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(*Continued on inside back cover*)

G. F. of Wicken

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A SURVEY OF THE SWEDISH SPECIES OF *PHAONIA* R.-D. (DIPT., MUSCIDAE)

By O. RINGDAHL

(1923, *Ent. Tidsk.*, 117-140)

Translated from the Swedish by E. C. M. d'Assis-Fonseca, B.Sc., F.R.E.S.*

The genus *Phaonia* is rich in species, of large or medium size. Body either broad or fairly narrow. Eyes of males touching or narrowly separated, female frons broad, almost always without crossed frontal bristles. Thorax four-striped, stripes sometimes indistinct or the median pair confluent. Abdomen usually with dorsal stripe and sometimes with shifting tessellations, but never with true paired spots. Legs usually without conspicuous secondary sexual characters. Hind tibiae with one, seldom with two, dorsal bristles below middle. In wing, cubital vein without setae at base. Squamae large, lower one protruding far beyond upper.

The majority of the species are woodland and meadow dwellers. A few favour water-loving vegetation, but on the other hand there are none which are drought-lovers. Not a few are flower visitors (*serva*, *lugubris*, *alpicola*, *incana*, *basalis*, *morio*, *hybrida*, *consobrina*), with some the principal habitat is a tree-trunk (*errans*, *signata*, *fuscata*, *goberti*, etc.), and similarly others are chiefly met with where sap is flowing (*querceti*, *laeta*, *cincta*, *mirabilis*).

[* Translator's Note: The original Tables have been modified to an appreciable extent in order to incorporate a further thirteen British species, viz., *subfuscinervis* Zett., *confluens* Stein, *mystica* Mg., *colbrani* Coll., *humerella* Stein, *bitincta* Rond., *laetabilis* Coll., *pullata* Stein, *trimaculata* Bché. (normal form with pale tibiae), *fusca* Mde., *cincta* Zett., *setifemur* Stein and *rufiseta* Zett. (the last three species in the Table for females only). For the *laeta*-group, the original characters have been largely replaced by those given by Mr. J. E. Collin in his paper on *Phaonia laetabilis* and related species (see ref. below), in order to make this section of the Tables workable. The species *servaeformis* Ringd., appearing in the original Swedish paper, has since (1945) been recognized by Ringdahl as a dark form of *trimaculata* Bché. Collin in 1931 (see ref. below) pointed out that *frenata* Holmgr. should correctly be placed in the genus *Lophosceles* Ringd., and this species has been omitted from the present Tables. In 1949 Ringdahl (see ref. below) proposed a re-grouping of the genus *Phaonia*, but his original arrangement is retained in this paper.

I am indebted to Mr. J. E. Collin for advice and information in regard to some of the additional British species. My thanks are also due to Mr. L. Parmenter for the loan of specimens of the little-known *fusca* Mde.

(*Continued at foot of page 2*)

Table of Species

Males:

1. Legs black 2
— Legs partly yellow 27

2. Four postsutural dorsocentral bristles 3
— Three postsutural dorsocentrals 21

3. Presutural acrostichal bristles absent 4
— Presutural acrostichals present 9

4. Arista plumose 5
— Arista pubescent 7

5. Arista long-plumose; front tibiae without longer hairs behind ..... 1. *incana* Wied.
— Arista shorter-plumose; front tibiae with scattered long hairs behind 6

6. Hind femora with only very short posteroventral bristles; brownish species with yellow wing-base ..... 3. *hybrida* Schnb.
— Hind femora with a posteroventral row of long bristles; blackish species with dark wing-base ..... 4. *morio* Zett.

7. Hind femora with a posteroventral row of bristles; blackish-grey species 8
— Hind femora without these bristles; black species 7. *pallidisquama* Zett.

8. Frons at narrowest at least as broad as third antennal segment; aristal hairs shorter; greyer species ..... 6. *subfuscinervis* Zett.
— Frons narrower; aristal hairs longer; darker species .. 5. *consobrina* Zett.

9. At least front femora, beneath at apex, with a row of very short, strong, spine-like bristles 10
— Not as above 11

10. Only the front femora with a row of spines beneath; eyes bare ..... 40. *setifemur* Stein
— Both front and middle femora spinose beneath; eyes hairy ..... 39. *mirabilis* Ringd.

11. Arista plumose, or at least short-haired 12
— Arista pubescent 18

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12. Hind tibiae abundantly bristled and haired; strong orbital bristles reaching almost to ocellar triangle, uppermost one upcurved.... .....41. *querceti* Bché.
— Hind tibiae not particularly bristly; strong orbital bristles not reaching near to ocellar triangle, upper ones weaker than lower.. 13
13. Crossveins clouded..... 14
— Crossveins not clouded 17
14. Scutellum with hairs on lateral margins, *below* lateral bristles..... 15
— Scutellum bare on lateral margins..... 16
15. Abdomen more or less transparent yellowish at base and on sides; eyes separated by almost twice the width of third antennal segment .....37. *cincta* Zett.
— Abdomen nowhere transparent yellow, with shifting tessellations; eyes separated by less than the width of third antennal segment.. ..... 46. *trimaculata* Bché.
16. The pair of strong postvertical bristles well in front of a line joining inner verticals; frons greyer; front tibiae without a median posterior bristle.....36. *laetabilis* Coll.
— The strong pair of postverticals not in front of the inner verticals; front tibiae usually with a median bristle.....35. *laeta* Fall.
17. Arista short-plumose; eyes densely hairy; abdomen with shifting tessellations; bristles beneath middle femora rather fine..... .....42. *goberti* Mik
— Arista long-plumose; eyes sparsely-haired; abdomen without shifting tessellations ..... 43. *canescens* Stein
18. Black or blue-black species; wings either smoky or strongly yellow at base 19
— Almost lead-grey species; wings not as above..... 20
19. Blue-black species, abdomen without markings; wings strongly yellow at base.....51. *atrocyanea* Ringd.
— Black species, abdomen with distinct median stripe; wings smoky.. .....38. *pullata* Cz.
20. Crossveins clouded; prealar bristle long ..... 49. *aeneiventris* Zett.
— Crossveins not clouded; prealar bristle absent.....50. *halterata* Stein
21. Mouthedge far protruding..... 22
— Mouthedge not or hardly protruding 23
22. Eyes touching; squamae yellowish.....10. *lugubris* Mg.
— Eyes somewhat separated; squamae whitish ..... 11. *alpicola* Zett.
23. Eyes densely hairy; fairly broad species with plumose arista..... 24
— Eyes sparsely short-haired, or bare; narrower species 25
24. One pair of presutural acrostichals; thorax distinctly four-striped; hind tibiae not remarkably bristly; front tibiae without a median bristle ..... 8. *serva* Mg.
— Presutural acrostichals absent or inconspicuous; median pair of thoracal stripes very broad, usually confluent; hind tibiae abundantly bristled and haired; front tibiae with a median bristle ..... 9. *confluens* Stein

25. Prealar bristle absent or inconspicuous; almost lead-grey species; knob of halteres dark; costal spine about as long as small crossvein ..... 50. *halterata* Stein
— Prealar bristle usually present, sometimes short and fine..... 26

26. Arista short-plumose, hairs about as long as third antennal segment is wide; knob of halteres usually dark; costal spine about twice as long as small crossvein ..... 47. *nitida* Macq.
— Arista almost bare; knob of halteres yellow.....30. *longicornis* Stein

27. Four postsutural dorsocentral bristles..... 28
— Three postsutural dorsocentrals 49

28. Abdomen yellow..... 29
— Abdomen not yellow, or only transparent yellowish at base..... 32

29. Head and thorax entirely yellow, latter at most darkened on dorsum; arista very long-plumose ..... 31. *pallida* F.
— Head and thorax mainly dark 30

30. Scutellum entirely yellow; one pair of well developed presutural acrostichals ..... 32. *scutellaris* Fall.
— Scutellum blackish at base; two pairs of presutural acrostichals.... 31

31. Arista short-plumose, hairs hardly as long as third antennal segment is wide; thorax with the median pair of stripes broad.....
.....33. *variegata* Mg.
— Arista very long-plumose; median pair of thoracal stripes very narrow ..... 34. *bitincta* Rond.

32. Presutural acrostichal bristles present..... 33
— Presutural acrostichals absent, or hair-like and inconspicuous..... 39

33. Abdomen more or less transparent yellowish at base; eyes separated by almost twice the width of third antennal segment..37. *cincta* Zett.
— Abdomen nowhere transparent yellow..... 34

34. At least some femora yellow..... 35
— Legs black, only the tibiae entirely or partly yellowish..... 36

35. Humeri usually yellowish; scutellum mainly yellow; only one pair of presutural acrostichals ..... 25. *humerella* Stein
— Neither humeri nor scutellum yellow; more than one pair of presutural acrostichals.....45. *gracilis* Stein

36. Crossveins clouded; arista fairly long-plumose..... 37
— Crossveins not clouded; arista rather short-plumose....42. *goberti* Mik

37. Scutellum with hairs on lateral margins, *below* lateral bristles, usually yellowish at apex.....46. *trimaculata* Bché.
— Scutellum bare on lateral margins, never yellowish at apex..... 38

38. The pair of strong postvertical bristles well in front of a line joining the inner verticals; frons greyer; front tibiae without a median bristle..... 36. *laetabilis* Coll.
— The pair of strong postverticals not in front of the inner verticals; frons darker; front tibiae usually with a median bristle..35. *laeta* Fall.

39. Prealar bristle absent; palpi more or less yellow....28. *rufipalpis* Macq.
— Prealar bristle long 40

40. Scutellum yellow at apex 41
— Scutellum not yellow at apex 44

41. Eyes separated by more than the width of third antennal segment; hind femora black.....15. *perdita* Mg.
— Eyes quite or almost touching; hind femora yellow..... 42

42. Antennae black ..... 14. *errans* Mg.
— Basal segments of antennae yellow 43

43. Front femora entirely yellow; front tibiae seldom with a median bristle; hind femora without long bristly-hairs posteroventrally ..... 12. *erratica* Fall.
— Front femora black at base; front tibiae with one or more posterior bristles; hind femora with long bristly-hairs posteroventrally.... .....13. *signata* Mg.

44. Middle tibiae with the posterior bristles in two rows....2. *basalis* Zett.
— Middle tibiae with only one row of bristles behind..... 45

45. Hind femora long-haired beneath.....17. *erronea* Schnb.
— Hind femora not long-haired beneath..... 46

46. Hind femora posteroventrally with several strong bristles; middle tibiae with an anterior bristle; hind tibiae with a strong posteroventral apical bristle.....16. *vagans* Fall.
— Hind femora without strong posteroventral bristles; middle tibiae without an anterior bristle; hind tibiae without a posteroventral apical bristle..... 47

47. Femora dark; eyes with the glistening white orbits touching..... 48
— Femora mainly yellow; eyes distinctly separated.....19. *fuscata* Fall.

48. Front tibiae with a median posterior bristle.....26. *palpata* Stein
— Front tibiae without a median bristle.....27. *ostrologica* sp. n.

49. Scutellum yellow at apex 50
— Scutellum not yellow at apex..... 51

50. Humeri usually yellowish; abdomen without shifting tessellations ..... 25. *humerella* Stein
— Humeri not yellowish; abdomen with shifting tessellations..... ..... 24. *apicalis* Stein

51. Hind tibiae densely bristled and haired all round....18. *crinipes* Stein
— Hind tibiae simple 52

52. All femora mainly black; crossveins at most very indistinctly clouded; abdomen without long bristly-hairs at apex beneath..... 53
— Middle and hind femora mainly yellow, or if darkened then either crossveins distinctly clouded, or genital sternite with long bristly-hairs 55

53. Arista very short-haired or pubescent; scutellum with hairs beneath ..... 29. *magnicornis* Zett.
— Arista plumose..... 54

54. Arista long-plumose; eyes touching.....26. *palpata* Stein
— Arista shorter-plumose; eyes separated by at least the width of third antennal segment ..... 48. *fusca* Mde.

55. Crossveins distinctly, usually broadly, clouded; abdomen not remarkably bristled at apex beneath.....19. *fuscata* Fall.
— Crossveins at most indistinctly clouded 56
56. Hind femora long-haired beneath; wings clear; abdomen without shifting tessellations.....17. *erronea* Schnb.
— Hind femora not long-haired beneath..... 57
57. Genital sternite with a dense bunch of long bristly-hairs on each side almost as long as fourth visible tergite.....20. *vittifera* Zett.
— Genital sternite at most with shorter fine hairs 58
58. Middle femora beneath with at least one strong bristle; antennae entirely black; abdomen with shifting tessellations..21. *mystica* Mg.
— Middle femora without any strong bristles beneath..... 59
59. Hind femora without strong posteroventral bristles; thorax seen from behind with the median pair of stripes coalesced into a central broad stripe; abdominal stripe broad ..... 22. *rufiseta* Zett.
— Hind femora with strong posteroventral bristles; thorax with four stripes; abdominal stripe narrow.....23. *colbrani* Coll.

FEMALES:

1. Legs black 2
— Legs partly yellow 28
2. Four postsutural dorsocentral bristles 3
— Three postsutural dorsocentrals 21
3. Presutural acrostichal bristles absent 4
— Presutural acrostichals present, though sometimes fine..... 9
4. Arista plumose, hairs at least as long as third antennal segment is wide 5
— Arista short-haired or pubescent..... 7
5. Front tibiae almost uniformly short-haired all round; arista very long-plumose.....1. *incana* Wied.
— Front tibiae with scattered hairs behind; arista shorter-plumose.... 6
6. Brownish-grey species; hind femora posteroventrally without longer bristles ..... 3. *hybrida* Schnb.
— Black species; hind femora with several long posteroventral bristles ..... 4. *morio* Zett.
7. Black, thinly pruinose species, with dark wing-base; hind femora posteroventrally without fine bristles ..... 7. *pallidisquama* Zett
— Distinctly grey pruinose species, with yellow wing-base; hind femora with numerous fine posteroventral bristles..... 8
8. Middle tibiae with posteroventral bristles; hind femora with long antero- and postero-ventral bristles; crossveins not clouded..... ..... 5. *consobrina* Zett.
— Middle tibiae without posteroventral bristles; the antero- and postero-ventral bristles on hind femora much shorter, hardly longer than femur is deep; crossveins slightly clouded..... ..... 6. *subfuscinervis* Zett.

9. Arista plumose, or at least short-haired 10
— Arista only pubescent..... 18
10. Crossveins distinctly clouded 11
— Crossveins not clouded 15
11. Scutellum with hairs on lateral margins, *below* lateral bristles..... 12
— Scutellum bare on lateral margins..... 14
12. Frons with hairs *on* frontal stripe; acrostichal rows very close together ..... 39. *mirabilis* Ringd.
— Frontal stripe without hairs; acrostichal rows not particularly close together 13
13. Scutellum with a dark basal spot and lateral patches; abdomen with a dorsal stripe and shifting tessellations ..... 46. *trimaculata* Bché.
— Scutellum entirely grey, at least without side spots; abdomen with a dorsal stripe and brownish patches on outer hind corners of second and third visible tergites.....37. *cincta* Zett.
14. Frontal stripe greyer, seen from the front hardly contrasting with the grey orbits; palpi distinctly broader than width of basal segment of front tarsi; front tibiae without a median posterior bristle.....36. *laetabilis* Coll.
— Frontal stripe darker, contrasting distinctly with the orbits; palpi narrower, at most as broad as basal segment of front tarsi; front tibiae usually with a median bristle.....35. *laeta* Fall.
15. Front tibiae with a strong median posterior bristle..43. *canescens* Stein
— Front tibiae without a median bristle 16
16. Knob of halteres darkened; a pair of strong upper orbital bristles pointing *forwards* 17
— Knob of halteres clear yellow; no such upper orbital bristles.....
.....42. *goberti* Mik
17. Hairs of arista shorter than third antennal segment is wide; anteroventral bristles near apex of front femora inconspicuous
.....41. *querceti* Bché.
— Hairs of arista much longer; front femora with much stronger anteroventral bristles near apex.....40. *setifemur* Stein
18. Blue-black species with strongly yellow wing-base.....
.....51. *atrocyanea* Ringd.
— Species not as above 19
19. Knob of halteres yellow; abdomen brownish pruinose..38. *pullata* Cz.
— Knob of halteres dark; abdomen lead-grey, somewhat shining..... 20
20. Crossveins distinctly clouded; prealar bristle rather long.....
..... 49. *aeneiventris* Zett.
— Crossveins not clouded; prealar bristle absent or very short.....
..... 50. *halterata* Stein
21. Eyes densely hairy; broad species..... 22
— Eyes sparsely-haired, or bare; somewhat slender species..... 26
22. Arista pubescent.....38. *pullata* Cz.
— Arista plumose..... 23

23. Mouthedge far protruding 25
— Mouthedge not or hardly protruding 24

24. One pair of strong presutural acrostichals; middle tibiae with two-four posterior bristles in a single row ..... 8. *serva* Mg.
— Presutural acrostichals absent or inconspicuous; middle tibiae with numerous posterior bristles irregularly biserial .... 9. *confluens* Stein

25. Squamae usually yellow ..... 10. *lugubris* Mg.
— Squamae whitish ..... 11. *alpicola* Zett.

26. Acrostichal bristles absent or very weakly developed; antennae very long with almost bare arista; front tibiae without posterior bristle ..... 30. *longicornis* Stein
— Acrostichals distinct, even though short and fine; antennae normal, arista distinctly pubescent or short-plumose; front tibiae with a posterior bristle 27

27. Arista short-plumose; costal spine very long, about half as long as hinder crossvein ..... 47. *nitida* Macq.
— Arista pubescent; costal spine shorter ..... See No. 20

28. Four postsutural dorsocentral bristles 29
— Three postsutural dorsocentrals 49

29. Palpi rather strongly developed; front tibiae with a median posterior bristle ..... 26. *palpata* Stein
— Palpi not, or only slightly enlarged 30

30. Abdomen yellow 31
— Abdomen nowhere yellow 34

31. Head, thorax and abdomen yellow ..... 31. *pallida* Fall.
— Head and thorax mainly dark 32

32. Scutellum entirely, and sides of thorax largely, yellow; median pair of thoracal stripes narrow ..... 32. *scutellaris* Fall.
— Scutellum darkened at base 33

33. Arista very long-plumose; median thoracical stripes very narrow .... 34. *bitincta* Rond.
— Arista with hairs hardly as long as width of third antennal segment; median thoracal stripes broad ..... 33. *variegata* Mg.

34. Presutural acrostichal bristles absent 35
— Presutural acrostichals present 42

35. Scutellum more or less yellow at apex, sometimes very obscurely .. 36
— Scutellum not yellow at apex 39

36. Antennae yellow at base; palpi usually more or less yellow 37
— Antennae and palpi black; abdomen with shifting tessellations 38

37. Very large species, about 10 mm.; small crossvein not clouded .... 12. *erratica* Fall.
— Smaller species, about 7 mm.; both crossveins distinctly clouded .. .. 13. *signata* Mg.

38. All femora yellow, at most front femora black at base; costal spine inconspicuous ..... 14. *errans* Mg.
— Front femora largely and middle femora partly black.. 15. *perdita* Mg.

39. Prealar bristle absent or extremely short; palpi more or less yellow ..... 28. *rufipalpis* Macq.
— Prealar bristle long; palpi dark 40

40. Middle tibiae with the posterior bristles in two rows; front tibiae with somewhat longer hairs behind ..... 2. *basalis* Zett.
— Middle tibiae with only one row of bristles behind; front tibiae almost uniformly haired all round 41

41. Front tibiae without a posterior bristle; middle tibiae without anterior bristles; hind femora posteroventrally without long bristles; abdomen without shifting tessellations from any point of view ..... 17. *erronea* Schnb.
— Front tibiae with one or more posterior bristles; middle tibiae with an anterior bristle; hind femora posteroventrally with several long bristles; hind tibiae with a posteroventral apical bristle ..... 16. *vagans* Fall.

42. Arista pubescent ..... 44. *grandaeva* Zett.
— Arista plumose 43

43. Legs mainly yellow 44
— Femora black, only the tibiae entirely or partly yellowish 45

44. Humeri usually yellowish; scutellum mainly yellow; only one pair of presutural acrostichals ..... 25. *humerella* Stein
— Neither humeri nor scutellum yellow; more than one pair of presutural acrostichals ..... 45. *gracilis* Stein

45. Crossveins not clouded; arista short-plumose ..... 42. *goberti* Mik
— Crossveins distinctly (sometimes broadly) clouded 46

46. Scutellum with hairs on lateral margins, *below* lateral bristles 47
— Scutellum bare on lateral margins 48

47. Scutellum with a dark basal spot and lateral patches, usually more or less yellow at apex; abdomen with a dorsal stripe and shifting tessellations ..... 46. *trimaculata* Bché.
— Scutellum entirely grey, at least without side spots; abdomen with a dorsal stripe and brownish patches on outer hind corners of second and third visible tergites ..... 37. *cincta* Zett.

48. Frontal stripe greyer, seen from the front hardly contrasting with the grey orbits; palpi distinctly broader than width of basal segment of front tarsi; front tibiae without a median posterior bristle ..... 36. *laetabilis* Coll.
— Frontal stripe darker, contrasting distinctly with the orbits; palpi narrower, at most as broad as basal segment of front tarsi; front tibiae usually with a median bristle ..... 35. *laeta* Fall.

49. Scutellum yellow at apex; legs mainly yellow 50
— Scutellum not yellow at apex 51

50. Humeri usually yellow; abdomen without shifting tessellations.... ..... 25. *humerella* Stein
— Humeri not yellow; abdomen with shifting tessellations..... .....24. *apicalis* Stein
51. Arista pubescent; antennae long with angular front corner; scutellum hairy beneath ..... 29. *magnicornis* Zett.
— Arista plumose, or at least short-haired..... 52
52. Palpi rather strongly developed.....26. *palpata* Stein
— Palpi not, or only slightly, enlarged..... 53
53. All femora entirely or mainly black.....48. *fusca* Mde.
— Femora mainly yellow 54
54. Thorax seen from behind with the median pair of stripes coalesced into a broad central stripe; third antennal segment yellowish at base ..... 22. *rufiseta* Zett.
— Thorax not as above; third antennal segment entirely dark..... 55
55. Hind tibiae with more than two anterodorsal bristles; middle tibiae with more than three posterior bristles, irregularly biserial..... ..... 18. *crinipes* Stein
— Hind tibiae with one-two anterodorsal bristles; middle tibiae behind usually with two-three bristles in a single row..... 56
56. Front femora almost entirely black; middle femora with strong bristles beneath in basal half.....17. *erronea* Schnb.
— Front femora mainly yellow, or if extensively darkened then middle femora with only fine bristles beneath in basal half..... 57
57. Crossveins broadly clouded; scutellum with a brown spot at base; hind tibiae usually with only one anterodorsal bristle..... ..... 19. *fuscata* Fall.
— Crossveins not, or hardly clouded..... 58
58. Hind tibiae with two (occasionally three) anterodorsal bristles; hind femora with two-three anteroventral bristles towards apex; front femora often extensively darkened; more yellowish-grey species .....20. *vittifera* Zett.
— Hind tibiae usually with only one anterodorsal bristle; hind femora anteroventrally with a row of bristles from middle to apex; front femora mainly yellow; more bluish-grey species....21. *mystica* Mg.

The genus *Phaonia* is composed of rather dissimilar species. Schnabl, in "Die Anthomyiden," has divided it up into five subgenera, which, owing to numerous diverse forms, are difficult to define. With the object of establishing a division of the genus by grouping together closely allied species, I have in this survey attempted to split it up into groups which correspond to Schnabl's subgenera, but since all the dissimilar species could not form separate groups, this has resulted in certain of the groups becoming rather overloaded, as for example Nos. III and V.

Group I

Rather large species of fairly stout build. Eyes densely hairy, frons in females without crossed bristles, mouth-parts more or less protruding and

cheeks broad, palpi almost filiform, arista plumose or pubescent. Four postsutural dorsocentral bristles, prealar bristle long as in most of the *Phaonia*. Abdomen with long, outstanding bristles. Legs black (except in *basalis*).

All the species are flower visitors, being found on numerous different flowers. (N.B.—usually only the males are briefly described in the following pages, the females being dealt with in the Table.)

1. *incana* Wied. ♂: Blackish-grey species, eyes narrowly separated, mouthedge protruding. Thorax distinctly striped. Abdomen thickly grey pruinose with narrow dorsal stripe. Front tibiae with a median posterior bristle, middle tibiae with a short anterodorsal bristle, hind femora with isolated bristles beneath. Wing-base, squamae and halteres yellow. Length about 8 mm. May-August.

2. *basalis* Zett. ♂: Yellowish-grey species. Arista long-plumose, eyes closely touching, mouthedge somewhat protruding. Thoracal stripes distinct, inner ones narrow, outer very broad. Abdomen thickly yellowish-grey pruinose with fine dorsal stripe. Legs yellow, femora sometimes black, front tibiae densely haired behind, usually with one-two bristles, hind femora with isolated bristles posteroventrally. Wing-base, squamae and halteres yellow. Length 7-8 mm. June-September.

3. *hybrida* Schnb. (*Aricia plumbea* Zett.) ♂: Eyes closely touching, arista medium long-plumose, mouthedge rather far protruding. Thorax with broad stripes, median pair close together. Abdomen lead-grey pruinose, somewhat shining, with dorsal stripe and shifting tessellations, the stripe laterally widened on hinder part of each segment. Front tibiae with median bristle, middle tibiae with one-three anterodorsal bristles. Wings faintly brownish, yellow at base, squamae and halteres yellow. Length about 8.5 mm.

4. *morio* Zett. Similar in most respects to the preceding species, but entirely black in colour and with blackish wing-base, even the halteres somewhat darkened.

5. *consobrina* Zett. (*Aricia turpis* Zett., *inconspicua* Zett., *vicina* Zett.). ♂: Eyes touching or slightly separated, mouthedge hardly protruding, arista pubescent. Thorax and abdomen about as in preceding species, first visible abdominal segment entirely black, dorsal stripe more triangularly broadened and more sharply defined. Front tibiae not long-haired behind, leg bristles as in last two species. Wings greyish, dark at base, squamae and halteres yellow, latter sometimes somewhat darkened. Length about 8 mm.

Whether the above synonymy contains any closely allied but distinct species is uncertain. Certain characters, such as separation of eyes and length of aristal hairs, are somewhat variable, but I have not discovered more distinctive features by which to separate them.

