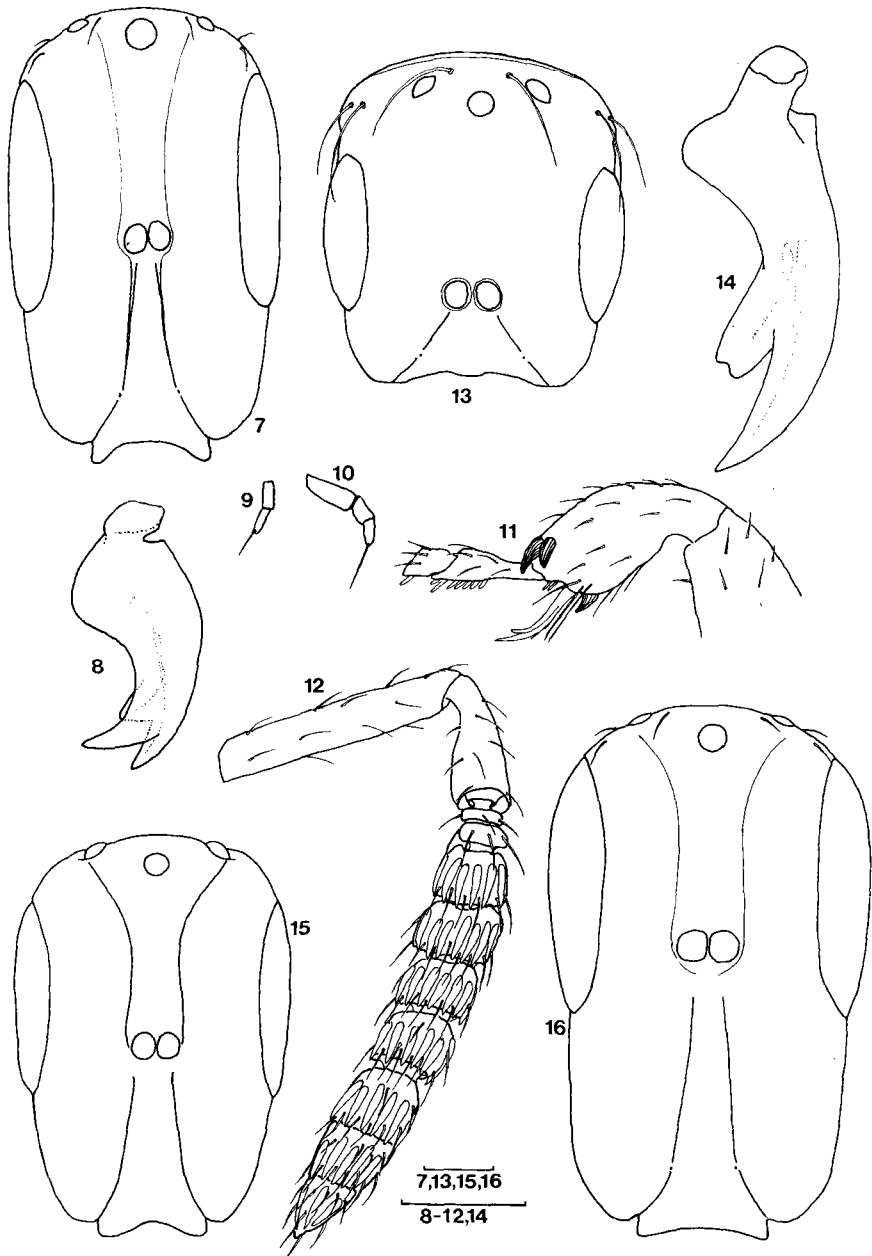
***Philocaenus bifurcus* spec. nov.**

(figs. 1–3)

Etymology: Bifurcus (latin) = forked, referring to the epistomal margin shape.

Type material: Holotype ♀ (slide mounted): Kenya, Kilifi distr., leg. L. Lap., no. 210, RMNH 4889, ex. *F. ottonifolia ulugurensis* (Mildbr. & Burr.) Berg. (det. Berg, from herbarium material) [associated pollinator = *Courtella camerunensis* (Wiebes)]. Holotype in SAMC.

FEMALE. Head metallic green, rest metallic green/black, gaster browner, antennae, legs and mandibles testaceous. Total length with head in orthognathous position, excluding ovipositor valves = 2 mm.