6. *subfuscinervis* Zett. ♂: Very closely resembling *consobrina*, but of a rather greyer colour, eyes less approximated, arista with rather shorter hairs, abdomen with shorter and weaker bristles, especially on fifth tergite, posteroventral bristles on middle femora shorter. (Description after Collin, 1933, "The Scottish Naturalist," p. 119.)

7. *pallidisquama* Zett. (? *Aricia anthracina* Zett.). Black species with faint thoracal stripes, abdomen very thinly pruinose with indistinct markings. ♂: Eyes almost touching, antennae short, arista slightly pubescent, mouthedge somewhat protruding. Front tibiae with short scattered hairs behind and several bristles. Wing-base and halteres blackish, squamae yellow. Length 7-8 mm.

Group II

Species similar in build and life-history to those of preceding group. Abdomen broad, densely clothed with long bristles and hairs. Mouthedge often protruding. Eyes densely and long-haired. Acrostichal bristles present. Legs black.

8. *serva* Mg. Blackish-grey species. ♂: Arista medium long-plumose, cheeks broad. Thorax with fairly distinct stripes. Abdomen with dorsal stripe and distinct shifting tessellations. Front tibiae without bristles, hind femora with isolated bristles posteroventrally. Squamae and halteres yellow. Length 7-8 mm. May-August.

9. *confluens* Stein. ♂: Eyes separated by at least width of third antennal segment. Thoracal stripes very broad, usually leaving only a pair of whitish pruinose stripes along dorsocentral lines, prealar bristle long, scutellum with black basal band and more or less distinct black median stripe. Abdomen with ill-defined, broad, dorsal stripe and shifting tessellations. Front tibiae with two posterior bristles, middle tibiae with six-seven bristles behind, hind tibiae abundantly bristled and haired. Length 6-8 mm. May.

10. *lugubris* Mg. ♂: Thorax almost entirely black, stripes very indistinct. Abdomen about as in *serva*. Middle femora long-haired beneath and with fine bristles (coarse in *serva*), hind femora posteroventrally without strong bristles. Squamae yellow, halteres somewhat darker. Length about 8.5 mm.

11. *alpicola* Zett. ♂: Thorax not so black as in *lugubris*, but stripes no more conspicuous, a somewhat smaller and rather more slender species, otherwise similar.

Group III

This group includes species somewhat unlike in appearance. Here belong the *erratica*-type (*erratica*, *signata*, *errans* and *perdita*), characterized by their stout build, shifting tessellations on abdomen, densely hairy eyes, long-plumose arista, and partly yellow scutellum. Close to these come possibly *vagans*, *erronea*, *rufipalpis* and *crinipes*; the *fuscata*-type: *fuscata*, *rufiseta*, *vittifera*, and possibly the closely allied *palpata* and *apicalis*, all of narrow, or rather narrow build; *magnicornis* and *longicornis* are distinguished by their remarkably long antennae and only pubescent arista. All these species are without acrostichal bristles, and there are no crossed frontal bristles in the females.

12. *erratica* Fall. One of our largest Muscids. ♂: Eyes closely touching, palpi partly yellow. Thorax and abdomen yellowish-grey pruinose, former distinctly striped, scutellum mainly yellow. Abdomen very broad with rather indistinct dorsal stripe. Coxae and legs yellow, front tibiae with or without bristles, middle tibiae with bristles only behind. Wings long, hinder crossvein very oblique, meeting discal vein just before middle of apical section, discal vein somewhat undulating near wing-tip. Length 10 mm. or more. July-September.

13. *signata* Mg. (*Anthomyza erythrostoma* Zett.). Like *erratica* but distinctly smaller. Both crossveins broadly clouded, the hinder one not oblique, discal vein straight to wing-margin. Length about 7 mm. May-October.

14. *errans* Mg. (Villeneuve considers this species to be the same as *tinctipennis* Rond., but the true *errans* Mg. is really more like *erratica*, though smaller.) A somewhat variable species. ♂: Orbits touching, antennae black, sometimes obscurely yellowish at base, palpi black. Thoracal stripes sometimes rather broad, giving thorax a darker appearance, median pair of stripes often confluent, scutellum more or less darkened at base. Abdomen with a short dorsal stripe and shifting patches. Legs yellow, front femora more or less black, front tibiae without median bristle, posteroventral bristles on hind femora may be isolated or numerous. Wings with crossveins more or less distinctly clouded, squamae and halteres yellow. Length 8-10 mm. May-August.

15. *perdita* Mg. Of more slender build than either of the two preceding species. ♂: Eyes distinctly separated by a rather broad frontal stripe, antennae and palpi black. Thorax distinctly striped, median pair close together, scutellum yellow at apex, often only very indistinctly. Abdomen thickly pruinose, without distinct shifting patches, but with a broad dorsal stripe consisting of three elongate spots. All femora black, yellow at apex (seldom more yellow), hind femora posteroventrally with closely set bristles at apex, tibiae yellow, front tibiae without median bristle. Wings with cubital and discal veins divergent towards apex, crossveins somewhat clouded, squamae and halteres yellowish. Length 8-9 mm. May-August.

16. *vagans* Fall. A dark, yellowish-grey pruinose species. ♂: Eyes almost touching, more sparsely haired than in *perdita*, antennae long, black, arista medium long-plumose,

palpi black. Thorax with median pair of stripes close together. Abdomen with narrow dorsal stripe and faint shifting patches. Legs yellow, front and middle femora partly darkened, front tibiae with or without bristles, hind femora with posteroventral bristles, pulvilli large. Wing-base, squamae and halteres yellowish. Length 8-9 mm. May-September.

17. *erronea* Schnb. A grey species resembling *basalis*, but of somewhat more slender build. ♂: Eyes sparsely hairy, the rather broad, glistening orbits touching, antennae long, black, arista medium long-plumose, palpi black. Thorax with faint stripes. Abdomen with narrow dorsal stripe and dense bristles. Legs yellow, front femora largely black, hind femora densely bristly-haired. Wing-base, squamae and halteres yellow. Length about 9 mm. June-July.

18. *crinipes* Stein. Grey species. ♂: Eyes distinctly separated, sparsely haired, antennae black, arista long-plumose, palpi black. Thorax with median pair of stripes close together. Abdomen with dorsal stripe and faint shifting tessellations, hind-margin of second visible segment with two strong bristles at middle. Legs yellow, front femora largely black, middle femora black at base, front tibiae with a long median bristle, middle tibiae without bristles in front but with many behind, hind femora, anteroventrally from middle to apex, with a row of about six close-set, long bristles, posteroventrally with a row of very short bristles, pulvilli very strongly developed. Wings with hinder crossvein somewhat clouded, squamae yellowish, halteres yellow. Length about 6.5 mm.

19. *fuscata* Fall. Light-grey pruinose species. ♂: Eyes sparsely hairy, separated by a narrow frontal stripe and rather broad orbits, antennae long and narrow with long-plumose arista, palpi black. Thorax distinctly striped, scutellum with a brown spot at middle of base. Abdomen narrow, with a dorsal stripe composed of sharply defined triangular spots on the first three visible segments. Legs yellow, front and sometimes middle femora darkened, front tibiae usually with median bristle, hind femora without posteroventral bristles, hind tibiae with one anterodorsal bristle at middle. Squamae white, halteres yellowish. Length 6-9 mm. April-September.

20. *vittifera* Zett. (*trigonospila* Cz.). Similar to *fuscata*, but somewhat darker and more shining. Middle femora with long bristles in front, hind tibiae with two or more anterodorsal bristles. Length 6-8 mm. April-June.

21. *mystica* Mg. ♂: Eyes shortly but moderately densely haired, separated by the fine silvery orbits and a linear frontal stripe, antennae black, arista long-plumose. Body densely bluish-white pruinose, abdomen with a fine dorsal line and shifting tessellations. Legs, except tarsi, entirely yellow, hind tibiae with one-two anterodorsal and three-four short anteroventral bristles. Wings yellowish at base, veins faintly brownish-seamed, costal spine very short, squamae whitish with yellow margin, halteres yellow. Length about 7.5 mm. May-June.

22. *rufiseta* Zett. Similar to *vittifera*, but eyes more distinctly hairy, abdomen beneath at apex densely fine-haired, but these hairs shorter and less bristly than in *vittifera*. Orbits broad, glistening white, face rather broader than antennae, latter rather long with moderately long-plumose arista, palpi dark. Thoracal stripes indistinct. Abdomen similar in shape and markings to that of *vittifera*. Legs yellow, front femora darkened almost to apex, hind femora without long posteroventral bristles. Wings with hinder crossvein almost straight, squamae white, halteres yellow.

23. *colbrani* Coll. ♂: A species similar to those of the *fuscata*-group, but with strong posteroventral bristles to hind femora. It resembles *rufiseta* in having no strong bristles beneath middle femora. Legs yellow, with front femora towards tip, and tarsi, brownish. Abdomen with only a narrow median dark line and without the dark shifting tessellations of *mystica*. Outer crossvein of wings very sinuous and slightly infuscated. Length 7.25 mm. Only one male specimen known. (Description after Collin, 1953, *J. Soc. Brit. Ent.*, **4**: (8), 174-5.)

24. *apicalis* Stein. Greyish species. ♂: Eyes sparsely hairy, the glistening white orbits closely touching, antennae long, black, with moderately long-plumose arista, face narrow, glistening white, palpi black. Thoracal stripes faint. Abdomen almost lead-greyish, somewhat shining, with an indistinct fine dorsal line. Legs yellow, front femora mainly black, front tibiae without median bristle, hind femora posteroventrally

with a row of bristles from base to middle. Wings yellowish, particularly at base, squamae and halteres yellow. Length 6 mm.+.

25. *humerella* Stein. ♂: Arista moderately long-plumose. Thorax usually with three postsutural dorsocentrals, but occasionally with four, prealar bristle long. Abdomen grey pruinose with a narrow, indistinct dorsal stripe, without other markings.

26. *palpata* Stein. A rather narrow, grey pruinose, somewhat shining species. ♂: Eyes hairy, the glistening white orbits closely touching, cheeks narrow, glistening white, antennae and palpi black. Thorax distinctly striped. Abdomen with dorsal stripe and faint shifting tessellations. Tibiae yellowish, middle tibiae with median bristle, hind femora with weak posteroventral bristles towards base. Wings greyish, crossveins slightly clouded, particularly in the female, squamae whitish, halteres yellow. Length 6-7 mm. July-August.

27. *ostrologica* sp.n. ♂: Eyes sparsely and short-haired, the glistening white orbits closely touching, cheeks very narrow, jowls slightly broader, mouthedge not protruding, antennae black, rather long, arista long-plumose, palpi black. Thorax grey pruinose with four distinct stripes, four postsutural dorsocentrals, presutural acrostichals absent, prealar bristle about as long as dorsocentrals. Abdomen long-oval, short-haired, yellowish-grey pruinose with distinct dorsal stripe. All femora dark, tibiae yellow, front tibiae without median bristle, middle femora with only fine bristles beneath, middle tibiae with three bristles behind, hind femora without posteroventral bristles, hind tibiae with two anterodorsal and three anteroventral bristles, pulvilli somewhat small. Wings yellowish, costal spine absent, hinder crossvein distinctly curved, squamae and halteres yellowish. Length about 7 mm. Only one ♂ specimen known.

28. *rufipalpis* Macq. A fairly broad, light grey pruinose species. ♂: Eyes densely hairy, the fine glistening white orbits closely touching, antennae long, arista long-plumose, third antennal segment yellow at base. Thorax distinctly striped. Abdomen with rather fine dorsal line. Legs yellow, front tibiae with median bristle, hind femora with antero- and postero-ventral rows of bristles. Wings faintly brownish, hinder crossvein oblique, cubital and discal veins divergent towards apex, squamae slightly yellowish, halteres yellow. Length about 7 mm. June-August.

29. *magnicornis* Zett. Dark grey pruinose species. ♂: Eyes densely hairy, frons somewhat protruding, antennae black, very long and broad, palpi black. Thorax with median pair of stripes close together. Abdomen with dorsal stripe. Legs black, tibiae and apices of femora yellow, front tibiae with two median bristles, hind femora only anteroventrally at apex with two strong bristles. Wings broad and rounded, squamae whitish, halteres yellow. Length 6-7 mm. July-September.

30. *longicornis* Stein. Blackish-grey species. ♂: Eyes sparsely hairy, widely separated, frons protruding, antennae black, very long, palpi black. Thorax indistinctly striped, median pair confluent. Abdomen blackish-grey, faintly shining, without distinct dorsal stripe. Legs black, front tibiae without median bristle, middle femora without bristles beneath, hind tibiae with only one anterodorsal bristle. Wing-base yellowish, hinder crossvein straight, squamae and halteres yellow. Length about 5.5 mm. May.

Group IV

Broad species of a yellow colour, otherwise similar to part of the preceding group. Mainly frequenting shady parts of woods, resting on leaves and tree-trunks, also visiting dung and rotting fungi.

31. *pallida* F. Entirely yellow species, thorax sometimes somewhat darkened (=*populi* Zett.). ♂: Eyes touching, densely hairy, antennae yellow, third segment sometimes somewhat darkened, arista plumose, palpi yellow. Thorax thinly white pruinose in front, two pairs of long presutural acrostichals. Legs yellow, front tibiae without bristles, hind femora with posteroventral bristles. Wings yellowish, squamae and halteres yellow. Length about 6.5 mm. June-September.

32. *scutellaris* Fall. ♂: Arista rather shorter-plumose than in *pallida*, antennae black, yellowish at base, palpi yellow. Thorax blackish-grey with four stripes, median

pair fine, humeri and sides above wing-bases yellow. Abdomen with a fine dorsal stripe and often with dark spots or patches. Legs and wings as in *pallida*. Length about 7 mm. May-October.

33. *variegata* Mg. (*Anthomyza denominata* Zett.). Similar to *scutellaris*, but thorax blacker and with broad stripes. Antennae entirely black, arista rather shorter-plumose. Hind tibiae usually with only two anterodorsal bristles (in *scutellaris* four or five). May-October.

34. *bitincta* Rond. ♂: Eyes touching, densely haired, antennae brownish-grey, second segment and base of third yellowish, palpi yellow. Thorax light grey pruinose, the narrow stripes not very conspicuous, humeri slightly yellowish, acrostichals strong. Abdomen with a narrow brown dorsal stripe. ♀: Second and third visible tergites with shifting brownish patches. Length 7-8 mm.

Group V

In this group also the author has found it necessary to include species of somewhat differing habits. The following species appear to be closely allied: *laeta*, *cincta*, *mirabilis*, *setifemur*, *querceti*, *goberti* and *canescens*. Most of these, or possibly all, are sap-feeders, and are therefore often found on tree-trunks. The species *nitida*, *aeneiventris* and *halterata* form a group in which *atrocyanea* holds a more isolated position. Schnabl has included many of the above species in the subgenus *Euphemia*, but it seems unlikely that these are really closely enough allied to *serva*, which is regarded as the type of that subgenus.

35. *laeta* Fall. A whitish-grey pruinose, somewhat elongate species. ♂: Eyes hairy, separated by a narrow frontal stripe and rather broad orbits (latter about as broad as frontal stripe), antennae long, black, palpi black. Thorax with sharply defined stripes, scutellum with a black basal spot which extends on to thorax. Abdomen with shifting tessellations and a dorsal stripe consisting of narrow triangular spots. Legs somewhat variable in colour, either entirely black or with the tibiae more or less yellow, front tibiae with or without median bristle, hind femora with short posteroventral bristles. Squamae white, halteres yellow. Length 7-8.5 mm. June-July.

36. *laetabilis* Coll. A species closely resembling *laeta*, but distinguished by the characters given in the Tables. Tibiae usually more blackish than in *laeta*. Length 7-8 mm. June-August.

37. *cincta* Zett. ♂: Similar to the last two species, but easily distinguished by the transparent yellow colour on abdomen. Arista rather short plumose. Scutellum without basal spot. Abdomen with narrow dorsal stripe, and a faintly defined dark spot on each side of hindmargin of second and third visible tergites. ♀: Similar to male, but no trace of yellow colour on abdomen, the spots on second and third tergites being rather more distinct and brownish. Length about 7 mm. June-August.

38. *pullata* Cz. ♂: Eyes touching, densely hairy. Thorax black, unstriped. Abdomen only thinly pruinose, but with distinct dorsal stripe. Wings with crossveins distinctly clouded, squamae yellowish, halteres blackish. ♀ with the abdominal stripe less distinct, and with yellow halteres.

39. *mirabilis* Ringd. (*keilini* Coll.). Very similar in appearance to a large specimen of *laeta*, but with a somewhat broader abdomen, rather shorter-plumose arista, and very slightly broader frons. Thorax with the acrostichal rows very close together. Abdomen with dorsal stripe, dark hindmargins to tergites and shifting tessellations. Legs black, halteres blackish. Both sexes have numerous hairs *on* the frontal stripe. Length 8-10 mm. May-June.

40. *setifemur* Stein. Similar in appearance to *querceti*, particularly in the female. ♂: Eyes separated by a narrow frontal stripe and narrow grey orbits, arista plumose, antennae and palpi black. Thoracal stripes fine and indistinct. The fairly broad stripe on abdomen entire. Legs black, front tibiae with median bristle, hind tibiae finely and densely haired, with a row of anterodorsal and several posterodorsal bristles. Wings clear, squamae white, halteres blackish. ♀ larger and stouter than *querceti*, third antennal segment longer, and orbital bristles on front part of frons further from eye-margin. Abdomen with less distinct tessellations. Length 8 mm.+. July-August.

41. *querceti* Bché. (*Aricia platyptera* Zett.). Dark grey species with a bluish-grey tinge. ♂: Eyes bare, separated by a narrow black frontal stripe which is about as broad as third antennal segment, and glistening white orbits. Antennae rather short, black, arista short-plumose, palpi black, somewhat thickened. Thoracal stripes hardly visible, median pair usually confluent and forming a single broad stripe. Abdomen rather narrow, with an uninterrupted dorsal stripe of uniform width, and with faint shifting tessellations. Legs black, between the front coxae a pair of backwardly directed bristles, front tibiae without median bristle, hind femora with one strong bristle beneath. Wings clear, squamae whitish, halteres blackish. Length about 8 mm. May-October.

42. *goberti* Mik. A rather broad species. ♂: Eyes with the glistening white orbits touching, antennae and palpi black, latter somewhat thickened. Thorax rather lightish grey pruinose with distinct stripes. Abdomen fairly broad, with very distinct shifting tessellations and less distinct dorsal stripe. Legs black, hind tibiae sometimes somewhat transparent, front tibiae without median bristle, hind femora with only very short posteroventral bristles. Wings clear, squamae whitish, halteres yellow. Length about 8 mm. May-August.

43. *canescens* Stein. Similar to *goberti* but thoracal stripes much less distinct. Abdomen without shifting tessellations, but with distinct dorsal stripe of uniform width. Length 6-8 mm. May-June.

44. *grandaeva* Zett. ♀: Frons distinctly protruding, as broad as an eye, with a pair of weak crossed bristles, eyes shortly and sparsely-haired, antennae long, somewhat yellowish at base, arista distinctly pubescent, mouthedge protruding as far as frons, palpi mainly yellow, slightly thickened. Thorax and scutellum grey, stripes hardly visible, presutural acrostichals present but very weak, prealar bristle long. Legs yellow, front femora darkened at base, front tibiae without median bristle, middle tibiae without bristle in front, hind femora without long posteroventral bristles. Wing-base rather strongly yellow, squamae and halteres yellow, costal spine absent. Length about 8 mm. Only one female specimen known.

45. *gracilis* Stein. An elongate, slender species, with long legs and *fuscata*-like appearance. Possibly it also belongs to that group. ♂: Ash-grey in colour. Eyes sparsely-haired, separated by broad, glistening white orbits and a narrow frontal stripe, antennae long, black, arista moderately long-plumose, palpi slender, black. Thorax with rather faint stripes, acrostichal rows close together and continuing behind suture. Abdomen yellowish-grey pruinose, narrow, with fine dorsal line. Front tibiae with one-two median bristles, hind femora with only short posteroventral bristles. Wings clear with somewhat clouded crossveins, squamae whitish, halteres yellow. Length 7-8 mm. June-August.

46. *trimaculata* Bché. (*servaeformis* Ringd., a small dark form). Blackish-grey, rather broad species. ♂: Eyes densely hairy, separated by a narrow frontal stripe and fine orbits, antennae black, arista moderately long-plumose, palpi black. Thoracal stripes broad and distinct, acrostichal bristles long in two complete rows, scutellum in typical form more or less yellow at apex. Abdomen with broad dorsal stripe and well pronounced shifting tessellations. Legs black, tibiae in typical form more or less yellow, middle femora with long, fine bristles beneath, hind femora without long posteroventral bristles, hind tibiae with two-three anterodorsal bristles. Wings with crossveins distinctly clouded, squamae whitish, halteres yellow. Length 5.5-7 mm. April-September.

47. *nitida* Macq. Elongate, shining black species, very thinly greyish pruinose. ♂: Eyes almost bare, distinctly separated, antennae and palpi black. Thorax black, with very indistinct stripes, acrostichals short and weak, prealar bristle short. Abdomen shining, seen from behind with a faint, broad dorsal stripe which is broadened out on each tergite. Legs black, front tibiae with median bristle, hind femora posteroventrally with only short, fine bristly-hairs, hind tibiae with two anterodorsal bristles. Wings yellowish, costal spine long, hinder crossvein almost straight, squamae whitish. Length 6-7 mm. July.

48. *fusca* Mde. ♂: Eyes microscopically but moderately densely haired, antennae black, arista with hairs about as long as width of antennal segment. Thorax and scutellum rather thinly bluish-grey pruinose, median pair of stripes narrow, presutural

acrostichals absent, prealar bristle short and hair-like. Abdomen more thickly yellowish-grey pruinose, with narrow dorsal stripe interrupted at hindmargins of tergites, without other markings. Tibiae and extreme apex of femora brownish-yellow, hind tibiae with two anterodorsal and two-three anteroventral bristles. Wings greyish, costal spine long, about half as long as hinder crossvein, squamae pale yellow, halteres yellow. ♀: Eyes more sparsely haired than in male, thorax and scutellum rather more thickly pruinose. Abdomen with the narrow dorsal line not reaching much beyond second visible tergite. Length 6-6.5 mm. July-August.

49. *aeneiventris* Zett. (*cinctinervis* Zett.). A shining blackish-grey or lead-grey species of slender build. ♂: Eyes hairy, the glistening white orbits touching, cheeks as broad as third antennal segment, antennae and palpi black, arista pubescent. Thorax with broad but indistinct stripes. Abdomen shining lead-grey with a broad dorsal stripe. Legs black, front tibiae without median bristle, middle femora with fine bristly-hairs beneath, middle tibiae often with a short anterodorsal bristle, hind femora with long posteroventral bristles. Wings with distinct costal spine, squamae whitish, halteres yellow. Length about 6 mm. July.

50. *halterata* Stein. Very similar to the preceding species. ♂: Eyes sparsely hairy, cheeks narrow. Thoracal stripes indistinct, median pair often confluent, acrostichal bristles weaker than in *aeneiventris*. Wings with small costal spine, hinder crossvein straight. Length about 6 mm. May-October. (Translator's Note: This and the last three species are sometimes placed in the genus *Dialyta* Mg.)

51. *atrocyanea* Ringd. A rather elongate species of a blue-black colour. ♂: Eyes touching, sparsely hairy, antennae and palpi black, arista pubescent. Thorax and scutellum black, former with faintly discernible stripes. Abdomen black with a bluish shine, without markings. Legs black, front tibiae without bristles, hind femora anteroventrally with a complete row of bristles, posteroventrally rather densely haired and with a row of fine, short bristles. Squamae and halteres yellow. Length about 7 mm.

Since the above survey was written, Malloch, in the *Trans. Amer. Ent. Soc.*, has set forth a revision of the North American species of *Phaonia*. There are only four or five species which are common to the European fauna, viz., *querceti*, *serva*, *errans*, *frenata*, and possibly *consobrina*. Moreover, it is also possible that *citreibasis* Malloch is identical with *atrocyanea* described by the author.

For *querceti* and an American species, *hilariformis* Stein, Malloch has erected a new genus which he calls *Dendrophaonia*.

[This part completes the present series.—ED.]

TRANSLATIONS OF RINGDAHL'S MUSCID TABLES ADDITIONS AND CORRECTIONS*

By E. C. M. D'ASSIS-FONSECA, B.Sc., F.R.E.S.

Mr. J. E. Collin's recent paper on Additional British Anthomyiidae (Diptera) (1953, *J. Soc. Brit. Ent.*, 4: (8) 169-177) contains a number of species of the genera *Coenosia*, *Mydaea*, *Helina*, *Hydrophoria* and *Acroptena*. The majority of these species are either new or were not otherwise included in the modified translations of Ringdahl's Muscid Tables appearing in this *Journal* in 1952. The following couplets are published with the object of bringing the Tables up to date, and at the same time introducing one or two necessary corrections.

* A limited number of copies of this paper have been printed on one side the paper only, so that they may be cut up and the couplets pasted over the original papers in the appropriate places.

A copy can be obtained post-free on application to the Secretary.

Coenosiinae

(*J. Soc. Brit. Ent.*, **4**: (3) 47-59)

Table of Genera:

1. (1st part) to read:

1. Wings broadly darkened along front margin; scutellum without bristles at base; hind tibiae with a posteroventral apical bristle ..... *Orchisia* Rond.
— Wings clear, or if darkened on foremargin then scutellum with a basal pair of bristles and hind tibiae without a posteroventral apical bristle 2

7. (2nd part) to read:

— Antennae entirely black, legs usually black..... 8

Coenosia

Table of Species

Males:

7. (2nd part) to read:

— Antennae entirely black..... 7a

7a. Whitish pruinose species with entirely glistening-white frons, without spots on abdomen.....*albatella* Zett.
— Darker species, with dark frontal stripe and spotted abdomen; marginal cell of wing distinctly darkened.....*stigmatica* Wood

17. (2nd part) to read:

— Darkening at apex of middle and hind femora diffuse; front tarsi mainly yellow.....17a

17a. Orbits opposite second antennal segment somewhat dark and shining; vibrissae, and the small setae in single row along mouth-edge, conspicuously longer ..... *vibrissata* Coll.
— Orbits entirely silvery-grey; vibrissae and small setae along mouth-edge shorter.....*verralli* Coll.
(n.n. for *steini* Verr. *nec* Strbl.)

19. (2nd part) to read:

— Antennae black; thorax with two brownish stripes; species about 3 mm. 19a

19a. Frontal stripe more or less yellow in front; palpi mainly yellow; jowls below eyes much wider at narrowest part than greatest width of third antennal segment .....*tricolor* Zett.
— Frontal stripe entirely dark; palpi black; jowls below eyes only as wide as third antennal segment ..... *infantula* Rond.

21. (2nd part) to read:

— Hind tibiae without posterodorsal bristle; third antennal segment at least partly black 22

22. Third antennal segment more or less yellowish at base.....22a
— Antennae entirely black..... 23

22a. Hypopygium more or less yellowish; abdominal spots small and rounded ..... *flavicauda* Ringd.
— Hypopygium entirely black; abdominal spots large and more or less rectangular, forming two almost complete brownish-black stripes ..... *pudorosa* Coll.

Females:

9. (2nd part) to read:
— Abdomen entirely grey; palpi black or brownish 10

10. Middle and hind femora more or less brownish at apex.....10a
— As written.

10a. Front tibiae somewhat darkened on apical half; abdominal spots large and more or less rectangular, forming two almost complete broad brownish stripes, only on apical tergite somewhat isolated ..... *pudorosa* Coll.
— Front tibiae entirely yellow; abdominal spots smaller and roundish.. 11

13. (1st part) to read:

13. Thorax with a pair of dorsocentral stripes, and usually traces of a median stripe in front; abdomen with distinct small spots; coxae more or less grey.....13a
— As written.

13a. Frontal stripe more or less yellowish in front; jowls below eyes much wider at narrowest part than greatest width of third antennal segment ..... *tricolor* Zett.
— Frontal stripe entirely dark; jowls below eyes only as wide as third antennal segment ..... *infantula* Rond.

20. (2nd part) to read:
— Mouthedge not protruding 20a

20a. Arista shorter-pubescent; vibrissae, and small setae in single row along mouthedge, conspicuously longer.....*vibrissata* Coll.
— Arista long-pubescent, almost short-haired; vibrissae and setae along mouthedge shorter ..... *verralli* Coll.

27. (2nd part) to read:
— Front corner of third antennal segment not pointed.....27a
27a. Thorax with three conspicuous brown stripes; marginal cell of wing somewhat darkened, less distinct after death; larger species, about 4.5 mm.....*stigmatica* Wood
— Thorax at most very indistinctly striped; wings clear; smaller species..... 28

28. Scutellum with four subequal bristles ..... *geniculata* Fall.
— Basal pair of scutellar bristles at most only about half as long as apical pair ..... *distinguens* Coll.

Hydrophoria and *Acroptena*

(*J. Soc. Brit. Ent.*, 4: (4) 75-83)

Males:

5. (1st part) to read:

5. Large species (usually); abdomen nowhere yellow..... 5a
— As written.

5a. Eyes more closely approximated on frons, orbits quite or nearly touching for a short space; tibiae more uniformly yellowish, at most somewhat darkened on apical quarter.....*conica* Wied.
— Eyes more distinctly separated; tibiae more extensively darkened on apical half.....*diabata* Pand.

8. (2nd part) to read:

— Abdomen beneath without, or (*nuda* and *wierzejskii*) with only indistinct tufts of hair 10a

9 and 10. As written.

10a. Arista very short-haired, the longest hairs not more than twice as long as width of arista at base; prehypopygial tergite very broadly dull above and entirely devoid of bristles and hairs..*spiniclunis* Pand.
— Arista with distinctly longer hairs..... 11

Females:

13. (2nd part) to read:

— Middle tibiae with one anterodorsal bristle; blackish species.....13a

13a. Hind tibiae with 6-7 anteroventral bristles.....*frontata* Zett.
— Hind tibiae with only three-four anteroventral bristles..*spiniclunis* Pand.

Note: The females of *Hydrophoria diabata* Pand. and *H. conica* Wied. are apparently indistinguishable.

Mydaea and *Helina*

(*J. Soc. Brit. Ent.*, 4: (5) 95-111)

Mydaea

Males:

1. (1st part) to read:

1. Legs partly yellow..... 1a
— As written.

1a. Abdomen entirely yellow.....*spinipes* Karl
— Abdomen not yellow..... 2

5. (1st part) to read:

5. Usually a shorter bristle below front sternopleural; prealar bristle not half as long as dorsocentrals, sometimes absent..... 5a
— As written.

5a. Genital mesolobe with blunt ends; apical segment of front tarsi slightly larger than usual.....*discimana* Mall.
— Genital mesolobe with pointed ends; front tarsi normal....*electa* Zett.

Females:

1. (1st part) to read:

1. Legs partly yellow 1a
— As written.
1a. Abdomen entirely yellow.....*spinipes* Karl
— Abdomen not yellow 1b
1b. Apical segment of front tarsi distinctly dilated.....*discimana* Mall.
— Front tarsi normal..... 2

Helina

Males:

12. (1st part) to read:

12. Hind femora with long posteroventral bristles at apex; venter with long and dense bristles and hairs.....12a
— As written.
12a. Abdominal sternites (especially the fourth) longer than wide; genital and pregenital tergites dull grey like those preceding them ..... *arctata* Coll.
— Sternites not longer than wide; genital and pregenital tergites blacker than those preceding them ..... *setiventris* Ringd.

There seems no doubt that the male specimens, *with* small setae on the radio-cubital node beneath wing, upon which *flagripes* Rond. was introduced into Ringdahl's Table, were in fact specimens of *crinita* Coll. It becomes necessary, therefore, to reposition *flagripes* in the Table.

29. (2nd part) to read:

— Common stem of radial and cubital veins bare beneath.....29a
29a. Middle and hind femora almost entirely yellow.....*flagripes* Rond.
— Middle and hind femora black..... 31
30. As written.
— Hind tibiae with several conspicuously long anterodorsal bristles on apical half, middle and hind femora entirely yellow....*crinita* Coll.

31. (1st part) to read:

31. Front tibiae without a median posterior bristle.....31a
— As written.
31a. Hind femora posteroventrally very densely long-haired .....*intermedia* Villen.
— Hind femora without posteroventral long hairs ..... *duplicata* Mg. *duplaris* Zett.

Females:

20 (2nd part) to read:

— Eyes bare or very sparsely haired.....20a
20a Common stem of radial and cubital veins with one or more small setae beneath; abdominal spots entirely absent; front tibiae blackish ..... *atripes* Mde.
— Common stem of radial and cubital veins bare; abdomen usually with distinct spots, but if without then front tibiae yellow..... 22

22. (1st part) to read:

22. Front tibiae usually without a median bristle.....22a
— As written.

22a. Hind femora with only short fine bristles posteroventrally at apex..22b
— Hind femora with one or more longer strong bristles posteroventrally at apex.....22c

22b. Abdomen with distinct paired spots.....*duplicata* Mg.
duplaris Zett.
— Abdomen without trace of spots.....*intermedia* Villen.

22c. Hinder crossvein straighter and less sloping.....*setiventris* Ringd.
— Hinder crossvein more sinuate and sloping.....*arctata* Coll.

24. (1st part) to read:

24. Common stem of radial and cubital veins with some small setae on underside of wing.....24a
— As written.

24a. Middle tibiae with a bristle in front; abdomen with distinct paired spots.....*anceps* Zett.
— Middle tibiae without a bristle in front; abdomen without spots .....*crinita* Coll.

40. (1st part) to read:

40. Arista plumose, antennae and palpi often yellowish; abdomen without spots 40a
— As written.

40a. Arista short-plumose, hairs about as long as third antennal segment is wide; one pair of presutural acrostichals.....*impuncta* Fall.
— Arista long plumose, hairs about twice as long as third antennal segment is wide; presutural acrostichals absent.....*depuncta* Fall.

I am indebted to Mr. J. E. Collin for information on the distinctive characters of the females of *Acroptena spiniclunis* Pand. and *Helina crinita* Coll.

"Swarming" of Phoridae (Diptera)

By Charles N. Colyer, F.R.E.S.

Dr. Hugh Scott's interesting article (1951) on the autumnal "swarming," indoors, of *Megaselia* (*Aphiochaeta*) *meconicera* (Speiser) and his comment, "I have not previously met with a swarm composed mainly of Phoridae," prompt me to bring forward some of my own notes on this and other species of this family.

In the instance mentioned, Dr. Scott is, of course, using the word "swarming" in the sense of "congregating in large numbers" and not in the sense of "tanzend in der Luft zu schwärmen" (Schmitz, 1929), i.e. "dancing together in numbers in the air," a habit characteristic of several families, but principally of the males of Nematocera.

I have already (Colyer and Hammond, 1951) instanced various kinds of "swarming," involving the families Tipulidae, Anisopodidae, Culicidae, Chironomidae, Simuliidae, Scatopsidae, Stratiomyidae, Phoridae, Coelopidae, Sphaeroceridae, Drosophilidae, Asteiidae, Chloropidae, Cordiluridae and Calliphoridae. Most of these are connected in some way with mating and/or oviposition, but there are some cases, including some of the autumnal indoor swarms, the reason for which is, as yet, obscure. Imms (1947) in his discussion of gregariousness and social life in insects has commented particularly upon the influence of temperature changes on the behaviour of certain flies and has advanced the speculation that odour-trails may account for the regular repetition of some swarms in specific places.

As to *meconicera*, Dr. Scott emphasizes the fact that only females were present, in his case, although he refers to another instance of indoor "swarming" by this species in spring, when both sexes were present. He also refers to the fact that Father Schmitz (1938) found the species very common, in the open, in Ireland, but that nearly all the specimens were females. Some further information can be added. Wood (1909), who described the species under the name of *albipennis* commented as follows, ". . . found commonly indoors as well as out, is on the wing in the early part of the year, and again and more abundantly in the autumn." Schmitz (1929, *op. cit.*) draws attention to the greatly developed fat-body, especially in the females, of this species, in which respect it corresponds with other species which are found in houses in winter; he assumes therefore that the adults overwinter, since they are so specially equipped. Schmitz also records that he, too, once found a great number of *meconicera* at a window in Sittard, Holland. For myself, I can say that the species has occurred to me numerously, both indoors and out. During the autumn of 1948, I took it in large numbers in a greenhouse at Shobley, New Forest, Hants, notably on the 27th October, when the numbers present were exceptional, consisting mainly of females. I have also taken it indoors as late as 27th November. Such specimens almost invariably turn greasy in the collection; in fact some of my spring females taken outdoors have also done this. Schmitz considers the fact useful in determining doubtful specimens. I have outdoor records as early as 21st March and as late as 23rd October from various types of locality, notably beechwoods and beside rivers and waterfalls. As regards the life-history, my experiments in attempting to breed from gravid females on various types of carrion have been unsuccessful, so that I have concluded that it may be connected with decaying vegetable matter, or fungi; as far as I know, there are no facts in relation to closely allied species which would indicate the possibility of obligatory parasitism or even any connection with animal matter.

As regards autumnal indoor assemblies of other species of Phoridae, I can record that, on 25th September, 1953, my house at Upton-by-Chester, Cheshire, was invaded by large numbers of both sexes of *Megaselia* (*A.*) *ciliata* (Zett.), in company with a very few other flies such as the inevitable *Pollenia rudis* (F.). The appearance of the Phoridae indoors was marked by cold, wet weather after a fine, warm spell. The flies persisted on the windows on and off until the middle of November. This species, which also has the same tendency to turn greasy in the collection, and is fairly closely related to *meconicera*, can be taken commonly in various kinds of locality throughout

most of the year. Lundbeck (1922) records it in Denmark from 22nd February to 25th December and from such locations as a bird's nest, hollow trees, and the bark of dead trees where the beetle, *Rhagium bifasciatum* F., was burrowing. I myself have taken it in England as early as 8th February but not later than 26th October, outdoors. No doubt it can be taken all the year round in suitable circumstances. I have found it in autumn and spring under the bark of dead trees and, in spring especially, on broad leaves such as rhododendron, in the sun, where it is very active. My friend, Mr. L. Parmenter, has sent me specimens from Bookham, Surrey, taken on 11th September, 1949, and 13th February, 1950, labelled "On oak tree near remains of Hymenoptera workings." My friend, Mr. A. E. Le Gros, has also sent me specimens (*a*) taken in company with the closely allied *Megaselia* (*A.*) *coaequalis* (Schmitz), "from outer workings of nest of the ant, *Lasius brunneus* (Latr.), Bookham, Surrey, 28th February, 1953," and (*b*) taken in company with another closely allied species, *Megaselia* (*A.*) *aequalis* (Wood), from broken-up grass clumps, Bookham, Surrey, 14th March, 1953. Both *ciliata* and *aequalis* are recorded by Donisthorpe (1927) as "guests" of the ants, *Lasius brunneus* (Latr.) and *L. fuliginosus* (Latr.), and present in numbers. It is possible that the Upton invasion emanated from a stack of poplar logs which had lain at the end of my garden for about a year, but I think it unlikely; I could find no trace of either of the two ants mentioned anywhere in the vicinity.

On 13th September, 1947, I found large numbers of both sexes of *Megaselia* (*Megaselia*) *halterata* (Wood) on the windows of an old house in Ringwood, New Forest, Hants. The time was early evening and the weather was fine and clear after a wet day. This wet day had succeeded a long spell of fine, dry weather. Whilst I have on many occasions taken this species both outdoors and numerously indoors on windows and in greenhouses, this instance was remarkable for the exceptional numbers of flies present on every window, regardless of aspect, and for the fact that no other flies were present apart from a single specimen or so of Culicidae, Scatopsidae and Drosophilidae. The Phoridae had all disappeared by the next day which was fine, and I was told after that they did not reappear later in the year. I could find no adequate explanation of their congregating thus, indoors, other than the weather conditions noted. Lundbeck gives 21st May to 28th October for the species; I have taken it outdoors from 11th April to the 18th September, and indoors from 13th March to 13th September. In greenhouses, I have found that the number of individuals present has been at its greatest at the end of May, and early June; the latter half of July; and again in early September. There is reason to think that *halterata* (of which *plurispinosa* (Ldbk.), which also occurs in greenhouses, may be a variety) develops in fungi, or, at least, feeds on mycelium in the larval state and may be a pest of cultivated mushrooms (Schmitz, 1948; Colyer, 1954).

Such invasions of houses are, however, not necessarily confined to autumn or spring. My friend, Mr. E. C. M. d'Assis-Fonseca, sent me some specimens of *Megaselia* (*A.*) *pleuralis* (Wood), a species quite close to *meconicera*, which he had found in large numbers on the windows of a house at Deal, Kent, on 28th July, 1951. Both sexes were present. He was unable to trace the origin of the assemblies, but commented that they persisted for some days, the flies

disappearing entirely if the weather was cloudy or cool and reappearing in force as soon as the sun came out. Similar congregations were found in an adjacent public house. I have taken this common species from 15th April until 8th October, outdoors, in England; Lundbeck gives 30th January to 10th November for Denmark. I also have English records of the appearance of both sexes indoors from mid-September until late November, and in greenhouses until late October. It is sometimes abundant in a particular locality. On the 15th July, and 27th August, 1950, out of a total catch of Phoridae, at Coopersale (Epping Forest), Essex, of 68 and 83 specimens respectively, roughly 90 per cent. in each case were *pleuralis* (both sexes). This is a notable exception to Lundbeck's generalization in regard to the incidence of the species of the genus. As far as I am aware, the life-history is, as yet, unknown.

On 18th July, 1949, an enormous number of *Conicera dauci* Mg. (=*atra* Mg.) quite suddenly appeared on the windows, mainly those of the kitchen, at my home at the time in Wood Green, a North London suburb. In this case, the explanation was soon found. Some plants of "Sweet William" which had finished flowering had been brought in from the garden in a bucket to be burnt in the kitchen boiler. Phorids were found to be issuing from the bucket, and on examination of a very large series, all were females. Not a single male could be found and an examination of the bucket and plants revealed no puparia. Unfortunately, at the time, it was impracticable to make a minute search for eggs, or to attempt to breed out, but it was assumed that oviposition was the probable reason. Support for this assumption was later to be found in Schmitz (1952), who quotes Prof. Dr. Franz' several records of this species in association with fresh plant-compost and rotting weeds, not too far advanced in decomposition. Schmitz points out that *dauci* is also associated with fungi but never carrion.

Of the five cases of indoor "swarming," then, that we have considered, one, *C. dauci*, clearly occurred through artificial circumstances, i.e. the flies were introduced indoors; another, *halterata*, might have been attributable to introduction with garden or greenhouse produce or firewood, although the numbers were prodigious and there was no evidence to support the idea; a third, *pleuralis*, might, possibly, be the result of introduction, but it occurred in more than one house, and moreover, the date more or less rules out even the firewood theory; in both of the latter cases, the explanation seems to lie in changes of weather conditions coupled with some other unknown factor accounting for the numerical abundance of specimens. The two remaining species, *meconicera* and *ciliata*, clearly hibernate in the adult state, and might therefore be expected indoors as well as in any naturally sheltered place, such as burrows, old nests, hollow trees, under bark, etc., or could well be introduced with firewood; it is the abundance of individuals which is puzzling. In the case reported by Dr. Scott, there is also some evidence that the assembly took place, *before* entry into the house, in good weather; so that it might be argued that, although the actual entry into houses may be fortuitous, the congregation of the individuals is not. Here it may be noted that Grassé (1936) has collated and commented upon a number of authors' observations in regard to mass unisexual assemblies of Hymenoptera, both of "social" and "solitary" species. As an example of the latter, males of certain solitary bees

are said to have the habit of assembling, each evening, in precisely the same place, to spend the night. A similar phenomenon is said to occur with the males of certain "social" or "colony" species. Such assemblies are considered to be a simple, elementary social phenomenon in which individuals exercise an attraction for each other; they do not necessarily imply a tendency toward life in an organized society. In the form of a question, Grassé advances the suggestion, "Could not these phenomena be, to some extent, the manifestation of a confused or diverted sexual impulse?" But, in nearly all the "invasions" now under review, both sexes were present. A more likely explanation in these cases would seem to be that advanced by Séguy (1950) who considers that these assemblies arise from simultaneous mass emergences of adults from their puparia, the larvae having presumably developed in large numbers within a confined area governed by the circumstantial disposition of a suitable pabulum, and the time of the emergences being ordained by favourable atmospheric conditions. The invasions are considered to be a consequence of the assemblies, provoked by such a reflex as the need for sustenance, the seeking of hosts, or the seeking of shelter. Each individual in the assemblies is capable of separate existence and independent reaction to a given stimulus; it seems reasonable to suppose that a given stimulus at a given moment will affect all the individuals in the assembly in a similar manner, resulting in a mass behaviour.

Outdoor "swarming" of Phoridae is not at all uncommon. The females of *Phalacrotophora berolinensis* Schmitz, for instance, congregate in large numbers and behave in a characteristic fashion on and near the trunks of trees (Colyer, 1952) and this is definitely connected with oviposition; the larvae are endoparasites of the pupae of a Coccinellid beetle.

Lundbeck (1922, *op. cit.*) mentions both sexes of *Megaselia* (*M.*) *tumida* (Wood) "swarming round the end of branches of Maple" and males, only, of *Megaselia* (*A.*) *latifrons* (Wood) "occurring in small swarms around the leaves of a Hazel." I found considerable numbers of *Megaselia* (*M.*) *rubella* Schmitz, nearly all males, running actively about on, and hovering over, accumulations of pine-needles and other vegetable débris at the roots of trees in the New Forest, Hants, in June, 1951 (Colyer, 1952, *op. cit.*) and in the same month in the two subsequent years. On 17th June, 1951, I found numbers of *Conicera pauxilla* Schmitz, nearly all males, running in rapid gyratory courses on lettuce leaves in a garden at Lymington, Hants. I found a very large number of *Metopina galeata* (Hal.) running agitatedly in similar gyratory courses on and around a heap of damp ashes, from a kitchen grate, deposited under currant bushes in a garden at Shobley, New Forest, Hants, 31st July, 1949. On this day, all the specimens taken were, with one exception, females; two days later, there were still large numbers present, behaving precisely in the same fashion. Of the specimens taken on this day, an approximately equal number of each sex was present, including two pairs *in cop.* The assembly persisted for a few days. It is not easy to explain the apparent attraction of damp ashes in this case, and it is possible that their presence had no bearing on the reason for the "swarming." Such assemblies as have been noted here are, in moderate numbers of individuals, quite often to be encountered and I think that the reason for most of them, if not all, is connected with mating.

Certainly the true "Tanzflüge in der Luft" of Schmitz (1929, *op. cit.*)

occurs as a regular and characteristic habit of the males of *Phora* species, and Schmitz suggests that this may account for the enlargement of the eyes in this genus (see Colyer and Hammond, 1951, *op. cit.*: pl. 42, 2) with consequent narrowing of the frons, which, in *P. velutina* Mg., reaches a condition approaching holoptic. But both sexes of the species of this genus can frequently be found running swiftly in the same characteristic manner as other Phoridae on broad leaves in the sun.

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The Swift, *Apus apus* L., as a predator of flies

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Introduction and methods

This paper forms part of a detailed study of the food of the Swift *Apus apus* L. in the breeding season, and is based on meals collected from young and adult Swifts at the nest, as described elsewhere (Lack and Owen *in press*). Each ball of food from the birds usually comprised 300-1,500 insects and spiders, many of which were still living when the meals were collected. The following meals were obtained: 54 in July and August, 1952, and 4 in July, 1953, at Oxford; 12 in July, 1944, at Radley, Berkshire. Eleven meals collected by Miss M. M. Betts at Radley and Oxford in 1949-51 have also been mentioned in this paper. At Oxford the birds were breeding in nest boxes in the University Museum Tower (as described by Lack, 1951), and at Radley in holes in the roof of a cottage.

This paper deals only with the Diptera, other orders that have been fully identified are being written up separately. A general summary of the food and feeding habits of the Swift has also been written (Lack and Owen *in press*).

As Swifts are entirely aerial feeders all the insects must have been caught in the air, though some may have been taken only a few feet above the ground or the trees, as Swifts may feed very low. Most Swifts feed close to their nests, normally within a quarter of a mile, but sometimes, particularly in bad weather when food is scarce, they may travel greater distances. There was no water close to where the meals were collected, and all the meals were collected during the day, usually about the middle of the morning or early afternoon.

Species and families of Diptera caught

In 1944, 988 Diptera were found in 12 meals, an average of 84 per meal, and in 1952, 4,074 in 54 meals, an average of 75 per meal. In 1953 there were 259 in 4 meals, and similar numbers were found in the meals collected by Miss M. M. Betts in 1949-1951. In all years the number of Diptera in each meal varied markedly. In 1944 and 1952, about 5,000 Diptera representing 38 families and at least 148 species were identified, but it was impossible to identify every individual down to species. A complete list of the families and species in the meals collected in 1944 and 1952 is given in Appendix 1.

The families supplying the bulk of the food, in order of numbers taken, were: Empididae 30%, Chloropidae 20%, Sphaeroceridae 7%, Mycetophilidae 5%, Dolichopodidae 5%, Stratiomyidae 4%, Syrphidae 3%, Phoridae 3%, Sepsidae 3%, Drosophilidae 3%, Agromyzidae 2%, Ephydridae 2%, Chironomidae 1% and Muscidae 1%.

It is of interest to consider the families of Diptera in turn, and to discuss the possible reasons for the presence or absence of certain species.

Of the 200 British species of Tipulidae, there were only seven specimens in the Swift meals, and these, and the Ptychopteridae, which are mainly marshland species and were absent from the meals, are perhaps too leggy for the Swifts. Also, many of the Tipulidae are crepuscular and almost all the meals were collected in late morning and early afternoon. Only 6 specimens in the meals out of 70 species of Psychodidae might be because these flies keep close to the ground and the foliage. Chironomidae, about 400 species in the British Isles, and Ceratopogonidae, about 140 species, are also mainly crepuscular and few were caught by the Swifts. The Bibionidae were confined to *Dilophus* spp.; most *Bibio* spp. are no longer flying in July. All but one of the Mycetophilidae appeared to be the same species, *Sciara* sp. Thus over 500 British species, mostly associated with fungi, were not taken. The 28 specimens of the Cecidomyiidae, or gall gnats, are a poor representation of this family with over 600 British species, but perhaps they are too small for the Swifts, for Freeman (1945) has shown that they are well represented in the aerial fauna, comprising 10% of all Diptera in his samples.

The only species of Asilidae taken by the Swifts, *Leptogaster guttiventris*, is the weakest and the smallest of the family in this country. This suggests that the others are too bulky or too strong for the Swifts. The larger Empididae were also absent from the meals, probably for the same reason. The small number of the genus *Hilara* is probably because so few of the

species are on the wing in July. The small number of Phoridae out of about 250 species, might be due to the preference of the majority of the species for woodland cover, for those taken represent species that are known to hover or dance in the air.

The scarcity of fungi in July and the woodland preference of the Platypezidae accounts for their absence in the diet of the Swift. The few Pipunculidae, there are about 50 species, is probably due to the small number of species flying in July. Homoptera, the hosts of this parasitic family, were common in many of the meals. The Syrphidae (hover-flies) with 250 species in the British Isles, were fairly well represented. The chief absentees were the woodland and the larger species. Many of those taken were yellow and black, presumably Mullerian mimics of wasps. Perhaps Swifts, approaching them at speed at approximately the same level and seeing them against the sky, are unable to see these colours.

Although most of the Otitidae occur in the open country, they were not taken by the Swifts, probably because these insects fly too close to the ground. The single representative of the Ulididae in the meals, is a species that hovers near rotting vegetation. The many species of Trypetidae, Lonchaeidae and Sapromyzidae tend to keep close to vegetation and moreover most of the latter prefer woodland cover, and are thus not available to the Swift. Psilidae entirely absent, and Sciomyzidae, rarely taken by the Swift, also remain close to vegetation, whilst the Helomyzidae, also absent from the meals, are mainly confined to woods. The abundance of Drosophilidae at Radley may be due to an especially suitable habitat for breeding. Some species are leaf miners and the rest prefer rotting fruit and similar substances. Both Ephydridae and Sphaeroceridae may occur in the air in numbers (Freeman, 1945). Although some of the species are restricted to the seaside and were therefore unavailable to the Oxford and Radley Swifts, these two families are about as well represented in the meals as the Agromyzidae. This family and the Chloropidae are well known in aerial samples from traps on kites, balloons, etc. Probably the bulk of the Chloropidae caught by the Swifts were the Frit fly *Oscinella frit*. The small number of Cordiluridae, Tachinidae, Calliphoridae and Muscidae, out of 60, 240, 100 and 500 species respectively, might be due to their large size. The hovering species of Muscidae are almost restricted to below the canopy of woodland and therefore are not available to Swifts.