Figs. 7–12. *Philocaenus clairae* spec. nov., female: 7, head, dorsal view; 8, mandible, ventral view; 9, labial palp; 10, maxillary palp; 11, fore tibia and first two tarsal segments, antiaxial view; 12, antenna, antiaxial view. Figs. 13–14. *Philocaenus clairae* spec. nov., male: 13, head, dorsal view; 14, mandible, dorsal view. Fig. 15. *Philocaenus levis* (Waterston), female: head, dorsal view (redrawn from Waterston, 1920). Fig. 16. *Philocaenus rasplusi* spec. nov., female: head, dorsal view. Scale bars = 0.1 mm.

Head (fig. 1) elongate, parallel sided ($l = 0.76$, $w = 0.51$), dorso-ventrally compressed ($h = 0.18$). Eye very elongate ($l = 0.33$, $w = 0.11$, $h = 0.062$), $0.44X$ as long as head. Cheek length $0.73X$ eye length ($l = 0.24$). Thin occipital carina present. $POL = 0.17$, $OOL = 0.12$. $TE = 1.23X$ as long as scrobe length ($TE = 0.39$, $SL = 0.32$). Clypeus long and narrow in area, broadening near the epistomal margin. Epistomal margin projects with angular bilobed margins and a medial concavity that extends deeper than the paraclypeal margins, width of margin ca. two-fifths of head width (fig. 1). Ventral tentorial pits very close together in slight depression, situated a third of the distance from the foramen magnum to the oral fossa. Mandible with two apical teeth and a single large ventral tooth, situated near the apex, rest of ventral edge a smooth ridge, two glands (fig. 2). Two labial palp segments, segments subequal in length. Three maxillary palp segments, proximal segment longest. Antenna (fig. 3), funicle segments subequal in size, dorso-ventrally compressed, flagellum $l = 0.41$. Scape narrow, $7X$ longer than wide ($l = 0.21$). Pedicel elongate, $0.43X$ scape length. MPS numerous, ca. fourteen per segment, more numerous dorsally.

Thorax. Pronotum broad ($l = 0.32$, $w = 0.38$). Propodeum wider than long ($l = 0.16$, $w = 0.39$). Mesoscutum broad ($l = 0.29$, $w = 0.45$). Scutellum, including axillae broad ($l = 0.29$, $w = 0.36$). Fore femur $3.3X$ as long as wide ($l = 0.40$). Fore tibia much as in *P. clairae* (fig. 11), except the armature on the dorso-apical margin is tridentate. Fore leg coxa $0.70X$ femur length ($C = 0.28$, $TR = 0.10$, $TI = 0.15$, $TA = 0.20$). Six spines on the dorsal margin of the hind tibia. Fore wing $2.3X$ longer than wide, $l = 1.38$, sparsely setous, fringe short. Postmarginal vein same length as stigmal ($SM = 0.55$, $M = 0.18$, $PM = 0.10$, $S = 0.10$). Marginal vein $9X$ longer than wide. Hind wing $4.7X$ longer than wide, $l = 1.09$.

Gaster, posterior edge of tergites crenulated with three medial incisions. Eighth urotergite spiracle normal ($l = 0.037$). Ovipositor $3.8X$ as long as valve (valve $l = 0.32$).

Comments. *P. bifurcus* can be separated by the epistomal margin concavity, which is deeper than the paraclypeal margins.

***Philocaenus levis* (Waterston) comb. nov.**

(fig. 15)

Seres levis Waterston 1920, 135–136, fig. 3(d–f), ♀ holotype, Uganda, ex *F. lukanda* Welw. = *F. ottonifolia lucanda* (Ficalho) Berg. [Examined paratype, NHML].

***Philocaenus rasplusi* spec. nov.**

(fig. 16)

Etymology: Named after Jean-Yves Rasplus, who kindly made this species and other west African material available to me.

Type material: Holotype ♀ (card mounted): Gabon, Makokou, Station M'Passa, 23 September 1988, leg. J.-M. Maldes, ex *Ficus artocarpoides* Warb. Paratypes, 2 ♀♀ (slide mounted): same data as holotype, but collected on 14 September 1988 and 27 September 1988. Holotype and paratypes in SAMC.