Most species of Diptera were represented by one or two specimens, and some such as *Dilophus humeralis*, *D. bispinosus* and *Ctenulus distinctus*, are rarely taken by dipterists. Some like *Microchrysa polita* occurred on most dates, but others such as *Odontomyia viridula* and *Dilophus febrilis* were almost confined to single days.

The two most numerous species taken, *Platypalpus pallidiventris* and *P. extricatus*, are much alike especially in the females, and it was not often possible to distinguish between the species. In 1952 these flies were particularly numerous. None were taken on 2nd July, but large numbers occurred on 12th July and subsequently until 19th July, after which there were few. *Platypalpus pallidiventris* was the commonest of the genus taken at Radley and occurred in 11 out of 12 meals. In the 1952 meals there were 1,347 female *P. pallidiventris* or *P. extricatus* and only 92 males. Also 208 out of 209 *Dilophus febrilis* were females. In fact out of 2,857 of all the Diptera

sexed there were only 320 males, and the only species where males predominated were *Odontomyia viridula*, 54 out of 59 being males, and *Haematopota pluvialis*, 21 males out of 27. These differences in the sex ratio are hard to explain, except they must in some way be reflected in availability.

Size of prey

The lists of flies for each meal suggests that the smaller species were selected. Flies as large as a honey bee, such as *Eristalis pertinax*, *E. nemorum*, *Odontomyia ornata* and *Sarcophaga carnaria* were only taken once or twice. The bulk of the Muscidae and the Trypetidae taken, and also the genera *Beris*, *Chloromyia*, *Oxycera*, *Sargus*, *Haematopota*, *Syrphus* and *Scatophaga* are roughly the size of a house fly, and almost all the remainder were about a quarter to half that size. As already indicated, very small species were also not taken.

Feeding area

The composition of the meals suggests that the Swifts fed over open fields bounded by hedges and ditches, streams or rivers, or with cattle ponds. Old trees are suggested by the several specimens of *Pachygaster leachii* and *P. atra*, *Populus* by *Phytagromyza populicola* and *Crataegus* by *Phagocarpus permundus*. The ground vegetation over which the meals were caught probably included a field of barley or at least a large amount of a species of *Hordeum*, judging by the numbers of *Oscinella frit*. Other plants indicated are *Glechoma hederacea* by *Napomyza glechomae*, *Urtica dioca* by *Phytomyza flavicornis*, *Ranunculus* sp. by *Phytomyza ranunculi*, *Sonchus* sp. by *Ensina sonchi*, *Achillia millefolium* by *Oxyna flavipennis*, various species of *Cirsium* by *Xyphosia miliaria*, *Chrysanthemum leucanthemum* or *Leontodon autumnalis* by *Tephritis leontodontis*, *Hypochaeris radicata* by *Tephritis vespertina* and possibly other Compositae by *Trypanea stellata*, whilst the numbers and variety of the Chloropidae and the Agromyzidae indicate meadows.

Hydrophorus praecox and various Ephydridae, *Odontomyia* and *Oxycera*, indicate the presence of mud and marshy places. Pastures are evident with the presence of the various Sphaeroceridae, Sepsidae, *Geosargus* and *Microchrysa*.

The bulk of the species were likely to have occurred mostly at low heights above the grassland and field vegetation, but as Freeman (1945) found Sciarinae, Chloropidae and Sphaeroceridae formed the bulk of the Diptera at 10-277 feet, the Swifts might at times have caught these flies quite high. The hoverers, Syrphidae and Stratiomyidae, are mainly confined to 1-20 feet and as many were caught by the Swifts it would appear that some birds were flying very low.

Availability of food

The species of Diptera in the meals would depend on the following factors:

1. *Time of year*. The adults of only a certain number of species are on the wing during the breeding season of the Swift.

2. *Time of day*. The species of flies present in the feeding area are on the wing only during certain restricted hours.

3. *Habitats in the feeding area*. Swifts feed over open country or over the woodland canopy. Each major habitat has its own group of species of Diptera as inhabitants.

4. *Flora of the feeding area.* This, besides affecting the general nature of the habitat, provides species of plants that are hosts to various species of Diptera with specific feeding habits.

5. *Habits of the Diptera present in the feeding area.* Hoverers, and those that are active in the air more than a few inches from the ground appear to be especially vulnerable to attack. The numbers of *Platypalpus pallidiventris* and *P. extricatus* are interesting as these flies are predators of small insects and may have been capturing aphids, as many aphids were present in the meals.

6. *Abundance and distribution.* Providing a species is available under the above five headings, the heaviness of the attack upon it seems relative to its abundance in the restricted feeding area of the Swift.

7. *Weather.* The affect of the weather on the food of the Swift has been discussed more fully in the general paper (Lack and Owen *in press*). On fine days when more insects are available in the air Swifts tend to catch larger insects than they catch on dull or windy days, but this did not always hold, probably because small species were sometimes exceptionally abundant and very easily caught. From this it appears that on dull days the larger species are unavailable and the Swift is forced to catch small species. Sun-loving Diptera, such as the Syrphidae, were caught mainly on sunny days, but on the whole it is difficult to correlate the species of Diptera taken with the weather, except that on the average numbers of Diptera dropped in bad weather and rose in fine weather, agreeing with the known activity of the order.

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Appendix 1

List of Diptera in Swift meals

(*a*) *Families and commonest species*

	Radley	Oxford
1. Tipulidae	3	4
2. Anisopodidae	1	
3. Psychodidae	6	
4. Chironomidae	47	7
(*Chironomus* sp.)	(15)	
5. Ceratopogonidae	5	
6. Simuliidae	3	2
7. Bibionidae	3	210
(*Dilophus febrilis* (L.))	—	(209)
8. Mycetophilidae	67	199
(*Sciara* sp.)	(66)	(199)
9. Cecidomyiidae	28	
10. Stratiomyidae	66	123
(*Microchrysa polita* (L.))	(2)	(40)
(*M. flavicornis* (Mg.))	(54)	
(*Odontomyia viridula* (F.))		(59)
11. Rhagionidae		1
12. Tabanidae		27
(*Haematopota pluvialis* (L.))		(27)

		Radley	Oxford
13.	ASILIDAE	1	
14.	EMPIDIDAE	57	1,524
	(*Platypalpus pallidiventris* (Mg.))	(43)	(40)
	(*P. extricatus* (Collin))		(14)
	(*P. pallidiventris* or *extricatus*)		(1,385)
	(*Platypalpus* sp.)	(2)	(67)
	(*Empis* sp.)	(1)	(11)
15.	DOLICHOPODIDAE	11	246
	(*Hercostomus* sp.)		(19)
	(*Chrysotus gramineus* (Fall.))		(67)
	(*Chrysotus* sp.)		(145)
16.	LONCHOPTERIDAE	6	23
	(*Lonchoptera lutea* Panz.)	(5)	(23)
17.	PHORIDAE	23	134
	(*Megaselia* sp.)	(15)	(35)
18.	DORILAIDAE		4
19.	SYRPHIDAE	27	138
	(*Melanostoma mellinum* (L.))		(13)
	(*M. scalare* (F.))	(2)	(20)
	(*Melanostoma* sp.)		(17)
	(*Platycheirus clypeatus* (Mg.))		(21)
	(*Syrphus balteatus* (Deg.))	(2)	(18)
	(*Syrphus corollae* (F.))	(15)	(20)
20.	ULIDIIDAE		1
21.	TRYPETIDAE	8	7
22.	LAUXANIIDAE	1	
23.	TYLIDAE	1	
24.	SEPSIDAE	28	96
	(*Sepsis punctum* F.)	(19)	
	(*Sepsis* sp.)	(9)	(84)
25.	SCIOMYZIDAE		1
26.	CHAMAEMYIIDAE	26	1
	(*Chamaemyia aridella* (Fall.))	(25)	
27.	OPOMYZIDAE	8	14
	(*Opomyza germinationis* (L.))	(4)	(12)
28.	EPHYDRIDAE	30	73
	(*Scatella stagnalis* (Fall.))	(13)	(6)
	(*Limnellia quadrata* (Fall.))	(3)	(10)
	(*Hydropota griseola* (Fall.))		(32)
29.	SPHAEROCERIDAE	49	322
	(*Trichiapsis equina* (Fall.))	(8)	(24)
	(*Limosina* sp.)	(19)	(289)
30.	ASTEIDAE		1
31.	CAMILLIDAE	1	
32.	DROSOPHILIDAE	106	31
	(*Drosophila fenestrarum* Fall.)	(50)	
	(*D. obscura* Fall.)	(17)	
	(*Drosophila* sp.)	(30)	(25)
33.	AGROMYZIDAE	55	50
	(*Phytagromyza populicola* (Hal.))	(17)	
	(*Phytomyza* sp.)	(25)	(42)
34.	CHLOROPIDAE	249	781
	(*Oscinella frit* (L.))	(167)	
	(*Oscinella* sp.)	(60)	(728)
	(*Meromyza pratorum* Mg.)	(11)	(5)
35.	CORDILURIDAE	2	2
36.	LARVAEVORIDAE	2	1
37.	CALLIPHORIDAE		1
38.	MUSCIDAE	8	45

(*b*) *Species caught less than ten times at each locality. Numbers refer to families as above.*

1, *Limonia nubeculosa* Mg., *Limnophila* sp., *Gonomyia lateralis* (Mcq.), *Erioptera* sp. 2, *Anisopus punctatus* (F.). 3, *Psychoda alternata* Say., *Psychoda* sp. 4, *Tanypus* sp. 6, *Simulium reptans* (L.), *Simulium* sp. 7, *Dilophus fermoratus* (Mg.), *D. humeralis* (Zett.), *D. bispinosus* (Lundst.). 8, *Macrocera maculata* Mg. 10, *Beris chalybeata* (Forst.), *Beris* sp., *Chloromyia formosa* (Scop.), *Geosargus cuprarius* (L.), *G. bipunctatus* (Scop.), *Odontomyia ornata* (Mg.), *Nemotelus nigrinus* Fall., *Oxycera trilineats* (F.), *O. pulchella* (Mg.), *O. formosa* Mg., *O. trivittata* (L.), *Pachygaster leachii* Curt., *P. atra* (Panz.). 11, *Chrysopilus cristatus* (F.). 13, *Leptogaster guttiventris* Zett. 14, *Drapetis exilis* Mg., *Platypalpus candicans* (Fall.), *P. flavicornis* Mg., *P. fasciatus* (Mg.), *P. articulatus* Mcq., *P. agilis* (Mg.), *Ocydromia glabricula* (Fall.), *Hilara* sp., *Empis nuntia* Mg., *E. albinervis* Mg., *Empis* sp. 15, *Dolichopus plumipes* (Scop.), *D. brevipennis* (Mg.), *Dolichopus* sp., *Hydrophorus praecox* (Lehm.), *Medeterus truncorum* Mg., *Diaphorus* sp., *Chrysotus cupreus* Mcq., *C. blepharosceles* Kow., *Campsicnemus curvipes* (Fall.), *Campsicnemus* sp., *Sciopus platypterus* (F.), *S. wiedemanni* (Fall.). 16, *Lonchoptera furcata* (Fall.). 17, *Conicera dauci* Mg., *Gymnophora quartomollis* Schmitz, *Megaseha rufipes* (Mg.). 18, *Chalarus spurius* (Fall.), *Pipunculus* sp. 19, *Eumerus strigatus* (Fall.), *Eristalis pertinax* (Scop.), *E. nemorum* L., *Cheilosia* sp., *Pyrophaena granditarsa* Forst., *Platycheirus scutatus* (Mg.), *P. albimanus* (F.), *Sphaerophoria menthastri* (L.), *S. scripta* (L.), *Scaeva pyrastri* (L.), *Syrphus cinctellus* (Zett.). *S. luniger* (Mg.), *S. ribesii* (L.), *S. vitripennis* Mg., *Physiphora demandata* (F.). 21, *Phargocarpus permundus* (Harris), *Xyphosia miliaria* (Schr.), *Oxyna flavipennis* (Lw.), *Ensina sonchi* L., *Trupanea stellata* Fuess., *Tephritis conjuncta* (Loew.), *T. vespertina* (Lw.), *T. leontodontis* (Deg.). 22, *Minettia fasciata* (Fall.). 23, *Trepidaria cibaria* (L.). 24, *Saltella scutellaris* (Fall), *Enicta annulipes* (Mg.), *Nemopoda nitidula* (Fall.), *Sepsis fulgens* Mg., *Sepsis cynipsea* (L.), *S. communis* Frey., *Themira putris* (L.). 25, *Ctenulus distinctus* (Mg.). 26, *Chamaemyia juncorum* (Fall.), *C. herbarum* (R.-D.). 27, *Geomyza combinata* (L.). 28, *Notiphila cinerea* Fall., *Notiphila* sp., *Scatella* sp., *Limnellia stenhammari* (Zett.), *Scatophila* sp., *Coenia* sp., *Philygria stictica* (Mg.), *P. posticata* (Mg.). 29, *Sphaerocera curvipes* Latr., *Borborus ater* Mg., *Collinellula fuscipennis* (Hal.), *C. limosa* (Fall.), *Paracollinella fontinalis* (Fall.), *Limosina silvatica* (Mg.), *L. mirabilis* Collin, *L. clunipes* (Mg.), *L. heteroneura* Hal. 30, *Asteia concinna* Mg. 31, *Camilla glabra* (Fall.). 32, *Drosophila disticha* (Duda), *D. graminum* (Fall.). 33, *Agromyza* sp., *Cerodontha denticornis* (Panz.), *Napomyza glechomae* (Kalt.), *N. lateralis* (Fall.), *Phytomyza ranunculi* (Schr.), *P. flavicornis* Fall., *P. atricornis* Mg. 34, *Elachiptera cornuta* (Fall.), *Elachiptera* sp., *Tricimba cincta* (Mg.), *Meromyza saltatrix* (L.), *Meromyza* sp., *Chlorops elongata* Mg., *C. pumilionis* (Bjer), *C. hypostigma* Mg., *Chlorops* sp. 35, *Scopeuma lutarium* (F.), *S. squalidum* (Mg.), *S. stercorarium* (L.). 36, *Actia pilipennis* (Fall.). 37, *Sarcophaga carnaria* (L.). 38, *Morellia aenescens* R.-D., *Morellia* sp., *Hydrotaea irritans* (Fall.), *Fannia* sp., *Hebecnema umbratica* (Mg.), *Mydaea urbana* (Mg.), *Pegomyia bicolor* (Wied.), *Schoenomyia litorella* (Fall.), *Egle* sp.

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Some Observations on the genus *Bombus*, with special reference to *Bombus cullumanus* (Kirby) (Hym. Apidae)

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In a recent series of articles on British *Bombus* and *Psithyrus* (Poole, 1952) it was stated that a few males but no females or workers of *B. cullumanus* had ever been found in Britain. In point of fact, the capture of a single female on the Berkshire Downs near Cholsey in 1926 and of a worker near Tring in Bucks two years earlier was put on record at that time (Richards, 1926). More recently my colleague Mr. J. F. Perkins has discovered two females and four workers placed under *B. lapidarius* (Linnaeus) in the Mortimer collection now in the British Museum; one female is from Streatley, Berkshire, the remainder from Seaford, Sussex. It is perhaps opportune therefore to list the present known distribution of this bee:

Beds. Barton Hills, north of Luton, ♂ 19/8/1923 (Palmer, 1923).

Berks. Cholsey, Pangbourne, Streatley, Sulham, Tilehurst, Wallingford. Holland, 1916, more than 30 ♂♂ late August and early September, and Burtt, 1921, 7 ♂♂ end of July. (Burtt, 1923.) Cholsey, 15/5/26 1 ♀ Richards (*loc. cit.*), Streatley, 6/1923 1 ♀ Mortimer coll.

Bucks. Between Dunstable and Tring, 1921, 1♂, A. D. Imms, *teste* Palmer (*loc. cit.*). Near Tring, 1☿ 9/1924, Richards (*loc. cit.*).

Hants. Hook and Butterworth near Basingstoke, 1916, Holland, *teste* Burtt (*loc. cit.*).

Kent. Ripple, 8/9/1911, 1 ♂ Sladen, 1912. Dover (*teste* Nevinson, 1923. This may well refer to Sladen's record from Ripple.)

Suffolk. Witnesham, 1 ♂ (the holotype; Kirby, 1802).

Sussex. Brighton Down, 1 ♂ presented to the British Museum in 1844 by W. Walcott of Bristol. (This is very probably the specimen referred to by F. Smith (1891) as coming from Bristol); Seaford, 9 ♂♂ 8/1921, 4 ☿☿ 8/1922, 1 ♀ 7/1924, Mortimer coll.; Seaford, about 40 ♂♂ confined to two districts, end of 9/1923, Nevinson (*loc. cit.*).

In addition to the above there is a single ♂ in the British Museum from a Mr. Foxcroft, presented in 1852 and reputed to have come from a collection made in Wales and Scotland; the origin of this specimen is obviously open to doubt.

The bee has been taken at the following plants: *Origanum vulgare* L., *Carduus nutans* L., *Cirsium acaule* Web., *Centaurea nigra* L., and *Trifolium repens* L. The localities are all associated with chalk and the flight period seems to lie between May and September.

So far as recognition is concerned, the characters given by Richards in his "Specific characters of British Humble-bees" (Richards, 1927) are largely confirmed by my examination of the more recently discovered material. It must be pointed out here that Smith (*op. cit.*) was quite wrong when he presumed that the worker and female of *cullumanus* would look like *pratorum* (Linnaeus): the specimens from Southend, Essex, upon which Smith based this presumption were in fact *pratorum*, though one must give him credit for

having stated that he had no positive proof that the female described was really that sex of *cullumanus*. Sladen in 1912 and Nevinson in 1923 have drawn attention to the colouring (yellow, black and red) of certain supposed *cullumanus* specimens from Burgos in Spain but these have proved to be *B. serrisquama* Morawitz, a very closely related species. On the other hand, the specimens from Schleswig, determined as *cullumanus* by Friese and referred to by Nevinson (1923) and Richards (1926) (*locs. cit.*) are correct. There is no difficulty in recognizing the male of *cullumanus* despite the superficial resemblance to *ruderarius* (Muller), *pratorum* (Linnaeus), and (Burtt, *loc. cit.*) *sylvarum* (Linnaeus), and a glance at the genitalia will settle the point. The females and workers, on the other hand, require more careful examination for they resemble *lapidarius* very closely, though with experience the females at any rate can be separated with the naked eye. The following table of comparisons should make it possible for collectors to recognize both ♀ and ☿ of *cullumanus*.

cullumanus	*lapidarius*
Hind metatarsus shining, with scanty pubescence and very few branched hairs.	Hind metatarsus alutaceus and well covered with branched hairs.
4th segment of ☿ antenna as wide as long or even wider (fig. 5).	4th segment of ☿ antenna distinctly longer than wide (fig. 6).
Malar space very distinctly broader than long, considerably punctured laterally (fig. 7).	Malar space about as long as broad or slightly longer (fig. 8).
♀ with antero-lateral impression of clypeus much more distinct.	♀ antero-lateral impression much less distinct.
Central furrow of labrum not very deep, not becoming a deep pit apically but gradually sloping upwards. Base of furrow (i.e., that part adjacent to clypeus) more shining, without surface sculpture. Tubercles convex, with coarse punctures all over.	Central furrow deep, particularly apically, where it becomes a deep pit. Base of furrow not very shining and with distinct surface sculpture. Tubercles flattened, sloping down to level of clypeus laterally, the flat surface in ☿ shining and with few punctures.
♀ with distinct yellow hairs among the black anteriorly and posteriorly on thorax; the ☿ in addition has some yellow hairs at base of abdomen.	♀ occasionally with a few yellow hairs on thorax anteriorly.
♀ wings darker.	♀ wings less dark.

Frison (1927) in a paper dealing with the relationships of North American *Bombus*, places the subgenus *Cullumanobombus* Vogt in Section *Boopobombus* Frison, this Section being characterized in the male by large swollen eyes, short malar space, large ocelli placed forward of a line joining the posterior

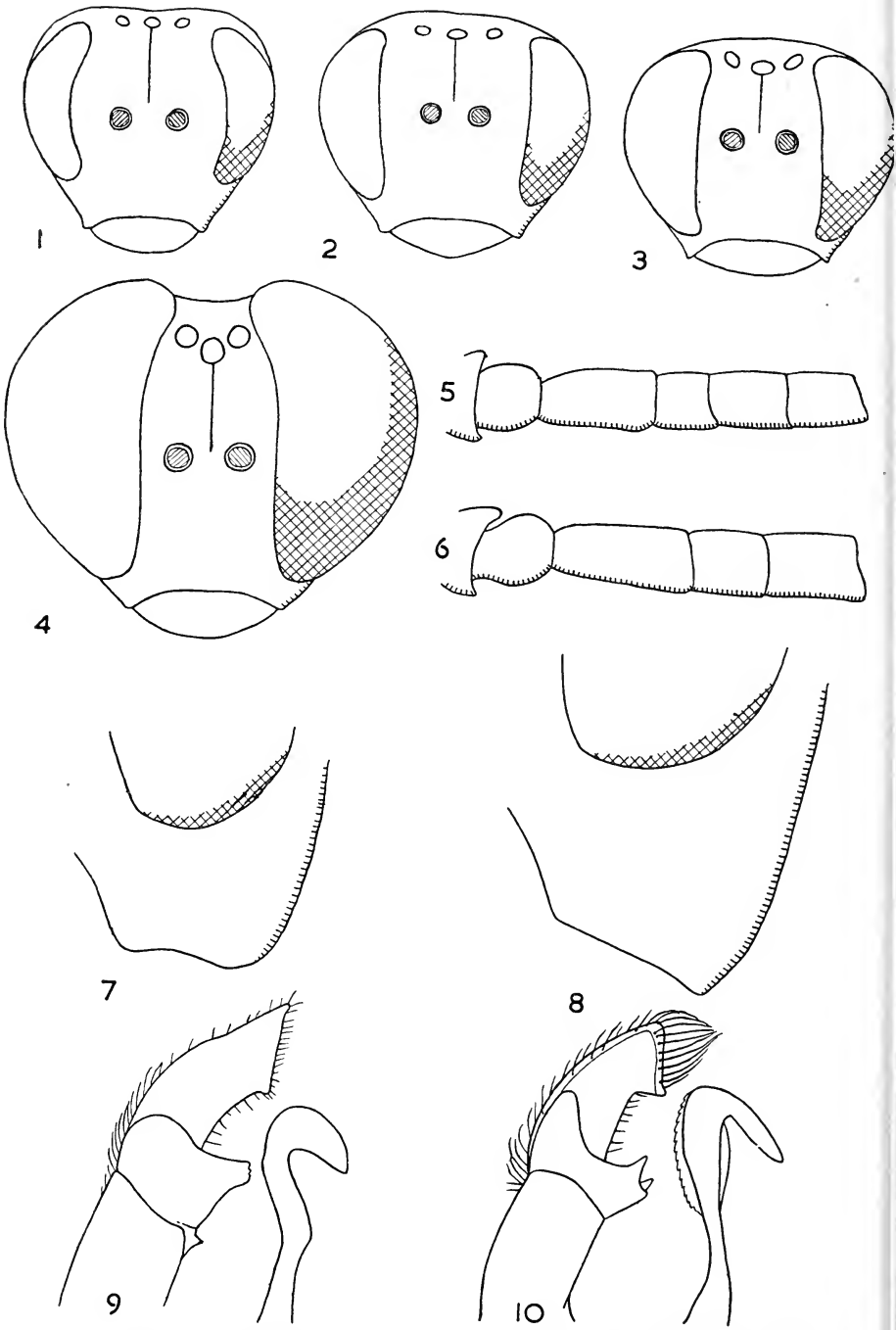

FIG. 1, Head of *B. pratorum* (Linnaeus) ♂. 2, Head of *B. cullumanus* (Kirby) ♂. 3, Head of *B. rufocinctus* Cresson ♂. 4, Head of *B. auricomus* Robertson ♂. 5, Basal segments of the antenna of *B. cullumanus* (Kirby) ☿. 6, Basal segments of the antenna of *B. lapidarius* (Linnaeus) ☿. 7, Malar space of *B. cullumanus* (Kirby) ☿. 8, Malar space of *B. lapidarius* (Linnaeus) ☿. 9, Volcella, squama and sagitta (dorsal view) of *B. cullumanus* (Kirby) ♂. 10, Volcella, squama and sagitta (dorsal view) of B. *rufocinctus* Cresson ♂.

eye-margins (fig. 4) and genitalia with protruding volsellae and in the female by ocelli similar to the male, 3rd antennal segment longer than 5th, and basitarsi of middle and hind legs without a pronounced projection at posterior apical angle. *Cullumanobombus* was considered to be represented in America by a single species, *B. rufocinctus* Cresson. Frison, who had not seen the European *B. cullumanus*, was following Skorikov (1922) who very probably had not seen the American *B. rufocinctus*. *Cullumanobombus* is very certainly not a *Boopobombus*, nor is *B. rufocinctus* very happily placed in either. To make this apparent I have drawn outlines of the heads of males of *B. auricomus* Robertson (fig. 4), *B. rufocinctus* Cresson (fig. 3), *B. cullumanus* (Kirby) (fig. 2), and for those who are concerned only with the British fauna, *B. pratorum* (Linnaeus) (fig. 1). There are certain differences in the male genitalia which suggest that *cullumanus* and *rufocinctus* are not very closely related and do not belong to the same species group (figs. 9 and 10); the squama, for instance, is of quite different form, being produced inwardly into two well defined teeth whereas in *Cullumanobombus* (*apollineus* Skorikov, *semenoviellus* Skorikov, *serrisquama* Morawitz and *cullumanus* (Kirby)) the squama is produced inwardly into a blunt process which shows signs of marginal serrations. (It is perhaps worth mentioning here that certain Palaearctic species (*B. confusus* Schenck and *B. mendax* Gerst. and its allies) have males with enormous eyes but on account of other characters do not belong in Section *Boopobombus*.) The female *rufocinctus*, like the male, seems intermediate between *Boopobombus* and *Anodontobombus*, allied to the former by its slightly larger eyes and ocelli and short malar space, and to *Cullumanobombus* and *Lapidariobombus* (though not to *Pratobombus*) by the form of the mandibles which have a sulcus obliquus but no incisura lateralis.

Frison was evidently not too sure how to handle *rufocinctus*, for in the legend to plate 17 he created a new subgenus, *Rufocinctobombus* for this species; whether *Rufocinctobombus* should be treated as a subgenus in Section *Boopobombus* or should be kept separate need not concern us here. In the recent catalogue of N. American Hymenoptera (Muesebeck, Krombein, Townes, etc., 1951), B. D. Burks, basing his treatment of *Bombus* largely on notes by Frison, retains *rufocinctus* in *Cullumanobombus*.

The form of the mandibles in female and worker *Bombus* was first used by Kruger (1920) as a taxonomic character and later by Richards for the British species (1927); it provides such a valuable aid to identification, though one which seems so little appreciated, that I have taken this opportunity to illustrate the forms which occur in our British species.

1. Basal keel and sulcus obliquus present, incisura lateralis absent. (Section *Odontobombus*, illustrated by *B. agrorum* (Fabricius), fig. 11.)
2. Basal keel absent, sulcus obliquus present, incisura lateralis absent. (*Lapidariobombus* and *Cullumanobombus*, illustrated by *B. lapidarius* (Linnaeus), fig. 12.)
3. Basal keel and sulcus obliquus absent or the latter very weak, incisura lateralis present. (*Pratobombus*, *B. pratorum* (Linnaeus) and *B. lapponicus* (Fabricius), figs. 13 and 15.)
4. Basal keel absent, sulcus obliquus and incisura lateralis both present. (*Terrestribombus*, illustrated by *B. terrestris* (Linnaeus), fig. 14.)

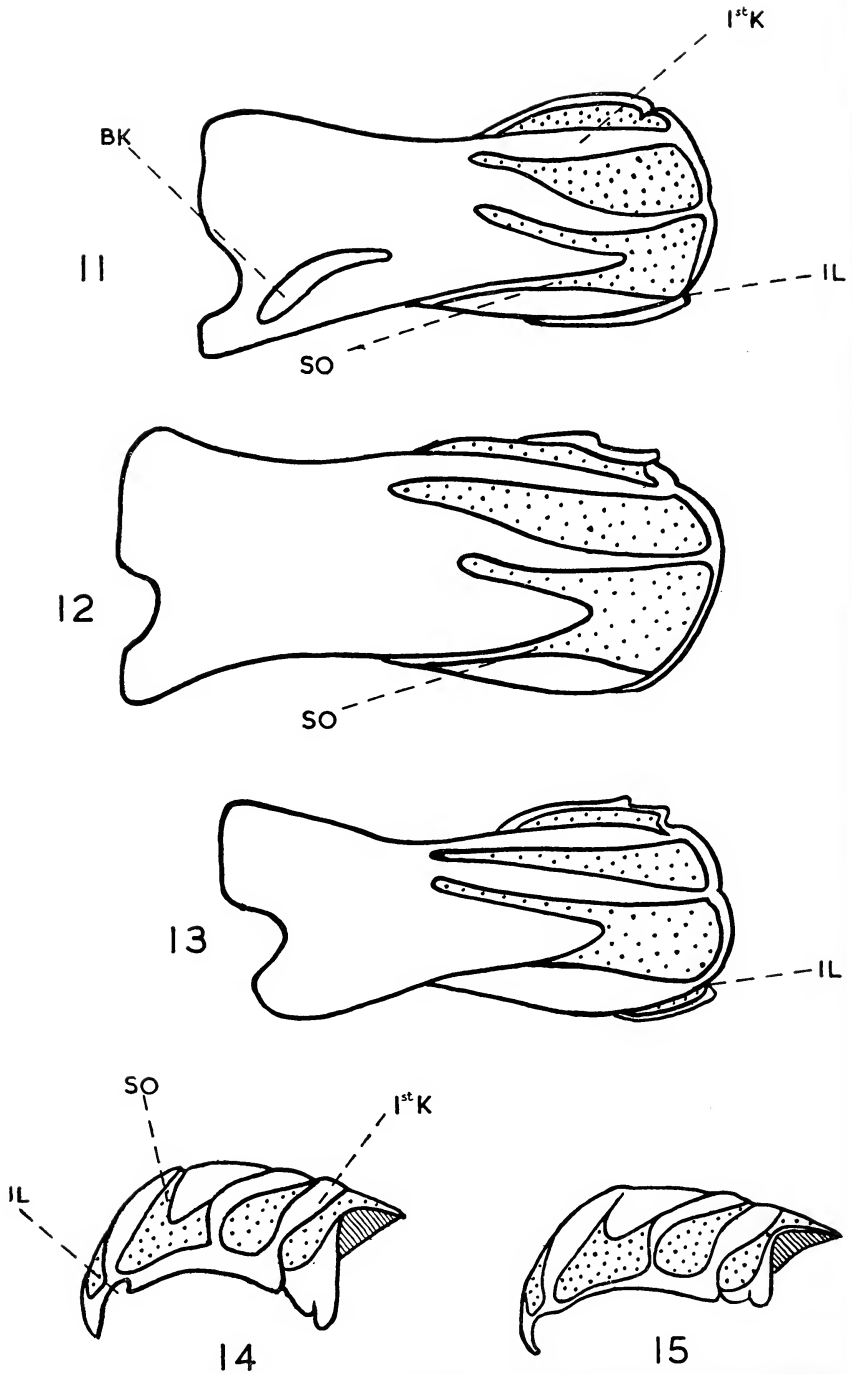

FIG. 11, Right mandible of *B. agrorum* (Fabricius). 12, Right mandible of *B. lapidarius* (Linnaeus). 13, Right mandible of *B. pratorum* (Linnaeus). 14, Right mandible of *B. terrestris* (Linnaeus) (apical view). 15, Right mandible of *B. lapponicus* (Fabricius) (apical view). BK = basal keel; 1st K = main keel; IL = incisura lateralis; SO = sulcus obliquus.

Turning finally to the European distribution of *cullumanus*, Skorikov (1922) has shown how very limited this is, the species being restricted to S. England, N. Holland, N. Germany, Denmark and S. Sweden. Its extreme rarity is emphasized by its complete absence from the very extensive Pittioni collection, a collection of bees containing some 40,000 specimens of mainly Eurasian *Bombus* species, recently purchased by the British Museum (Natural History).

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COLLETES HALOPHILA VERHOEFF (=*C. SUCCINCTA HALOPHILA* VERHOEFF), A BEE HITHERTO UNRECOGNIZED IN GREAT BRITAIN

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Until 1925 when Mr. G. M. Spooner discovered large colonies of what was presumed to be *Colletes succincta* (Linnaeus) visiting the plants *Aster tripolium*, *Senecio jacobaea* and *Limonium* sp. on maritime sand in September at Scolt Head and Blakeney Point in Norfolk, it had been believed that this species was restricted entirely to *Erica* and *Calluna*; this unusual behaviour was noted by O. W. Richards in his paper on British *Epeolus* and *Colletes* (*Trans. Soc. Brit. Ent.*, 1937, **4**: 89-130). In 1943 P. M. F. Verhoeff in

Holland published some observations on a *Colletes* taken at *Aster tripolium* (*Tijdschr. v. Entom.*, **86**: XLII); these he found could be distinguished from the *Erica* and *Calluna* frequenting *succincta* in both males and females and he treated them as a race of *succincta* giving the subspecific epithet *halophila*; he pointed out that if Spooner's specimens from Norfolk were examined they would in all probability prove to be the same. Accordingly Dr. Richards examined a male and female of the Norfolk specimens and confirmed that they agreed with Dutch specimens kindly sent by Dr. Verhoeff both to him and to the British Museum (Natural History). It has since been discovered that in the British Museum (Natural History) there is one ♀ *halophila* taken by Col. Yerbury at Aldeburgh in Suffolk, 26/9/1900, and a series of 51 ♂♂ and 1 ♀ taken at Dovercourt and St. Osyth on the Essex coast from the Harwood collection; Mr. P. Harwood has kindly sent further examples of both sexes from St. Osyth for examination.

Mr. H. W. Daltry of Rugby has taken males and females at Fishcroft Marsh, N. Lincs., flying to *Leontodon*, and at Moulton Marsh, S. Lincs., at *Aster tripolium*, in September, 1950, and recently I have discovered a single ♀ taken on *Aster*, 25/9/1936, Southwold Saltings in the Claude Morley collection, among specimens from Southwold which are *succincta*.

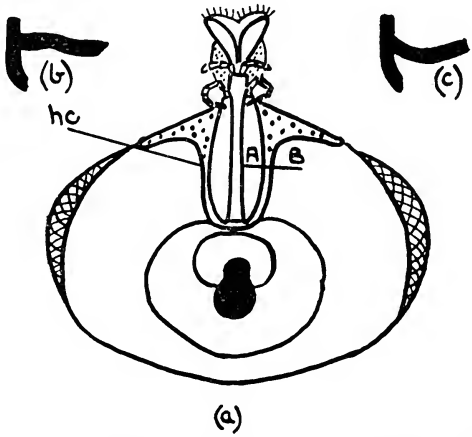

FIG. 1. (*a*) Ventral view of the head capsule; hc—hypostomal carina. (*b*) Section through hypostomal carina at A-B in *C. succincta* (Linnaeus). (*c*) Section through hypostomal carina at A-B in *C. halophila* Verhoeff.

Halophila is usually larger than typical British *succincta* and the ♀ can be distinguished readily by the coarser puncturation of the disc of the 1st tergite and mesopleura; the ♂, however, is more difficult to distinguish on these characters, particularly in small individuals. However, it has been found that *halophila* differs from *succincta* in the form of the hypostomal carina (fig. 1a) and the area of the gena adjacent to this (figs. 1b and 1c are sections through the hypostomal carina at A-B):

succincta. Hypostomal carina only narrowly raised and the area of the gena adjacent almost flat, or at most weakly impressed at a short distance from the carina (fig. 1b).

halophila. Hypostomal carina conspicuously raised, the gena impressed immediately adjacent to it (fig. 1c).

To see this character clearly it may be necessary to scrape away some of the hairs on the gena, particularly in the ♂, in which the hair in this region is much more dense than in the ♀.

In view of the difference in biology and the morphological characters noted above it would seem better to regard these two forms as separate species.

It would be interesting to know whether *halophila* occurs south of the Thames estuary, in the vicinity of the Medway and the Swale, for instance.

Psenulus schencki Tournier, a Psenine Wasp new to the British List

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Three females of *P. schencki* Tournier have been discovered from British localities in collections now in the British Museum (Natural History); two are from Holmwood, Surrey, 7/22, ex Mortimer collection, and one from Byfleet, Surrey, 6/45, ex Guichard collection. This addition is the more interesting since the species has hitherto been recorded not nearer than Switzerland. There should be no difficulty in recognizing *P. schencki*, at any rate in the female sex from the characters given below and those who have specimens of this genus from Surrey would do well to re-examine them. I have not yet seen a male but from the characters given by de Beaumont in his "Les Psenini de la région paléarctique" (*Mitt. Schweiz. ent. Ges.*, 1937, **17**: 33-93) this sex should not be difficult to spot, for while resembling *atratus* in the striate vertex and shape of the apical antennal segment, which is less than twice as long as it is wide, it resembles *concolor* in having the apical antennal segments distinctly carinate and in the absence of a smooth and shining semi-elliptical area at the base of the second sternite.

Key to females of British *Psenulus*

(For further details of *P. concolor* (Dahlbom) see Spooner, G. M., *Trans. R. ent. Soc. Lond.*, 1948, **99**: 139.)

1. Vertex very shining, puncturation microscopic, clypeal carina inverted Y shaped ..... *concolor* (Dahlbom)
— Vertex distinctly punctured and striate, clypeal carina inverted T shaped 2

2. Middle tibia with a longitudinal impression on the outer side (fig. 1) ..... *schencki* (Tournier)
Black, flagellum beneath, anterior tibia above and posterior tarsus testaceous; anterior tibia below and in front and middle and posterior tarsi yellowish. Clypeus densely but finely punctured,

pilose, apically with an indentation wider than deep between the teeth. 2nd segment of flagellum hardly longer than broad, 3rd about as long as broad, remainder except apical, broader than long. Thorax shining, finely punctured, the outer pair of longitudinal impressions extending back about one-third length of mesonotum. Pygidium with a median longitudinal area parallel sided apically, opening out Y-shaped basally. 2nd sternite with an indistinct but very shining semi-elliptical area, the sternite abruptly descending to the transverse carina. 4th and 5th sternites without apical fringes of silvery hair.

— Middle tibia without such an impression ..... *atratus* (Fabricius)
Black, flagellum beneath, anterior tibia on the inner side, tarsus and middle tibia testaceous; clypeus more or less distinctly punctured, pilose, apically with an indentation as deep or deeper than wide between the teeth. 2nd segment of flagellum distinctly longer than broad, 3rd, 4th and 5th slightly longer than broad, remainder, except apical, as broad as long or rather broader. Mesonotum shining, punctured and distinctly striate posteriorly, the outer pair of longitudinal impressions indistinct except in the anterior third of the mesonotum. Pygidium with a median area indistinctly bordered and V-shaped. 2nd sternite with a very distinctly bordered semi-elliptical area occupying about two-thirds of the sternite which slopes gently down to the transverse carina. Fresh examples have apical fringes of silvery hair on 4th and 5th sternites.

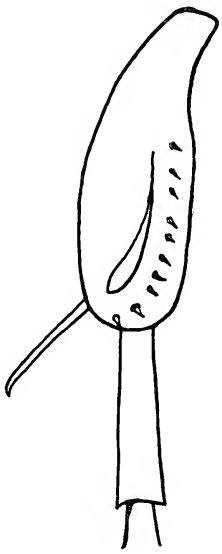

FIG. 1. Outer side of middle tibia of *Psenulus schencki* Tournier showing the longitudinal impression.

The Irish form of *Myrmosa atra* Panz. (Hym., Tiphiidae)

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Through the kindness of Mr. A. W. Stelfox of Dublin I have been able to examine specimens of a red-headed form of *Myrmosa atra* Panz. In 1927, when Stelfox published his "Hymenoptera Aculeata (*sensu lato*) of Ireland" (*Proc. R. Irish Acad.*, **37** (B) No. 22: 201-355) he drew attention to a single female of *M. atra* (=*M. melanocephala* (Fabricius)) from Co. Wicklow as having the head, instead of black, of the same red colour as the thorax and commented that as this was the only known Irish example of the species, the red head was in all probability no more than an individual aberration; by 1933, however, when he published "Some Recent Records for Irish Aculeate Hymenoptera" (*Ent. mon. Mag.*, **69**: 47-53) he had seen some 20-30 females from Ireland and there was not a black-headed example among them; he concluded that the red-headed form must be endemic. Since then no black-headed females have turned up, nor has a red-headed female been seen from anywhere but Ireland. Immature specimens may have the head of a less intense black than older ones and a certain amount of red is frequently seen in the region of the mandibular articulations but after examining several hundred British examples I have seen nothing to approach those from Ireland. I therefore describe this as a subspecies of *M. atra* Panzer.

Myrmosa atra erythrocephala n. ssp.

♀. Distinguished from typical *atra* by the head and thorax being unicolorous ferruginous and from the Nearctic *unicolor* Say, which it otherwise resembles rather closely, by the presence of a small tubercle at the base of the 2nd sternite.

♂. I am unable to distinguish this sex from British specimens, except that the hairs on the head and thorax are slightly more red; from *unicolor* both are immediately distinguished by the presence of a median longitudinal carina on the apical half of the 7th sternite.

Holotype ♀. 9/8/30, Clone, Co. Wexford (B.M. (N.H.)).

Paratype ♀. 14/2/29, Clone, Co. Wexford (B.M. (N.H.)).

Allotype. 17/7/35, Shave, near Glengarriff, Co. Wicklow (B.M. (N.H.)).

Stelfox (1933, *loc. cit.*) gives the following additional localities: Carlow, N. Tipperary, S. Galway, N. Kerry.

Krombein (1940, *Trans. Amer. ent. Soc.*, **65**: 415-465) in a revision of the Myrmosidae of the New World with a discussion of the Old World species comments that occasionally the black areas tend to be piceous in typical *atra* and the ferruginous areas on the 2nd tergite reduced in extent; in the Irish specimens which I have seen it is the black areas on the 2nd tergite which are reduced so that the whole insect has a very red appearance; in addition, the apical segments of the flagellum are not darkened as in the typical form.

Reviews

The World of the Honeybee, by Colin G. Butler. Collins, The "New Naturalist" Series, **29**. 24th May, 1954. Price 21*s.* 0*d.*

The volume noticed nearly four years ago (*antea* **3**: 222) is a miniature text-book for the bee-keeper or entomologist with some training in the natural sciences: the present book is one within the compass of the layman, that will give pleasure and instruction to the general entomologist.

After an account of what can be deduced of the origin and evolution of the honeybee, and of the present distribution of the several species and varieties, the author writes of the lives and problems of honeybee colonies and of the individuals which compose them. He writes from a large knowledge of the literature, tested out and followed up in most respects in his own department at the Rothamsted Experimental Station, and makes a coherent story of the whole.

The reviewer received only two shocks, and those in the first dozen pages. It was surprising to one with a background of Darwinian thinking to read (p. 6) that the evolution of bees together with flowers "has frequently been overlooked," yet the author's own thinking on this subject may clarify that of his readers. More startling was to read that all honeybees are wild, not domesticated, that "all that man has been able to do has been to induce colonies . . . to build their nests in . . . shelters such as modern hives, so that he can readily *rob* them of their stores of honey" (italics mine). Now man inserts into his hives "foundation" sheets of wax, ready stamped out into the right shapes and sizes of the cells, and the bees build on these and are saved the labour of starting the cells. Man takes honey in the summer, but feeds sugar in the winter, according to the needs of the colony. If there are more honeybees in an area of dense agricultural occupation than there would be in a similar, very sparsely populated area, then honeybees have gained a biological advantage that would be reversed with the decline of man.

There are chapters on "the origin of members of the colony," the "survival of colonies that have lost their queens," the "life of a queen," on colony odour and defence, swarming, food, etc. That on "the world of the worker honeybee" concludes with an intriguing summary of how the world must seem to a bee. In "bee stings and bee venom" the popular supposition is confirmed that a bee dies soon after stinging a human but not, of course, after stinging another bee; and bee venom as a possible antidote to rheumatism is discussed. Under "recognition of presence of queen" the author describes his own recent discovery of "queen substance," and he follows by developing the evident importance of this in maintaining the social cohesion of the colony: his first simple experiment (p. 102) seems conclusive in a general way, and is supported by others published only a few weeks ago, but many will probably demur until this substance has been isolated and analysed. Under "direction finding and communication," there is an account of von Frisch's famous discovery of the dances of the bees, confirmed by observation at Rothamsted. The author is to be congratulated on presenting all this material in such acceptable form. G.J.K.

A Coleopterist's Handbook, edited by G. B. Walsh and John R. Dibb. $8\frac{1}{2}'' \times 5\frac{1}{2}''$, 120 pp., 50 text figs., 20 half-tone pls. London, The Amateur Entomologists' Society, 1 West Ham Lane, London, E.15. Price 15*s.* 3*d.* post free.

This excellent Handbook, written by a team of acknowledged experts in the beetle art, is so packed with useful material that it is difficult to know where to make a start. An excellent opening chapter on collecting equipment is followed by another on methods of collecting, in which the beginner is too continually exhorted to hunt for rarities and to let the common things take care of themselves—a procedure which is apt to land him between two stools: he is liable to finish the day's collecting with neither. Two excellent chapters on beetle larvae, by E. A. J. Duffey, open up a field which has been too much neglected by coleopterists, and deserve very special mention. The ticklish business of rearing beetles is dealt with very fully, and there are excellent chapters on the association of beetles with plants and stored products, and on insect photography. For a book of this kind, intended mainly for beginners, the Glossary is rather inadequate.

The weak chapter in the book is that on identification, which covers just two pages. Too little is written about the intelligent use of dichotomous keys, and nothing at all about puncturation and the subtle gradations of colour which are such a puzzle to the beginner.

Both the line drawings and the half-tone plates are excellent, and the seven splendid reproductions from J. C. Schiodte's rare *De metamorphosi eleutheratorum observationes* are especially good and very welcome.

Very reasonably priced, and altogether an excellent handbook, which should be carried in the field by every beetle enthusiast. J.H.M.

Handbooks for the Identification of British Insects. Published by the Royal Entomological Society of London, 24th May, 1954.

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These two further parts of this excellent series are just to hand. The Handbook on the Thysanura and Diplura simplifies, on paper at least, the separation of the species of this little known and little worked group.

The Coleoptera part covers fifteen families which form part of Crowson's section ii of the Cucujoidea (*Ent. mon. Mag.*, **89**: 37-59), all of which are poorly represented in Britain. Mr. Buck has dealt with the subject as fully as was possible in the limited space available, and this part should do much to clear up many of the difficulties presented by these families in Fowler and Joy. J.H.M.

Accounts

The Receipts and Payments Account for the year ended 31st December, 1953, and the Statement of the Society's financial position at that date are printed on page 46.

The Hon. Treasurer, Mrs. M. Murgatroyd, reports that during the year the Subscription income was maintained, the sum of £24 14s. was received from H. M. Inland Revenue under the seven-year Covenant scheme, and the income from sales of Publications was again up on the previous year.

Transaction

With this issue are distributed *Transaction*, Vol. 11, Part 11, and Title Page and Contents for Vol. 4 of the *Journal*.

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1952	9 9 0	
1953	207 15 6	
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		228 15 6
Sales of Publications		100 3 3
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		£353 12 9
	£ s. d.	
Balance at Bank, 1st January, 1953 ..	30 11 9	
Add Excess of Receipts over Payments	65 8 10	
Balance at Bank, 31st December, 1953 ..	£96 0 7	

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	£ s. d.	£ s. d.
By Publications:		
Journals	160 6 4	
Transactions	71 3 9	
		231 10 1
Subscriptions		12 6
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Secretary's Typist		10 0 0
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Expenses re 1952 Congress		11 3 1
Balance, being Excess of Receipts over Payments for the year		65 8 10
		£353 12 9

We report to the Members of the Society for British Entomology that we have audited the foregoing Receipts and Payments Account for the year ended 31st December, 1953, and we have received all the information and explanations we have required. In our opinion the foregoing Account is correct and properly sets forth the result of the Society's activities for this year.

Ellerslie Chambers, Bournemouth.
25th March, 1954.

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(*Continued from inside front cover*)

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(*Continued on inside back cover*)

JOURNAL OF THE SOCIETY
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VOL. 5 15TH NOVEMBER, 1954 PART 2

THE BRITISH SPECIES OF *ELIPSOCUS* HAGEN (CORRODENTIA, MESOPSOCIDAE)

By I. W. B. THORNTON, B.Sc., Ph.D., and E. BROADHEAD, M.A., D.Phil.
(Department of Zoology, Leeds University)

INTRODUCTION

The present paper deals with the taxonomy of the nymphs and adults of the three *Elipsocus* species which are common in Britain—*hyalinus*, *westwoodi* and *mclachlani*. During the course of an ecological study of these species at Malham in Yorkshire (Broadhead and Thornton, 1954), it was necessary to identify every individual captured whether nymph or adult. It was possible to recognize the various instars of these species and to identify specifically the nymphs at each instar. The specific characters of the adults, listed by Kimmins (1941) and Badonnel (1943) have been reviewed. Their variation in the Malham populations has been studied, and only those characters which have proved most reliable in distinguishing these species are included in the short diagnoses given here. Notes are also given on distribution and mating behaviour.

ADULTS

(*a*) Females

Females of *E. hyalinus*, *westwoodi* and *mclachlani*, whether freshly emerged or otherwise, may readily be identified by three characters in combination—the colour pattern on the head, that on the abdomen and the extent of certain pigmented areas on the forewings.

Elipsocus hyalinus (Stephens, 1836) (figs. 1-3, 10)

Psocus hyalinus Stephens, 1836, *Ill. Brit. Ent., Mand.*, **6**: 123; *nec* Hagen, 1861, *Ent. Ann.*: 26.

Elipsocus westwoodi McLachlan, 1867 (partim), *Ent. mon. Mag.*, **3**: 274.

Elipsocus abietis Kolbe, 1880, *Jber. Westfäl Prov. Ver.*, **8**: 114; Enderlein, 1927, *Tierwelt Mitteleuropas*, **4** (VII, 10): 10; Badonnel, 1943, *Faune Fr.*, **42**: 76; Hartmann, 1951, *Verh. naturf. Ges. Basel*, **62**: 116.

Head dorsally: uniformly dark brown apart from a paler area between the ocelli and each antennal sclerite.

Abdomen dorsally (fig. 10): transversely banded, terga 2 and 3 pale yellow ochre; 4, 5, and most of 6 darker, medium brown or reddish brown; distal part of 6, 7 and proximal part of 8 as terga 2 and 3; apex of abdomen blackish brown.

Forewing (figs. 1-3): Pterostigma uniformly pigmented throughout its length; no fuscous patch over areola postica. Length of forewing 2.87-3.45 mm.

Elipsocus westwoodi McLachlan, 1867 (figs. 4-6, 11)

Elipsocus westwoodi McLachlan, 1867 (partim), *Ent. mon. Mag.*, **3**: 274; Enderlein, 1927, *Tierwelt Mitteleuropas*, **4** (VII, 10): 10; Badonnel, 1943, *Faune Fr.*, **42**: 74; Hartmann, 1951, *Verh. naturf. Ges. Basel*, **62**: 114.

Elipsocus moebiusi Tetens, 1891, *Ent. Nachr.*: 372, 379.

Head dorsally: with a longitudinal dark brown median band from posterior margin of cranium to clypeus and a broad dull yellow band on each side, a cluster of dark brown spots on cranium laterally just above each eye.

Abdomen dorsally (fig. 11): terga 3-7 uniformly covered with granular reddish brown pigment, extending anteriorly in mid line over terga 1 and 2; terga 1 and 2 laterally pale whitish yellow; apex of abdomen blackish brown.

Forewing (figs. 4-6): Pterostigma darkly pigmented in apical two-thirds only; areola postica with distinct fuscous patch over apex; median smokey patch always extends basad along R as far as it extends along M+Cu; whole wing often rather greyish. Length of forewing 2.77-3.31 mm.

Elipsocus mclachlani Kimmins, 1941 (figs. 7-9, 12)

Elipsocus mclachlani Kimmins, 1941 *Ann. Mag. nat. Hist.* (11), **7**: 528.

Elipsocus hyalinus (Stephens) *sec.* McLachlan, 1867, *Ent. mon. Mag.*, **3**: 257; Kolbe, 1880, *Jber. Westfäl. Prov. Ver.* **8**: 114; Enderlein, 1927, *Tierwelt Mitteleuropas*, **4** (VII, 10): 11; Badonnel, 1943, *Faune Fr.*, **42**: 75; Hartmann, 1951, *Verh. naturf. Ges. Basel.*, **62**: 115.

? *Elipsocus brevistylus* Reuter, 1893, *Acta. Soc. Fauna. Flor. Fenn.*, **9** (4): 44 (♂).

Elipsocus hyalinus var. *abdominalis* Reuter, 1904, *Acta. Soc. Fauna Flor. Fenn.*, **26** (9): 6.

Head dorsally: as *westwoodi.*

Abdomen dorsally (fig. 12): tergum 1 anteriorly fuscous; tergum 1 posteriorly and terga 2-7 pale yellow; apex of abdomen dark brown; often from 3 to 5 reddish brown narrow transverse bands along anterior margins of terga 3-7, the bands typically having irregular posterior margins, and never confluent.

Forewing (figs. 7-9): wing membrane always clear, never greyish; markings similar to *westwoodi* with one exception: median smoky band not extending basad along radius (53 out of 60 wings) or if so, only for half as far as it does along M+Cu (remaining 7). Length of forewing 2.31-2.76 mm.

Figs. 1-9 are composite drawings of the forewings based on a study of 46 wings of *hyalinus*, 76 of *westwoodi* and 60 of *mclachlani*. Two of the three figures for each species represent extremes of the extent and density of the pigment, the position of the fork of the radial sector in relation to the origins of M_2 and M_{3+4}, the degree of rounding of the wing apex and the shape and size of the areola postica. The other drawing in each case represents the modal condition of these characters.

It may be noted that the shape of the areola postica is too variable to be useful as a diagnostic character and that the relative position of the fork of the radial sector shows only a modal difference between the species. In *hyalinus* this fork is generally situated between the origins of M_2 and M_{3+4} (in 43 wings out of 46), occasionally (in the remaining 3) it is level with M_{3+4}. In *westwoodi* it is generally level with or only slightly beyond the origin of M_{3+4}

(in 46 wings out of 76). The relative position of this fork is more variable in *mclachlani*. Of other characters suggested in the literature to be of specific value, the maxillary pick, the genitalia and the subgenital plate show no constant features differing in the three species, and the number of long marginal setae on the epiproct has only doubtful reliability.

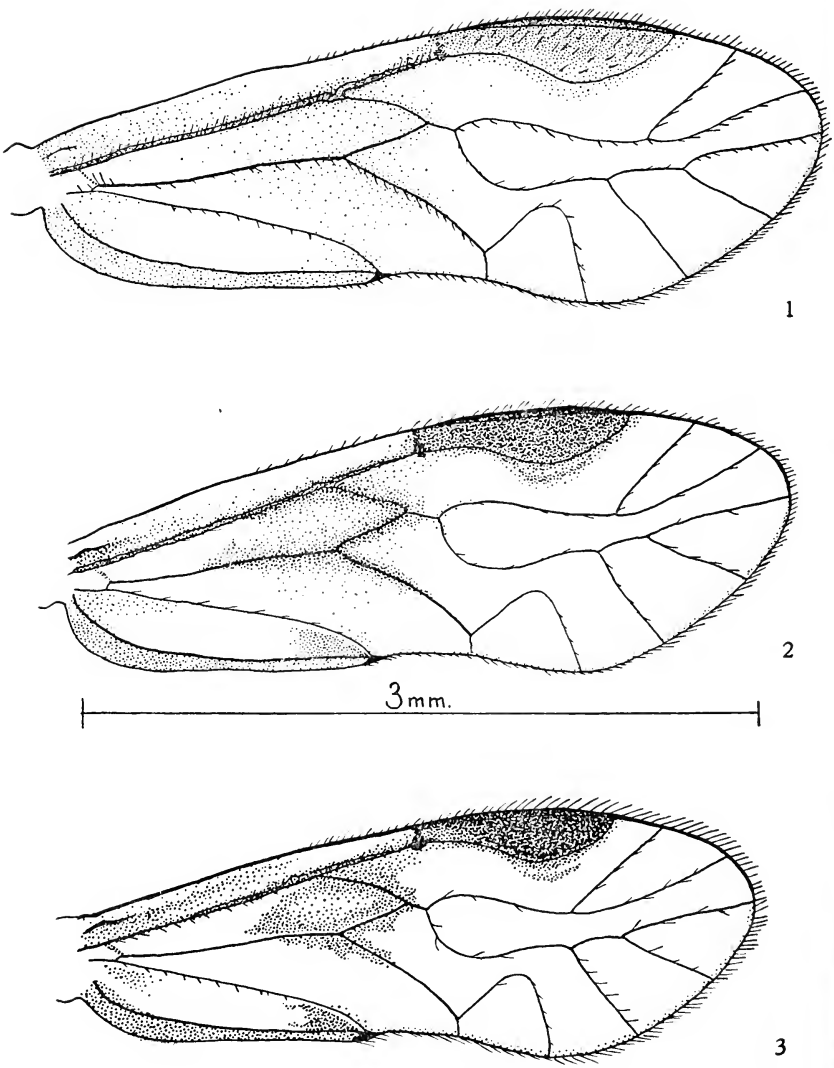
The uniformly pigmented pterostigma, the lack of smoky patch over the areola postica and the distinct line of demarcation running transversely across abdominal tergum 6 between the reddish brown and pale areas are absolutely diagnostic for *hyalinus*, and the last character is always clearly evident in freshly emerged specimens in which the wing pigment has not yet been laid down. The colour of the head is also diagnostic for this species in all except the weakly pigmented individuals, which show a head pattern similar to that of *westwoodi*, but with very much less contrast between the constituent parts. *Westwoodi* and *mclachlani* are more closely related to each other than either of them is to *hyalinus*. They resemble each other in head pattern, in extent of the pigment on the pterostigma and in the presence of pigment on the areola postica. The colour of the abdomen is, however, absolutely diagnostic for living or freshly preserved specimens of both *westwoodi* and *mclachlani*. Specimens of *westwoodi* long preserved in alcohol are apt to lose the abdominal pigment and, in this case, the extension of the median smoky patch basad along the radius is reliable for separating these two species.

The range of variation of metric characters within the species

1. Comparison of the three species.

Measurements of the females of each of the three species, captured at Malham, given in Table 1, comprise three head measurements, two of the antennae, two of the hind legs and the forewing length (fig. 13). The ranges of variation of the head and leg characters of all three species overlap extensively. *Mclachlani* is, however, much smaller than the other two species in forewing length and in the length of the flagellum and of the first flagellar segment, there being no overlap between *mclachlani* and either *westwoodi* or *hyalinus* in these characters.

The coefficients of variability have been compared by the following method. The difference between two coefficients, if greater than twice the square root of the sum of the squares of the two standard errors, is regarded as significant at the 5% probability level. The standard error of the coefficient of variability is computed by dividing the coefficient by the square root of twice the number of items in the sample. The results are as follows. The bisexual *mclachlani* is more variable than the parthenogenetic *hyalinus* in the two antennal characters, but the coefficients of these two species are not significantly different for the remaining six characters. The bisexual *westwoodi* is more variable than *hyalinus* in the two antennal and the two hind leg characters. There is no significant difference between these two species in the variabilities of the three head measurements. *Hyalinus*, however, is slightly more variable than *westwoodi* in forewing length. *Westwoodi* and *mclachlani* show no consistent difference in variability. The former is the more variable of the two in the two leg characters, whereas the latter species is the more variable in forewing length, and there is no significant difference in the variabilities of the head and antennal characters. Another aspect of this comparison between the variability of the three species may be brought



Figs. 1-3. Forewings of *E. hyalinus*, female.

out by comparing the range of the coefficients over all eight characters in each species. Thus, *hyalinus* shows coefficients ranging from 2.50 to 3.52, whereas *westwoodi* shows a corresponding range of 2.60 to 5.31 and *mclachlani* 2.51 to 6.50. With reference to variation within a single population, these results therefore indicate that the parthenogenetic *hyalinus* is less variable than either of the bisexual species.

TABLE 1

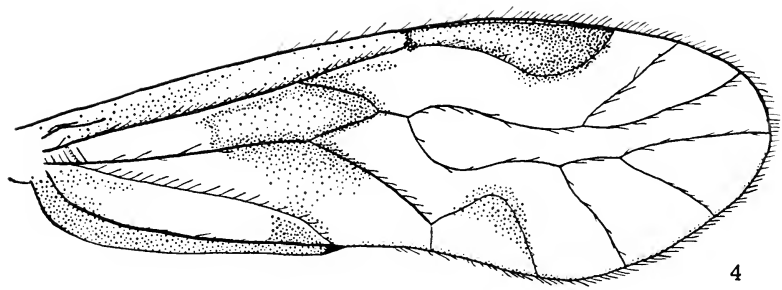
Linear measurements (mm.) of female *Elipsocus hyalinus*, *westwoodi* and *mclachlani* from Malham

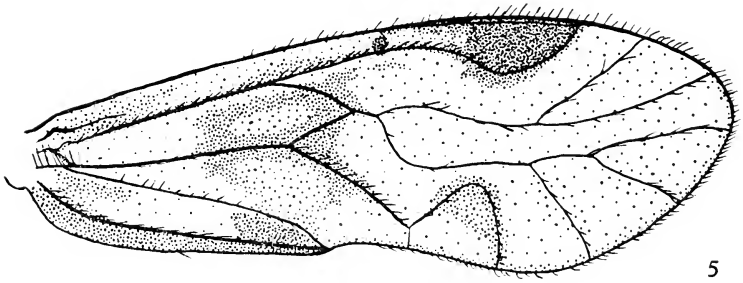
	Number measured (=number of individuals)	Observed extremes (mm.)	Mean ± standard error of mean (mm.)	Standard deviation (mm.)	Coefficient of variability ± its standard error
(*a*) *E. hyalinus.*					
Interocular distance	50	0.379-0.438	0.407±0.002	0.012	2.918±0.292
Total head width	50	0.608-0.703	0.651±0.002	0.016	2.497±0.250
Head width excluding eyes	50	0.484-0.562	0.526±0.002	0.015	2.840±0.284
Flagellum length	50	1.690-1.987	1.824±0.009	0.064	3.515±0.352
Length of 1st flagellar segment	50	0.382-0.453	0.410±0.002	0.014	3.515±0.352
Forewing length	110	2.872-3.452	3.151±0.010	0.106	3.352±0.226
Hind femur length	50	0.492-0.555	0.520±0.002	0.015	2.811±0.281
Hind tibia length	50	0.939-1.124	1.039±0.005	0.037	3.518±0.352
(*b*) *E. westwoodi.*					
Interocular distance	26	0.440-0.485	0.459±0.002	0.012	2.596±0.360
Total head width	38	0.671-0.757	0.714±0.003	0.019	2.681±0.308
Head width excluding eyes	38	0.536-0.611	0.569±0.003	0.020	3.536±0.406
Flagellum length	50	1.782-2.204	2.011±0.014	0.097	4.835±0.484
Length of 1st flagellar segment	50	0.397-0.506	0.441±0.003	0.023	5.308±0.531
Forewing length	63	2.773-3.310	3.075±0.010	0.080	2.602±0.232
Hind femur length	57	0.492-0.600	0.552±0.004	0.027	4.928±0.462
Hind tibia length	57	0.932-1.161	1.053±0.007	0.055	5.219±0.489
(*c*) *E. mclachlani.*					
Interocular distance	51	0.413-0.472	0.444±0.002	0.013	2.828±0.280
Total head width	63	0.613-0.695	0.660±0.002	0.017	2.514±0.224
Head width excluding eyes	63	0.496-0.566	0.532±0.002	0.014	2.716±0.242
Flagellum length	67	1.262-1.605	1.467±0.009	0.072	4.940±0.427
Length of 1st flagellar segment	69	0.259-0.361	0.320±0.002	0.021	6.495±0.553
Forewing length	60	2.307-2.761	2.565±0.012	0.091	3.550±0.324
Hind femur length	68	0.443-0.541	0.508±0.002	0.015	2.916±0.250
Hind tibia length	69	0.779-0.985	0.906±0.004	0.032	3.549±0.302

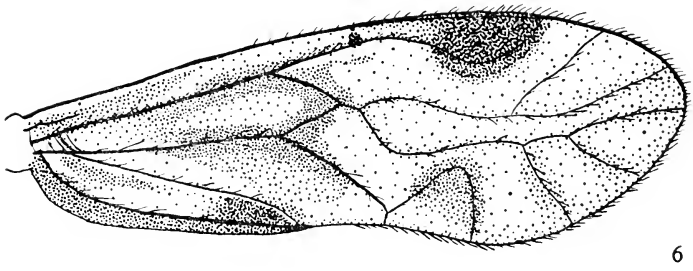
TABLE 2

The percentage of individuals of *Elipsocus hyalinus*, *westwoodi* and *mclachlani* showing venational aberrations

	hyalinus	*westwoodi*	*mclachlani*
In the forewing	8	8	22
In the hind wing	2	4	14







Figs. 4-6. Forewings of *E. westwoodi*, female (scale as for figs. 1-3).

2. Venational aberrations in the three species.

Many psocids, apart from those showing a distinct alary dimorphism, show a very great variability in wing size. In such species, the venation is often very variable also, the brachypterous forms having a simplified vein pattern. Enderlein (1908) describes a wide range of variation in the venation ol *Psoquilla microps* (End.), which has relatively short wings, and Badonnef (1943) mentions the "extremely numerous and varied aberrations of venation" in the brachypterous form of *Psyllipsocus ramburii* Selys.

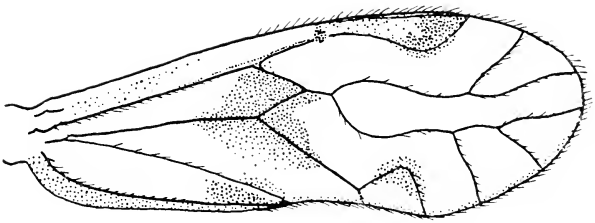
The three *Elipsocus* species studied here are all fully winged, but the measurements of various body characters given above do suggest, however, that a reduction of the wings is beginning to take place in *mclachlani*. Whereas the head and leg measurements of *mclachlani* overlap extensively those of *hyalinus* and *westwoodi*, the forewing and the two antennal measurements do not do so and are much smaller than those of the other two species. The ratios of forewing length to total head width are 4.84, 4.31 and 3.89 in *hyalinus*, *westwoodi* and *mclachlani* respectively, and the ratios, forewing length to hind femur length are 6.06, 5.57 and 5.05 respectively.

The wings of 50 females of each of the three species, collected at Malham, were examined for the duplication or loss of veins or parts of veins. In the forewings the nature of the aberrations was most frequently a loss of one of the branches of the media, breakage or loss of part of Cu_1, which forms the areola postica, and a lack of fusion of Rs and M. In the hind wings, the most frequent aberration in *mclachlani* was the absence of vein R_{2+3}, whereas the three cases recorded for *hyalinus* and *westwoodi* all consisted of a duplication of this vein. The numbers of individuals, expressed as a percentage, showing some aberrational feature in the venation are given in Table 2. In all individuals except two, the aberration was present on only one of the pair of fore- or hind-wings. This suggests that these aberrations are not under direct genetic control, but the much greater frequency of aberrations in *mclachlani* presumably implies some greater genetic instability, as compared with the others. In the two individuals, both *mclachlani*, in which the same aberration was present on both wings, one showed a lack of fusion of the radial sector and the media in both forewings and the other lacked the vein R_{2+3} in both hind wings.

The distribution of these venational aberrations with reference to wing size in 87 wings of *mclachlani* selected at random, is given in fig. 14. The modal forewing length for those individuals showing these venational aberrations is well below the modal length for all individuals. The presence of these aberrations would, therefore, appear to be associated with the smaller wings. The incipient wing reduction and the greater frequency of aberrant venation in *mclachlani* are not associated, however, with any unusually high variability of wing length. Although *mclachlani* is more variable than *westwoodi* in forewing length, there is no significant difference between *mclachlani* and *hyalinus* in this respect.

3. Comparisons of populations of one species.

E. westwoodi females were collected from Exeter on 23rd July, 1951, from Aberdeen, 500 miles to the north, on 2nd September, 1951, and from Malham, midway between these two localities, in September of the same year. The lengths of the hind femur and of the hind tibia are given in Table 3. The



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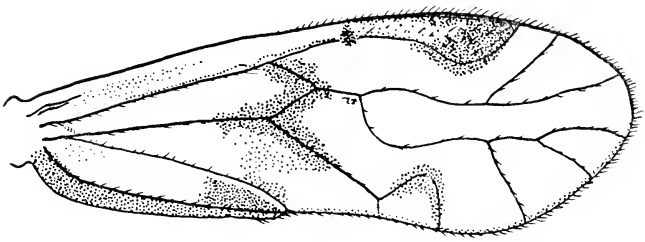

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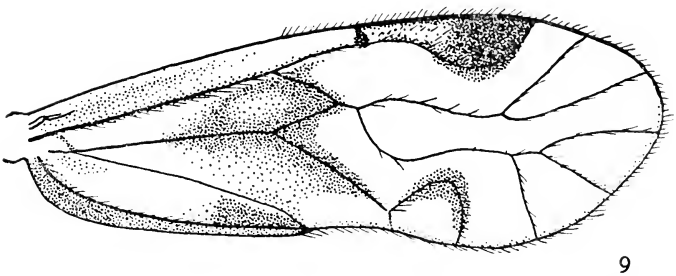

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Figs. 7-9. Forewings of *E. mclachlani*, female (scale as for figs. 1-3).

three sample means differ significantly for both tibia and femur, except for the hind tibia means of the Exeter and Aberdeen samples. A variance analysis of these data indicates a heterogeneity in which three distinct populations are involved. The variance ratio (the ratio of the "between samples" mean square to the "within samples" mean square) is 20 for the tibia and 10 for the femur, and in the latter case, for example, a value as high as 10 could only occur fortuitously by a much less than 1 in 100 chance, if the three samples were taken from one homogeneous population. It will be noted that there is no regular gradation in size from north to south. The power of dispersal of these insects is discussed by Broadhead and Thornton (1954).

TABLE 3

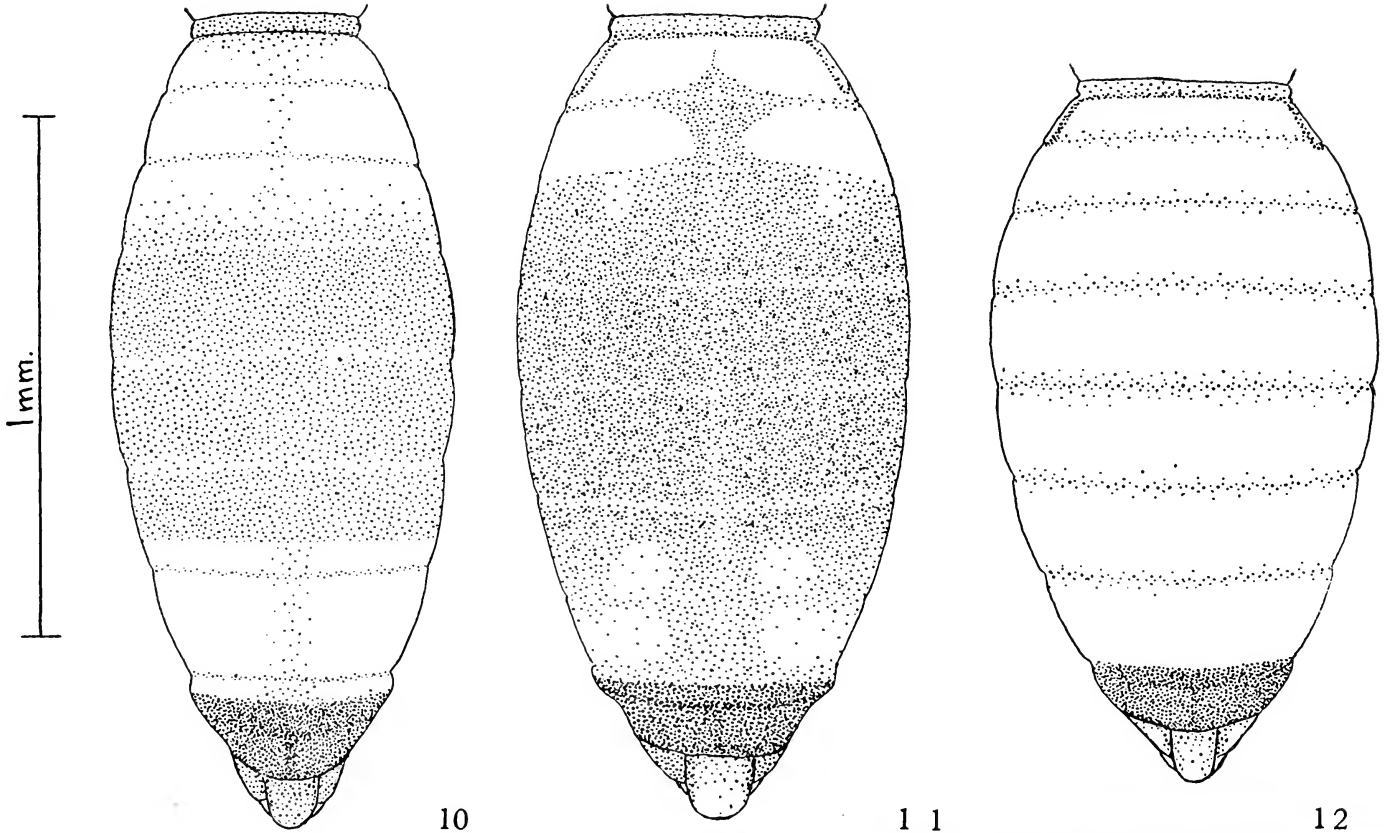
Length of hind tibia and hind femur in three *E. westwoodi* populations

	Hind tibia		
	Exeter	Malham	Aberdeen
Number measured (=number of individuals)	59	57	63
Observed extremes (mm.)	0.998-1.264	0.932-1.161	1.000-1.286
Mean ± standard error of mean (mm.)	1.091 ±0.006	1.053 ±0.007	1.100 ±0.006
Standard deviation of items in sample (mm.)	0.050	0.055	0.048
Coefficient of variability ± its standard error	4.54 ±0.42	5.22 ±0.49	4.35 ±0.39

	Hind femur		
	Exeter	Malham	Aberdeen
Number measured (=number of individuals)	59	57	63
Observed extremes (mm.)	0.529-0.595	0.492-0.600	0.518-0.609
Mean ± standard error of mean (mm.)	0.561 ±0.002	0.552 ±0.004	0.571 ±0.002
Standard deviation of items in sample (mm.)	0.016	0.027	0.019
Coefficient of variability ± its standard error	2.77 ±0.26	4.93 ±0.46	3.26 ±0.29

(*b*) Males

The males of *E. westwoodi* and *E. mclachlani* have noticeably larger eyes and smaller abdomens than the females, and the wings lack the pigmented patches except for the pterostigma, which is entirely fuscous. No character of venation or wing marking has been found satisfactory for specific identification. Although the abdomen is smaller, it has a similar colour pattern to the female (figs. 11-12) and in freshly killed specimens this character is diagnostic. Even after preservation in 70% alcohol for a few months, the pattern is still recognizable, but beyond that time the pigment fades and specific diagnosis by this character becomes less certain. No males of *hyalinus* have been recorded from this country, despite intensive collecting, but males have been recorded in Switzerland by Hartmann (1951) and in France by Badonnel (1943).



Figs. 10-12. Female abdomen dorsally to show colour pattern. (10) *E. hyalinus*, (11) *E. westwoodi*, (12) *E. mclachlani*.

Eggs

Pearman (1928) has described the eggs of *hyalinus* and *westwoodi* as "scattered, ovoid, brown grey eggs, with an amorphous but not dense coating (often deficient above) of brownish bark granules." The eggs of all three species fit this description and are, in fact, indistinguishable from each other. They are large, relative to the size of the insect, 0.42-0.51 mm. long and 0.22-0.26 mm. broad. The chorion is smooth with a pearly lustre. They are laid usually on the underside of the twigs and branches, in the crannies of the bark, and are covered by a few silken threads or by none at all. They are evidently laid singly, since isolated eggs on the twigs are as frequent as clusters of eggs, which probably are the result of successive ovipositions of single eggs by several females at the same spot.

Nymphs

Attempts to rear *Elipsocus* species in the laboratory from egg to adult resulted in a very heavy mortality, so that direct observation of the number of moults could not be made. It has, however, proved possible to differentiate the *Elipsocus* nymphs from those of other psocid species, and to recognize and identify the separate nymphal instars of the three species. The nymphal material was obtained by taking weekly samples from larch trees at Malham in 1952. The data on the times of occurrence of the successive instars at this

Table 4

Head widths of nymphs of *Elipsocus hyalinus*, *westwoodi* and *mclachlani*, and the application of Dyar's Law

Instar	Number measured	Observed extremes	Observed mean (mm.)	Ratio of increase	Expected width	Difference from observed
E. hyalinus.						
1 ..	7	0.212-0.232	0.223	—	—	—
2 ..	12	0.256-0.286	0·272	1.220	0.271	0.001
3 ..	5	0.311-0.326	0.318	1.169	0.329	0.011
4 ..	9	0.383-0.404	0.391	1.229	0.400	0.009
5 ..	10	0.478-0.517	0.498	1.274	0.486	0.012
6 ..	20	0.580-0.625	0.590	1.185	0.590	0.000
				Mean: 1.215		
E. westwoodi.						
1 ..	8	0.215-0.242	0.236	—	—	—
2 ..	11	0.265-0.296	0.284	1.203	0.288	0.004
3 ..	20	0.311-0.361	0.343	1.208	0.351	0.008
4 ..	11	0.407-0.430	0.421	1.227	0.427	0.006
5 ..	16	0.497-0.579	0.526	1.249	0.521	0.005
6 ..	10	0.617-0.671	0.635	1.207	0.635	0.000
				Mean: 1.219		
E. mclachlani.						
1 ..	14	0.216-0.231	0.225	—	—	—
2 ..	10	0.271-0.289	0.281	1.248	0.272	0.009
3 ..	12	0.316-0.349	0.338	1.203	0.330	0.008
4 ..	20	0.384-0.425	0.404	1.195	0.399	0.005
5 ..	17	0.475-0.516	0.501	1.240	0.482	0.019
6 ..	20	0.566-0.595	0.583	1.163	0.584	0.001
				Mean: 1.210		

locality, obtained as a result of this taxonomic work, are given in the ecological study of these species by Broadhead and Thornton (1954).

1. Generic identification.

The general question of the generic identification of psocid nymphs has not been explored, since it was only necessary to distinguish the *Elipsocus* nymphs collected at Malham from the nymphs of the small number of other psocid species occurring in this locality.

Although nine other psocid species occur at Malham, only three of these were present in sufficient numbers to warrant a detailed examination. The nymphs of these three species were distinguished from those of *Elipsocus* in the following way: *Mesopsocus unipunctatus* (Müller) nymphs appear earlier in the season, are larger and also differ from *Elipsocus* nymphs in having no preapical tooth on the claw, in head marking and in having a mottled

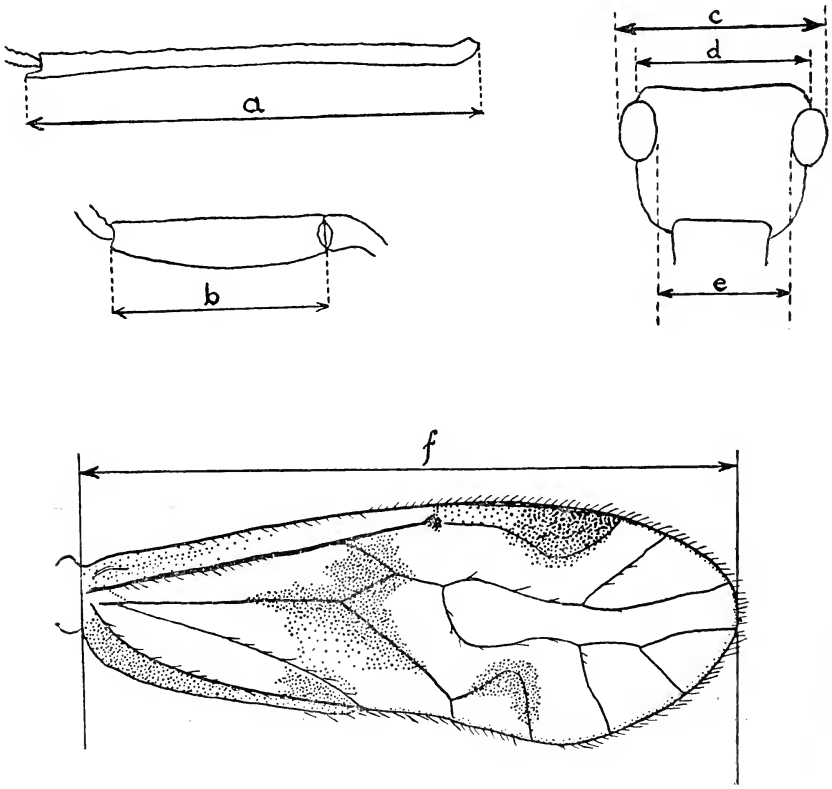


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Fig. 13. Hind tibia (a), hind femur (b), head (c, d, e), and forewing (f) to indicate measurements taken.

abdomen; the nymphs of *Amphigerontia contaminata* (Stephens), unlike those of *Elipsocus*, possess capitate glandular hairs over the body and differ in the shape of the head capsule; the nymphs of *Philotarsus picicornis* (Fabricius) were difficult to recognize in the early instars, but were readily identified in the later instars by the presence of yellow bands on the body, dark rings on the legs and by the head pattern. Nymphs of all instars of the first two species were discarded from the samples of psocid nymphs taken weekly from the larch trees at Malham in 1952. The separation of the last species was evidently complete even in the earliest instars, judging from the regularities shown by the measurements recorded below (fig. 16).

2. Identification of the successive instars.

A mixed collection of nymphs of the three species was separated under the binocular microscope into five groups using the size of the developing wing pads as a grouping character. The groups thus formed were quite distinct, showing no intermediates. In the group containing the smallest individuals, which showed no discernible wing pads under the binocular microscope, a further division was made on the number of antennal segments, some individuals having 8 and others 13 segments. Moreover, further examination at greater magnification showed that the individuals with 13 antennal segments had in fact small wing buds on the thorax, and were in all cases larger in head capsule width than those with only 8 segments. The nymphs in all the other groups had 13 antennal segments and showed a size difference between one group and the next. Thus, six nymphal instars were indicated but this could not be confirmed until a specific diagnosis of this mixed collection of these nymphs was found possible.

3. Specific diagnosis of each instar.

The last instar nymphs of the three species could be divided into three distinct groups by the colour pattern of the dorsal surface of the abdomen, no intermediate forms being found. These three patterns were almost identical with those of the abdomen of the adult females of the three species (figs. 10-12), so that the last instar nymphs were thereby definitely identified. In the earlier instars, the pigmentation is much less intense and is very often not sufficiently differentiated to allow specific diagnosis. In the very small nymphs no colour pattern whatsoever is present.

The colour pattern of the last instar nymphs was, however, found to be correlated with the length of the abdominal hairs, which thus provides a convenient alternative diagnostic character. *Westwoodi* has the shortest hairs, those of *mclachlani* are much longer, while *hyalinus* has fairly short hairs over the abdomen generally, but has very long setae on the last three segments.

Mixed collections of nymphs of each instar (the instar being distinguished as described above) were examined for abdominal hair length. The nymphs were treated with cold 10% KOH solution for twenty-four hours, stained with acid fuchsin, mounted ventral side uppermost, and the longest hair on the lateral margin of the last abdominal segment measured. The results, plotted in fig. 16, show that this character separates the nymphs of each of the last five instars into three distinct groups. There is, however, some overlap in the case of the first instar. This overlap is not extensive, as shown by the

histogram (fig. 15), which is trimodal. The three modes have been related to the species by measuring the bristles of first instar nymphs hatched in the laboratory from known eggs.

The specific identity of the three groups in the first instar and in the last instar has thus been obtained. The measurements of the intermediate instars, when plotted, fall along three regular and distinct curves linking the first and the last instar of each species (fig. 16). These curves therefore represent the three species of *Elipsocus* and their regularity and distinctness indicate that all the early *Philotarsus* nymphs in the original samples had been removed (p. 59).

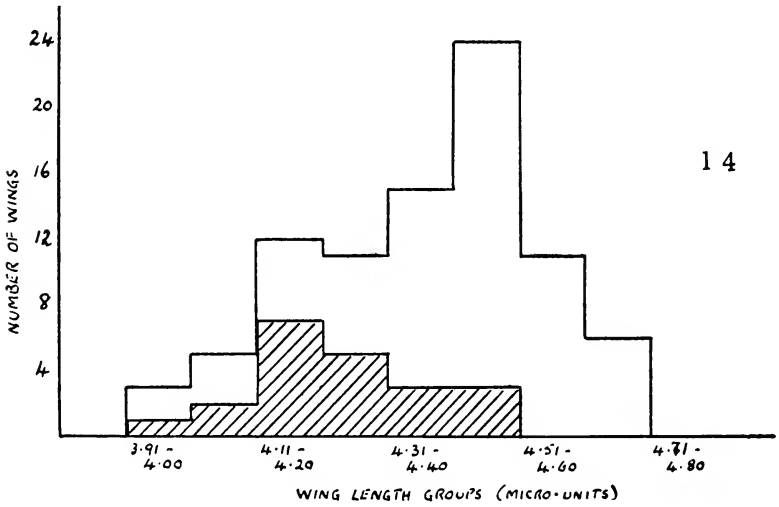


Fig. 14. Histogram of forewing length of adult female *E. mclachlani*. The shaded portion indicates wings having aberrant venation. (1.00 micro-unit=0.588 mm.).

4. Confirmation of the number of instars for each species.

After separating the nymphs into the three species, six nymphal instars were indicated for each species, using, as diagnostic characters, wing pad size, antennal segment number and head width. It may be mentioned here that in all three species the antennae attain their adult number of segments (13) in the second instar. The first instar has 8 antennal segments, 6 of these being the flagellum. Each of these flagellar segments, except the distal one, divides into two at the next moult, so giving the adult number. In no case was there any overlap in head width from one instar to the next. The fact that the smallest nymphs from the collected samples were first instar was established for all three species by the measurement of nymphs newly hatched from known eggs. The sixth instar was established as the last nymphal instar, since nymphs with head widths falling into this range emerged as adults at the next moult.

There remains the possibility of the absence of one instar in the collected samples. This was checked by the application of Dyar's Law. The head width (including the eyes) of a number of individuals of each instar of each species was measured, and the logarithmic plots of these data approximate closely to a straight line. Moreover, the coefficient of increase of the head width for each instar can be calculated and an average coefficient of increase obtained for each species. Using this and the observed head width of the first instar, theoretical figures can be obtained for the head widths of the succeeding instars, and if there are in fact six instars, these calculated figures should approximate closely to the observed means. Table 4 shows that this is the case, thus confirming that there are six nymphal instars for each of the three species.

General biology

Geographical distribution

The locality records in the literature are too meagre to define the southern and eastern limits of the distribution of the three species. All three species

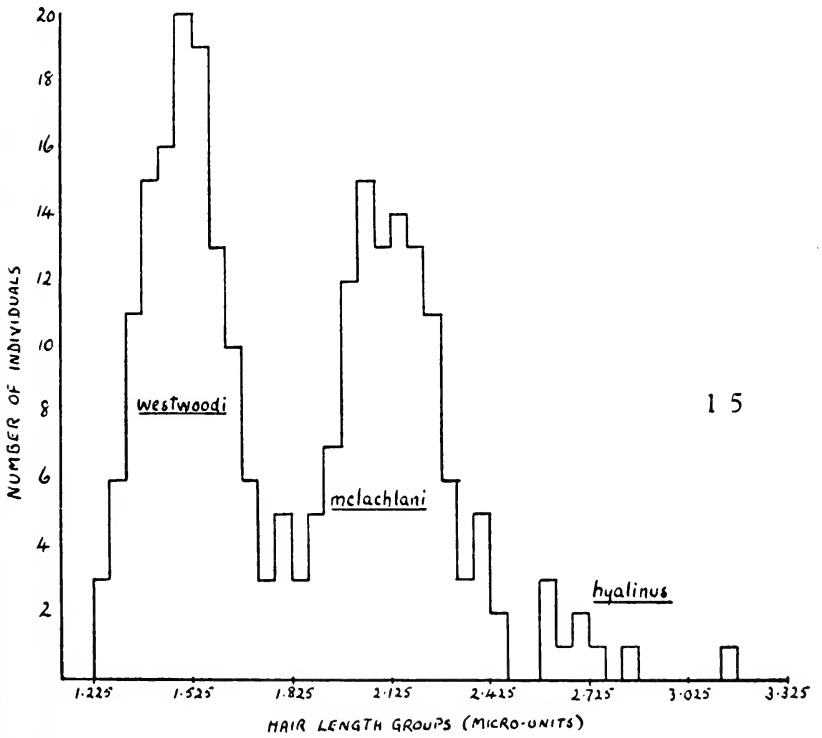
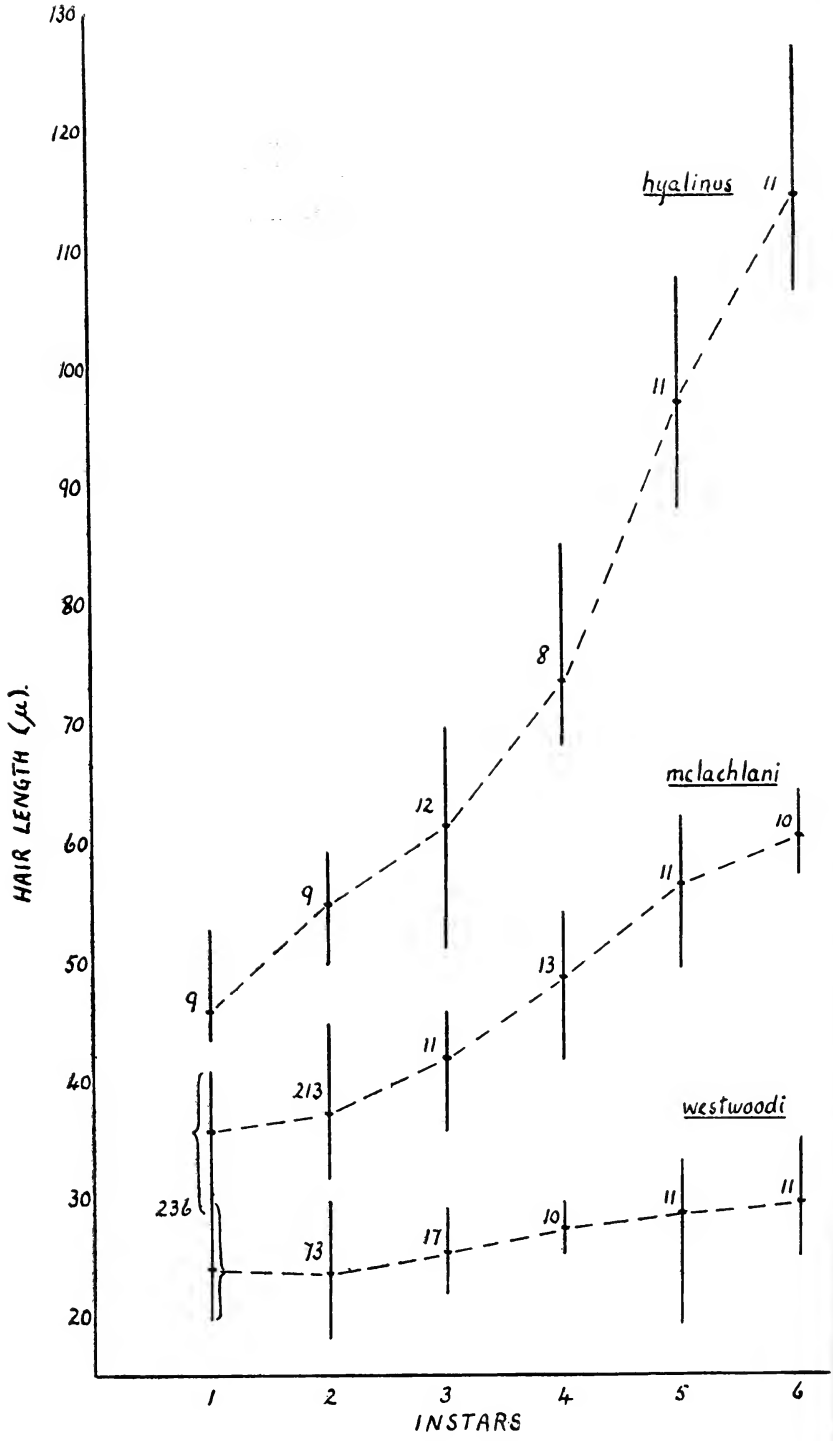


Fig. 15. Frequency distribution of abdominal hair length of 1st instar *Elipsocus* nymphs. (1.00 micro-unit = 16.7 μ.)


HAIR LENGTH (μ).
130
120
110
100
90
80
70
60
50
40
30
20
1
2
3
4
5
6
INSTARS
hyalinus
mclachlani
westwoodi
9
9
12
8
11
11
10
13
11
213
236
73
17
10
11
11

have been recorded from France (Badonnel, 1943), Germany (Roesler, 1935), Switzerland (Hartmann, 1951), Romania (Marcu, 1938), Sweden (Tullgren, 1909), and Finland (Reuter, 1893, 1904). *Mclachlani* and *hyalinus* have been recorded from Norway by Enderlein (1910), *mclachlani* and *westwoodi* from Bornholm by Esben-Petersen (1933), and *hyalinus* and *westwoodi* from Holland (personal observations, E.B.), and from Italy (Ribaga, 1900). *E. westwoodi* is reported from Czechoslovakia (Obr, 1948). None of the species occurs in Iceland (Fristrup, 1942), or the Faroes (Henriksen, 1937).

Distribution in Britain

Kimmins (1941) has summarized the county locality records for this country. To his list may be added: *hyalinus* in Devon, Cambridgeshire, Oxfordshire, Yorkshire and Aberdeen; *westwoodi* in Yorkshire, and *mclachlani* in Yorkshire. These combined records are sufficient to indicate that all three species are generally distributed throughout the British Isles, although it would appear that *mclachlani* is much less frequently taken.

Mating behaviour

Elipsocus species mate only very reluctantly under laboratory conditions. Many attempts were made to observe the mating behaviour by enclosing virgin females of various ages with males of various ages in inverted corked 3″ × 1″ glass tubes under various light intensities. Courtship was observed in only two pairs, one of *mclachlani* and one of *westwoodi*, and both in the morning in direct sunlight. The *mclachlani* pair consisted of a six-day old virgin female and a male freshly taken in the field. On introduction, the male immediately vibrated his wings on three successive occasions, each set of vibrations lasting about half a second, with half a second between the sets. These vibrations were made with the wings half open, at an angle of about 45° with the body and raised slightly above it. Between each set of vibrations the wings returned to their normal resting position roofwise over the abdomen. After a few seconds, another two sets of vibrations occurred, and then another two, followed by three more. The male then mounted on the back of the female, but quickly dismounted, after which no further responses were observed. The pair of *westwoodi* showed a greater response. The male vibrated his wings in a manner indistinguishable from that already described for *mclachlani*, whenever it was within 2 mm. of the female and occasionally when as far away as 5 mm. The male became more active and the interval between successive sets of wing vibrations decreased. After about two minutes, the female, which had hitherto been walking about slowly, remained still. The male then approached her from behind, clambered on to her back and then forwards over her until he was directly in front of her. Spreading his wings at right angles to his body, he moved backwards beneath her. The female then flexed her abdomen strongly downward and forward, the male's abdomen being flexed upwards, until the tips came into contact. They remained in this position for only half a minute, after which time the female withdrew.

Fig. 16. Length of longest hair on last abdominal segment of *Elipsocus* nymphs. The vertical lines indicate the range observed in each sample and the figures the sample size. The broken lines join the means of successive instars.

Since coitus in other psocids usually lasts about half an hour, this separation was evidently premature.

The courtship of the two species is obviously extremely similar. Pearman (1928), observing the courtship of *mclachlani*, recorded that the two insects faced one another and the male then quickly spun round and moved backward beneath the female, without having first walked over her. Both these types of behaviour have also been recorded in *Liposcelis rufus* Broadhead (Broadhead, 1952).

ACKNOWLEDGMENTS

We desire to express our thanks to Professor E. A. Spaul for his kindness in reading and criticizing the manuscript, and to the Nature Conservancy for a post-graduate Research Studentship which enabled I.W.B.T. to participate in this investigation.

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Further Notes on the Distribution of British Orthopteroids

By D. Keith McE. Kevan

Since the publication of the distributional "Summary" of British Orthopteroid insects and the two supplements to it (Kevan, 1952, 1953, 1953a), various additional vice-comital records continue to be sent to me by correspondents, to all of whom I am most grateful. There are also certain inaccuracies requiring correction which come to light from time to time. The following notes are aimed at further amending the "Summary."

Blattodea

Blatta orientalis L. This was omitted by an oversight from v.c. 39; it is recorded in the "Victoria County History" of Staffordshire (Jourdain, 1908). Mr. H. W. Daltry (*in litt.*, 1954) also records it as plentiful in Staffs., although he gives no precise locality. The record from Gloucestershire (whence it was already known) given by Kevan (1953a) was an error due to transposition of type; this record actually refers to *Blattella germanica* (L.)—see below.

Periplaneta americana (L.) and *P. australasiae* (F.). George (1954) doubts the authenticity of the records for Gloucestershire W. (v.c. 34) based on the vague data of Lucas (1920) and Fletcher (1937) for which seaport localities were presumed. He adds v.c. 33 for both species, however, *P. americana* being recorded from oil-cake mills at Gloucester (where it might be established); his record of *P. australasiae* doubtless refers only to a casual specimen.

[*Nauphoeta cinerea* (Ol.). This not uncommonly imported cosmotropical alien may very dubiously be added to the list of species which from time to time have become temporarily established under artificial conditions in this country. Raffil (1910), followed by Zacher (1920), recorded it (together with its relatives, *N. brazzae* Bol. and *Pycnoscelus surinamensis* (L.)) under glass in London. The inference is that it was established as a pest although this may be doubtful. Illingworth (1942) also alludes to its occurrence in London.]

Blattella germanica (L.) [=*transfuga* (Brünn.)]. I am indebted to Mr. H. W. Daltry for drawing attention to his record of this species from Staffordshire (v.c. 39) (see Daltry, 1939, *Trans. N. Staffs. Fld. Cl.*, 74: 41). The record of this species from the city of Gloucester (v.c. 33, not 34) has already been noted under *Blatta orientalis* (above). Fletcher's (1937) imprecise record from the county was inadvertently omitted from the "Summary." George (*l.c.*), on the basis of these two records, now gives the distribution as v.c. 33 and ? 34.

Ectobius lapponicus (L.). This is now recorded by Pickard (1954) from Jersey. The same author also lists *E. pallidus* (Ol.) from Guernsey (whence there is a record—of "*E. perspicillaris*"—which was omitted from the "Summary"), but not from Alderney (to which the same remarks apply). Owing to early confusion in this genus, it is not impossible that these refer to *E. lapponicus* also.

Phasmatodea

Acanthoxyla prasina (Westw.). The vice-comital distribution of this species is not yet further extended, but its thorough establishment on the mainland of South Devon is discussed by Rivers (1953; 1953a).

Carausius morosus Brunn. v. W. In the "Summary" it is stated that no record of the common Laboratory Stick-insect having become established unattended, even temporarily under artificial conditions, had come to light in this country. Rivers (1953a), however, states that it was "a plague" in the municipal greenhouses at Torquay (v.c. 3). The same author (*in litt.*, 1954) indicates the species as having been troublesome in certain houses at Kew Gardens (v.c. 17). Mr. H. K. Airy Shaw (*in litt.*, 1954) also confirms that stick-insects were found living freely there on some of the plants in one of the large houses a few years ago and that "their presence was looked upon with much official disfavour at the time of their discovery!" It would be interesting to learn just to what extent this species is now established as an "escape" in British greenhouses, especially since it appears to have acquired unforeseen notoriety as an injurious insect.

Orthoptera (s. str.)

Tettigonioidea

Meconema thalassinum (Deg.). Mr. H. W. Daltry kindly draws my attention to his record of this species from Staffordshire (v.c. 39) (see Daltry, 1933, *Trans. N. Staffs. Fld. Cl.*, **68**: 136); this vice-county was previously omitted from the distribution of the species. Mr. W. K. Ford of the Liverpool Museum kindly provides the data upon which Lucas (1930) based his general record for Lancashire: namely, 1 ♀, Droylsden [v.c. 59], in station yard, 5.ix.1922 (W. Buckley) [Manchester Museum]. It may also be noted that the reference to K. G. V. Smith's Salop record should have been cited as 1954 [Jan.] and not 1953 [Dec.] as anticipated by Kevan (1953a).

Pholidoptera grisepaptera (Deg.). The record for Huntingdonshire (v.c. 31) given by Omer-Cooper (1926) was inadvertently omitted from the "Summary."

Platycleis denticulata (Pz.). Mr. Ford also furnishes a new Welsh record of this species: 1 ♂, Aberdaron, Caernarvon [v.c. 49], 16.vii.1941 (M. E. Pickles); there is also 1 ♂, Manobier [v.c. 45], 20.viii.1943 (M. E. Pickles), but the species has already been recorded from Pembroke, as have *Tettigonia viridissima* L. and *Pholidoptera griseoaptera* (Deg.), for each of which a female is recorded bearing the same data as the last.

Metrioptera brachyptera (L.). Again Mr. Ford sends a record new to v.c. 49; 1 ♂, 1 ♀, Aberdaron, 16.vii.1941 (M. E. Pickles). He also records the species for the first time from Cheshire (v.c. 58): Newchurch Common, 16.vi.1940 (H. Britten) and Abbot's Moss, 3.viii.1941 (H. Britten). For Staffordshire (v.c. 39) Mr. H. W. Daltry (*in litt.*, 1954) draws attention to the record published by him in 1933 (*Trans. N. Staffs. Fld. Cl.*, **68**: 136). It was common amongst Ling (*Calluna vulgaris*) and Bilberry (*Vaccinium Myrtillus*) on Camp Hill, Maer Woods, about three miles south of Madeley. An interesting point is that the hill was rather dry (contrary to what is generally regarded as a more usual habitat). Mr. Daltry also says that he knew of one or two spots where a few rushes grew but the species seemed to favour the driest parts where there was no sign of free moisture. He further adds that he has observed this insect in five other localities, only one of which could be described as really wet (Matley Bog, New Forest). The other localities were: the driest part of Whixall Moss, Salop (where it was not at

all common); Lord's Wood, Southampton (1 ex. among brambles about 4 ft. from the ground); Portland Island (Dorset), east side, between Garton and Southwell (in an approach to a disused quarry); near Stimford, Dorchester (Dorset), on the heath at the edge of Duddle sandpit.

Leptophyes punctatissima (Bosc). Mr. Daltry records one adult from Wavely Wood, near Leamington, Warwicks. [v.c. 38], autumn, 1952; "nymphs were abundant last summer [1953], but I saw no adults this autumn."

Grylloidea

Nemobius sylvestris (Bosc).* Daltry (1953) confirms the occurrence of the Wood Cricket in Dorset (v.c. 9), its status there having previously been doubtful. The species is added to the Channel Islands (Jersey) list by Pickard (1954).

[*Orocharis* sp. nov. This Eneopterid species deserves no place in the British list, even as a temporarily established alien, but it perhaps deserves mention as something a little out of the ordinary run of casually imported species; there does not appear to be another published record of the importation of any member of the genus, while this species appears to be new to science! The species is a large one for the genus (over 4 cm. long) and West Indian or Central American in origin. It was kindly sent to me (alive) by Mr. D. H. Murphy in mid February, 1953, having been brought to the University from a Durham greengrocer's shop by the local constabulary. The specimen was a male and had been imported with bananas. Until the end of July, 1954, it remained alive and healthy, often singing loudly with a bird-like chirp just after dark.]

Gryllotalpa gryllotalpa L. George (*l.c.*) reports the Mole Cricket from v.c. 34, his reference being the unsatisfactory record of Fletcher (1940); the same author (1939) recorded it earlier and both references cite a prior note (1939, *Field*, **188**: 1227). The record was purposely omitted from the "Summary."

Acridoidea

Tetrix subulata (L.). Le Quesne (1954) and Pickard (1954) list all three British species of *Tetrix* from Jersey, *T. subulata* not having previously been correctly recorded—previous records refer to *T. ceperoi* (Bol.).

I am once more indebted to Mr. W. K. Ford of the Liverpool Museum for the first authentic Irish record of this species: 1 ♀ [f. *bifasciata* (Herbst)], Galway [presumably near the town, v.c. Ireland 17], 20.viii.1937 (M. E. Pickles). The species was recorded previously from Limerick (v.c. Ireland 8) by Lucas (1920) and Burr (1936), but Brown (1950) failed to trace any Irish specimen upon which this record was based, so that it is unknown if *T. subulata* or *T. ceperoi* was involved. Brown suggests that "on the whole, there is some evidence that *T. subulata* is predominantly south-eastern and *T. ceperoi* south-western which makes their Irish status, when we know it, more intriguing." The correctness of Brown's suggestion is dubious, however, since *T. subulata* is now known from every vice-county in which *T. ceperoi* occurs, with the exception of West Cornwall (v.c.1); now it is

* The correct authorship of this name is discussed by Mr. P. D. Gabbutt (1953), to whom I am grateful for the relevant information.

known from Ireland also, whence *T. ceperoi* has not so far been recorded. One may, however, quote Brown further: "The Irish record may therefore indicate that at least one of the species entered Britain in an interglacial or interstadial phase when the northern land-bridge across to Ireland was intact and it is therefore important that a close watch should be kept for either or both species in Ireland."

Tetrix undulata (Swrb.). A misprint in the "Summary" gives this species from Cardiganshire (v.c. 46), where it doubtless occurs, but the actual record is for Merioneth (v.c. 48); Pickard (1954) follows the error in his map.

Stenobothrus lineatus (Pz.). The locality of Mr. J. Ranger's record of this species from the Isle of Wight (Kevan, 1953a) should more correctly be: St. Boniface Downs, Ventnor, 18.vii.1951. In the "Summary" also, it is stated that there is no actual published record for Oxfordshire, but this was a *lapsus calami* (*cf.* Killington, 1939). It was also suggested that Clark (1948) implied records from Oxford, Bucks and Monmouth, but Mr. R. S. George, who has been studying the late E. J. Clark's notebooks, informs me in a private communication (1954) that the latter had no record of the species from any of these counties; v.c.s 24 and 35 thus still lack records.

Omocestus rufipes (Zett.) [=*ventralis* (Zett.)].* Mr. George confirms that the late E. J. Clark's notebooks contain a record from Oxfordshire (Merton, 3.viii.1944), so that v.c. 23 may now stand although Monmouth (v.c. 35) must be deleted from the known vice-comital distribution of the species. Mr. W. K. Ford, however, adds Cheshire and Lancs. S. to the list, specimens from the former (v.c. 58) being known from Delamere, 20.viii.1922 (H. Britten), and from the latter (v.c. 59) from Ainsdale, 18.ix.1923 (H. Britten), and Southport, 4.viii.1934 (L. Nathan). I have not checked these specimens.

Omocestus viridulus (L.). The statement in the "Summary" that no definite published record for this species was known from Oxfordshire and Gloucestershire is incorrect. This was due to an error of transcription and should only have referred to Monmouth (which was also mentioned) since Killington (*l.c.*) records it from Oxford and there are several references to both vice-counties of Gloucestershire. The latter need not be repeated since they are given by George (1954). Mr. George (in private communication) also notes that the late E. J. Clark's notes contain several confirmatory records from v.c.s 23 and 34; Monmouth (v.c.35), however, remains unconfirmed and is thus the only vice-county in *England* from which the species is unrecorded. In Wales, Montgomeryshire (v.c.47) has hitherto remained one of the few vice-counties from which *no* orthopteroid has so far been recorded. Four species of Acrididae were taken casually by the writer while passing through, and of the present species, one female was captured on an upland pasture above the Banw Valley, west of Llangadfan, 11.ix.1954. For Scotland, I am indebted to my colleague, Mr. J. Y. Ritchie, for two new

* Now that the principle of "page priority," established at Paris in 1948, has been reversed in favour of that of the "first reviser" (*cf.* Hemming, 1953), there seems to be no alternative but to accept the opinion of Ander (1943)—rejected by Kevan (1952) before the Copenhagen reversal—and to revert to the specific name *rufipes*, since von Borck's (1848) selection, quoted by Ander, fulfils the necessary conditions laid down at Copenhagen. The name *ventralis* has not really become so entrenched in the literature that there is justification in applying to the International Commission to have *rufipes* suppressed.

vice-county records: 1 ♂ [last nymphal instar], S. side of Struie Hill, Dingwall-Bonar Bridge road, Easter Ross (v.c. 106), 16.viii.1954, and 1 ♂, lower slopes of Stac Polly, W. Sutherland (v.c. 108), 25.viii.1954.

Chorthippus vagans (Eversm.). Attention was drawn by Kevan (1953a) to Fletcher's two dubious records of this species from Gloucestershire. The specimens upon which these were based have now been examined and prove to belong to the next species (*cf.* also George, 1954).

Chorthippus brunneus (Thunb.) [=*bicolor* (Charp.)]. The "Summary" states that there is no definite record from v.c. 33, but this is incorrect; several references exist which were inadvertently passed over. They are given by George (*l.c.*) so need not be repeated here. Mr. George, in private communication, also confirms that the late E. J. Clark's notes contain a record from Glos. E. (Cheltenham to Northleach, roadside, 11.ix.1944). Montgomeryshire (v.c. 47) may now be added to the distribution; I casually took two males on a hillside about four miles west of Welshpool, 11.ix.1954.

Chorthippus albomarginatus (Deg.). George (1954) is unable to confirm the occurrence of this species in Gloucestershire (v.c. 33, 34), nor, according to a communication from Mr. George, does the late E. J. Clark have any record of it from Monmouth (v.c. 35); this is contrary to the implication in the "Summary." These vice-counties must therefore be deleted from the known distribution.

In connection with this species, it may be noted that Mr. J. Ranger took several specimens (13 ex., ♂, ♀) in unmown (lush) grass, Swalecliffe golf course (E. Kent), 9.viii.1953. "All were uniform pale buff with characteristic blackish markings on the sides of the pronotum and elytra," so they must have been rather conspicuous. The interesting point mentioned by Mr. Ranger was that the habitat was much damper than appears to be usual for the species in this county, where it is more commonly met with on sand dunes, etc. The Swalecliffe habitat is more in keeping with what is more frequently found on the Continent. The species is, of course, by no means unknown from moister localities in Britain as its vernacular name of Lesser Marsh Grasshopper indicates.

Chorthippus parallelus (Zett.). Mr. W. K. Ford gives us the first records of this common species from Denbigh (v.c. 50): 1 ♂, St. Asaph, 7.vii.1940; 1 ♀, 13.vii.1940 (both G. E. Williams); I have taken it myself also near Llangollen, 28.viii.1954. Dr. C. H. Andrewes (*in litt.*, 1954) also supplies a new Welsh record from Anglesey (v.c. 52), stating that the species was quite common on the island in 1953; this was confirmed by myself, 9.ix.1954, specimens being collected at the north-east end of Malldraeth Marsh. I can also record it for the first time from Montgomeryshire (v.c. 47): 1 ♀, hillside, about four miles west of Welshpool, 11.ix.1954. A new Scottish record is for Easter Ross (v.c. 106): 2♂♂, S. side of Struie Hill, Dingwall-Bonar Bridge road, 16.viii.1954 (J. Y. Ritchie). It may be added also, in connection with this species, that the macropterous form (f. *explicatus* (Sélys)) was recorded by Fletcher (1939) from Gloucestershire W. (v.c. 34); this record was inadvertently omitted from the "Summary."

Myrmeleotettix maculatus (Thunb.). Unintentionally omitted from Anglesey (v.c. 52) in the "Summary" although recorded by both Lucas (1920) and Burr (1936); confirmed by the writer from heathery slopes of Mynydd

Llwydiarth, near Pentraeth, 9.ix.1954. It is also recorded for the first time from Montgomeryshire (v.c. 47): upland pasture above Banw Valley west of Llangadfan, 11.ix.1954.

Gomphocerippus rufus (L.). Mr. R. S. George, in private communication, is unable to confirm from the notes of the late E. J. Clark that the latter knew this species from either Bucks. or Monmouth. Vice-counties 24 and 35 must therefore be deleted from its known distribution.

On the other hand, West Cornwall (v.c.1) should be added, having been omitted in error from the "Summary" (see Clark, 1906).

Dermaptera

Labia minor (L.). The record of this from Taplow, Bucks. (*cf.* Kevan, 1953a), should, more correctly, be Cookham, near Taplow.

Appendix

The appearance of the recent new work on British Orthoptera (Pickard, 1954) calls for a few comments on distribution although it is not proposed to give a general review of the book here. The additional records and corrections listed in the present paper are, of course, also applicable to Mr. Pickard's text and distribution maps, but there are quite a number of other errors and omissions in these to which attention should be drawn. These are listed below in the order in which they appear:

Omocestus viridulus (L.). The map shows this only from the northern part of the Outer Hebrides, but it is known only from the southern islands; N. and S. Ebudes are omitted; Kirkudbright and Northumberland N. are included in error (unless Mr. Pickard has some unpublished records).

Myrmeleotettix maculatus (Thunb.). There is a *lapsus calami* under this species; in Scotland it is not yet recorded from East Sutherland (not Ross) nor from *any* part of Ross and Cromarty.

Chorthippus brunneus (Thunb.). Easterness, Midlothian and Arran are omitted.

Ch. parallelus (Zett.). N. and S. Ebudes and Arran are omitted; Kincardineshire is erroneously included.

Ch. albomarginatus (Deg.). Omitted from Irish list; this may be justifiable on account of the vagueness of the single record.

Tetrix subulata (L.). Said to occur commonly in the brachypterous condition in Glamorgan; this assumes much from a single record! Huntingdonshire is accepted but requires confirmation. The species is given in the Guernsey list but there is nothing to indicate that this is not based on early incorrect records; the species recorded from that island actually proved to be *T. ceperoi* (Bol.) which Mr. Pickard does not list; *T. subulata* may well occur in Guernsey, however, for it is found in Jersey. (see above).

T. undulata (Swrb.). As *T. vittata* (Zett.), the map omits Orkney, Outer Hebrides and S. Ebudes; the record from N. Ebudes is from Eigg (unshaded) and not from Skye as indicated; Kincardineshire is included in error; as noted above, Cardiganshire should in fact be Merioneth.

Tettigonia viridissima L. Angus is extremely dubious and should be omitted; Gloucestershire has been but should not be.

Metrioptera brachyptera (L.). The southern part of Somerset is shaded, but the record is strictly Somerset E. (or N.).

Meconema thalassinum (Deg.). Midlothian is very questionable.

Gryllus campestris L. Warwickshire is also dubious.

Gryllotalpa gryllotalpa L. Angus is dubious; the omission of Warwickshire and Gloucester is justifiable on account of the poorness of the records.

Ectobius panzeri Stephens. The north-eastward range extends to Norfolk, not Essex; the species is also known from Pembroke, Glamorgan, Anglesey and certain islands. Other references to *Ectobius* spp. have already been made.

In conclusion it is interesting to note that Mr. Pickard has adopted the up-to-date course of regarding *Stethophyma* [*Mecostethus*] *grossum* (L.) as a member of the subfamily Oedipodinae. This is the first time this has been done in a British work; it is our only mainland species of the subfamily.

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Tipula Siebkei Zetterstedt (1852), an addition to the British Tipulidae (Diptera)

By J. E. Collin, F.R.E.S.

A male of this species was taken by me in Mark Ash Enclosure of the New Forest (Hants), on the 26th June, 1953. It obviously was not a previously recorded British species and proved to be one unknown to Mr. R. L. Coe of the Natural History Museum, South Kensington, but Dr. Mannheims, to whom it was sent for identification, returned it as the little-known *T. Siebkei* Zett. Unfortunately the specimen was damaged on the journey. By the Tables published by Audcent (1932, *Trans. ent. Soc. S. Eng.*) and Coe (1953, *Handb. Brit. Ins: Nematocera*) it runs down to *T. sarajevensis* Strbl. (*microstigma* Pierre), its wings being practically without clouds except for a distinct "stigma," and the veinlet arising from the middle of the end of this stigma ending before reaching costa. Thorax with four pale brownish stripes, the two middle ones practically confluent in front. Abdomen noticeably hairy towards tip, the hairs pale. Eighth (prehypopygial) sternite with a triangular yellowish apical area bearing rather long pale hairs curving towards the middle line, its curved hindmargin with a very slight median incision. Genitalia quite distinctive, the tergite with hindmargin not excised, but bearing beneath at tip a pair of projecting knobs with blackened hispid ends, and between them but further back and more hidden a similar knob. Outer lamellae yellowish, particularly long and strap-shaped, straight and upright but curved over at tip, which may project above level of genital tergite. Inner lamellae also yellowish and narrow, shorter than outer pair, but from the base of each there projects *inwards* (into the genital cavity) a larger, long, straight process, which is stout at base, but narrowing towards its end.

Length, without antennae, about 9 mm.

Its larvae were recorded by Zetterstedt as found living in the rotten wood of Aspen trees (*Populus tremula* L.).

Notes on some British Scatopsidae (Diptera)

By J. E. Collin, F.R.E.S.

Psectrosciara soluta Loew, and *palustris* Edwards.

Duda in 1928 (Lindner's Die Fliegen, Scatopsidae) quite unnecessarily altered the names of these two species. Loew described his *Scatopse soluta* in 1846 (Linnaea Ent. I. 335) from two specimens taken by Zeller in Sicily in the months of March and April, and gave a figure of its wing. In a further note published in March, 1847 (*Stettin. ent. Ztg.* viii (68)), when he had seen the type of *Aspistes inermis* in Ruthé's collection, Loew stated that this species was not an *Aspistes* but a *Scatopse* very closely related, though possibly not identical, with his *S. soluta*, that he possessed three specimens of *soluta*, and that he had found it in the neighbourhood of Posen. I am informed, however, that when Loew's collection came to the Berlin Museum it contained only *one* specimen of *soluta*, that being one taken at Annaberg in Silesia *three months after Loew had published his note of* 1847. Therefore Loew's three original specimens (which may, or may not, have included at least one of the Sicilian types) had by then either been lost or destroyed, making the selection of a "Type" for *S. soluta* Lw. impossible.

The additional Annaberg specimen, which Loew has nowhere mentioned, now bears a label in his handwriting "*soluta* Loew," and someone has added another label "Type." Actually it is at most only a "homoeotype," i.e. a specimen compared with the type and *believed* to be conspecific with it, and in this case there are strong reasons for not accepting the identification as correct. I have seen this specimen and it is (as Duda has already noted) a male of *Psectrosciara palustris* Edw.

Trouble in regard to this species *soluta* first arose in 1864 when Schiner in his Fauna Austriaca Dipt. sank *S. soluta* Loew as a synonym of *S. inermis* Ruthé. Then in 1870 (*Zeitschr. Naturwiss.*, XXXV, 4), at a time when it must be remembered Loew was, on every possible occasion, venomously attacking Schiner's entomological work because the latter had exposed Loew's very extraordinary behaviour over the publication of a monograph of the Trypetidae, Loew denied the correctness of this synonymy, stated that he had taken *inermis* in large numbers, and indicated certain characters which served to distinguish *soluta* from that species. These were mainly venational differences, of a shorter upper (disconnected) branch of the forked vein, the fork more divergent at tip, and anal vein not so straight as in *inermis*. These can certainly all be traced in the Annaberg species, but with the exception of the anal vein, *they are not all in agreement with the figure of a wing of the Sicilian soluta*, which moreover shows the second vein at tip more abruptly upcurved into costa. The wing so figured *does*, however, agree with that of a species which: (1) is known to occur in the Mediterranean region from whence the Annaberg species has *not* apparently been recorded, (2) has been captured in the same months of March and April as the Sicilian *soluta*, while the Annaberg species has *not* been so captured, and (3) was identified and recorded as *soluta* Lw. by Enderlein (1912), and Edwards (1925), the latter describing a distinct species (which proves to be the Annaberg species) as *Psectrosciara palustris* n. sp., Edwards considering the generic name *Anapausis* End. to be a synonym of *Psectrosciara* Kieff. Moreover, as the Annaberg and the Sicilian species are very much alike except for genital differences, *which were not used by Loew for separating species in this genus*, it is not even probable that the Annaberg specimen is necessarily the same species as the type from Sicily merely because Loew had so identified it.

A remarkable fact is that Loew in 1878 returned a British male of Edward's *soluta*, which had been sent to him by Verrall, as "*inermis* var. *obscura*," an identification which caused Verrall to make the mistake of including *S. inermis* in the British list. This appears to indicate that Loew thought that his Sicilian specimens were only a variety of *inermis*, and certainly indicates an inability on his part to recognize the different species of this group.

From all these facts one is forced to the conclusion that Loew in 1870 quite unnecessarily tried to transfer the name of *soluta* from Zeller's Sicilian specimens to his Annaberg specimen, and Duda in 1928, deceived by the incorrect label "Type" on the Annaberg specimen, and without investigating the facts, accepted this transfer of the name, and gave the new name of *tenuicauda* to the species which Enderlein and Edwards had apparently correctly recognized as the Sicilian *soluta* Lw.

The names by which these two species should be known are therefore those used by Edwards in 1925, viz.: (1) *Psectrosciara soluta* Lw. with syn.

Anapausis tenuicauda Duda (1928), and (2) *Psectrosciara palustris* Edwards, with syns. *Scatopse soluta* Lw. p.p. (homoeotype in Loew's Coll.), and *Anapausis soluta* Lw. of Duda (1928) (Edwards, 1925, *Ann. appl. Biol.*, **xii**: 270).

The males of these two species have very distinctive genitalia as figured by Edwards. In the females, *soluta* has the eighth tergite largely bare and usually short, often being much withdrawn beneath the seventh, while that of *palustris* is always more evident, and its entire upper surface pubescent.

Aldrovandiella Winthemi Duda (1928)

This was added to the British List in 1934 by Edwards (*J. Soc. Brit. Ent.*, **1**: 34) on a pair taken by Mr. R. L. Coe in Scotland. The male is easily recognized by the genitalia, figured by Duda in 1928 (with venter uppermost), but Duda's female, of which he also gave a figure of its terminalia, is not the same as the female taken by Coe, and certainly not conspecific with Duda's male. I have taken both sexes of *Winthemi* in various localities in Scotland, but none of the females agree with Duda's female, though I have taken females which *do* so agree in Norfolk (Horning Ferry) in company with males which are *not Winthemi* Duda, but very much like *Verralli* Edw., though certainly distinct, and which I describe below as *A. Edwardsi* sp. n., retaining the name *Winthemi* for Duda's male. The true female of the latter has the median projection to last tergite larger and more prominent than in the figure given by Duda, extending far beyond the "shoulders" on each side, and these latter are more sloping, while instead of the *two* pairs of hairy processes of unequal length of Duda's female (my *A. Edwardsi*), there is only one pair of smaller processes, more or less hidden beneath the projecting tergite.

Aldrovandiella Edwardsi sp. n.

A species superficially like *halterata* and *Verralli*, and while the male genitalia more resemble those of *Verralli* as figured by Edwards (*Ent. mon. Mag.*, **LXX**: 139), they are abundantly distinct in the absence of the lateral indentation on each side of the hypopygial "shell" (ninth sternite), actually the shell is at its widest at this point, and on the basal side of this widest part it very rapidly narrows, making its outline completely different from that of either *Verralli* or *halterata*. The internal processes on each side of the penis are also larger than in either of these other species. The female is that described and figured by Duda as *A. Winthemi* ♀.

Length about 2 mm.

This species was not at all uncommon in the marshy ground near Horning Ferry (Norfolk) on the 13th June, 1953, and again very common there in June of this year. Duda's female specimens were from Finland, but not from the same locality as his type males.

The following two species are also additions to the British List:

Scatopse flavocincta Duda (1928)

A species very much like *S. bifilata* Hal. but whereas in *bifilata* the two prongs of the penis are both very long, and, except for the somewhat longer one being more pointed, are not very different in shape or direction, in *flavocincta* they (and especially the blunter one) are both much shorter, and the pointed upper prong after an upward loop near tip is straight, while the very short blunt prong arises from the longer one near the base of the loop,

and is then bent upwards almost at right angles into the loop. This blunt prong is often not visible without dissection. There are also other differences in the shape of the genital processes. It is very variable in size.

I have taken this species at Sizewell on the Suffolk coast in September, and there was a male in the Verrall Collection taken at Chippenham Fen (Cambs.), also in September.

Scatopse brevifurca Enderlein (1912)

This species is remarkably distinct not only in the arms of the discal fork in wings being shorter than its stem, but in the female by the possession of a small rounded "brand" on the upper branch of this fork just beyond middle.

I caught a female at Horning Ferry (Norfolk) on the 25th May, 1953.

The male genitalia of *Sehirus bicolor* (L.) (Heteroptera, Cydnidae)

By Dennis Leston, F.R.E.S.

Introduction

Pruthi (1925, *Trans. ent. Soc. Lond.*, **1925**: 143) described and figured the aedeagus of a *Sehirus* sp. and found it to be of the same type as that of Cydninae and Brachyplatidae (Plataspidae). His figure shows an unexpanded aedeagus from which he concluded that only two conjunctival appendages were present. The male genitalia of *Sehirus bicolor* (L.)—from material collected at Ugley, Essex, in July, 1953—has been examined in the expanded position: erection was obtained by manipulation of KOH treated genitalia in acetic acid.

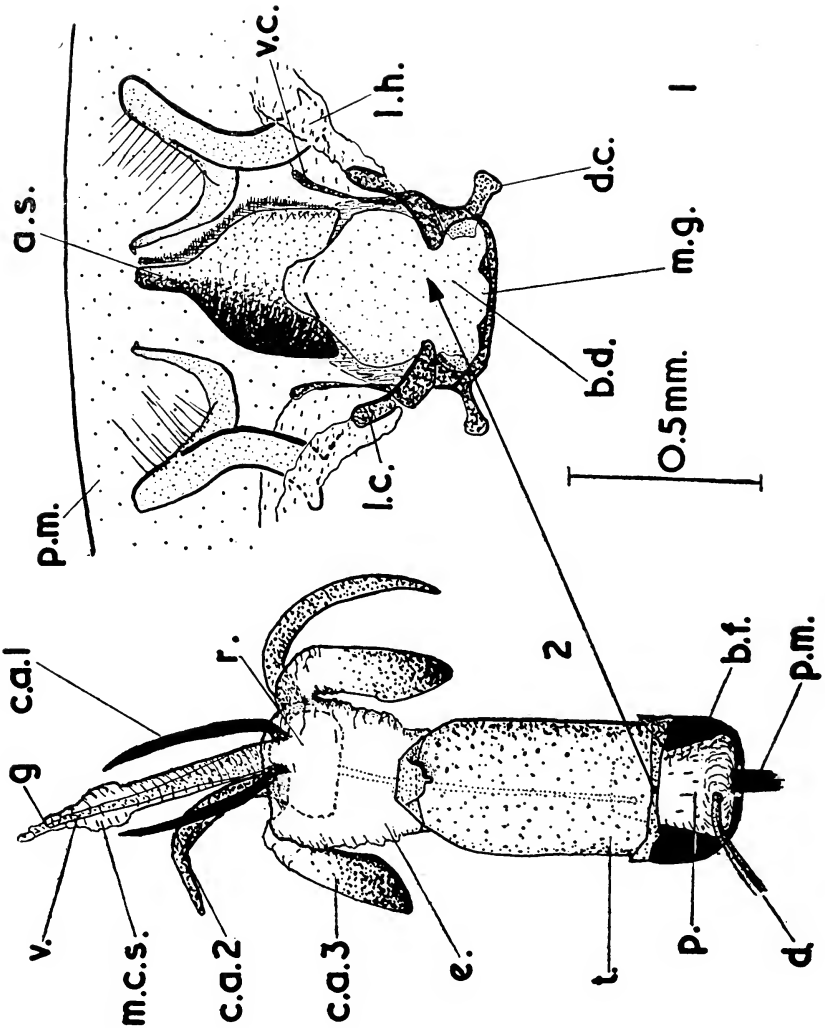
Description

The 9th segment bears within its postero-inferior border a raised and grooved process, the aedeagal strut, arising from the base of the genital atrium. The base of the aedeagus sits over a shallow depression in the basal membrane of the atrium; this depression is delimited by sclerotizations which form the so-called basal plate. Anteriorly the basal plate carries a pair of processes which are strongly sclerotized and rigid; they are homologous with the tendon and capitate process usually found in Heteroptera and are thus the dorsal connectives. Posteriorly, the ventral connectives are present as thin sclerotized rods whilst laterally a third pair of processes run out, attached distally to the muscle sheet surrounding the harpagones above their base.

The harpagones are quite unlike Pruthi's figure (similar discrepancies have been noticed in, for example, his delineation of the harpagones of *Podops*); they are rod-like and with a recurved latero-median arm. At their bases the harpagones have the usual muscle attachment. Movement of the aedeagus causes movement of the harpagones through the lateral muscle sheet.

The aedeagus is attached at its basal-superior margin by a rod-like sclerotization which lies between two further processes of the basal plate (arrow runs from the rod to its anatomical position between the two processes). At the base of the aedeagus lies the erection pump and its attached muscle; the muscle runs in a shallow groove of the basal plate whilst the pump, when the aedeagus is at rest, lies dorsi-ventrally flattened between the aedeagus above and the floor of the atrium below.

The sperm duct is surrounded by a concentric duct carrying body fluid to the erection pump—the details of the passage of the sperm duct into the



Figs. 1-2. Male genital apparatus of *Sehirus bicolor* (L.) (Het., Cydnidae); example from Ugley, Essex. 1, Postero-internal aspect of 9th segment (pygophore). 2, Ventral aspect of erected aedeagus.

For terminology and abbreviations see opposite page.

aedeagus were not elucidated. The theca is an elongate cylinder carrying a recurved median tongue-like process at its dorsal apex. When at rest the vesica, conjunctiva and appendages lie within the theca except for their apices. The expanded conjunctiva (endosoma) forms a cylindrical, sack-like continuation of the theca (exosoma) and carries three pairs of symmetrical conjunctival appendages (shown off-centre in the figure). The 1st conjunctival appendages are rigid rods arising from each side of a median prolongation of the conjunctiva, the median conjunctival sheath. Laterally the 2nd and 3rd conjunctival appendages arise; they are somewhat closely connected at their origins. The 2nd conjunctival appendages are sclerotized curved rods, whilst the 3rd are membranous sacs with an apical sclerotization.

The vesica is surrounded by the median conjunctival sheath (median penis lobe of some authors); it is long, slender and tapering with a minute external gonopore at its apex. Basally the vesica is seen to be an outgrowth of the seminal reservoir (or the reservoir can be considered as an expansion of the vesica at its base). The sperm duct enters the reservoir at its base.

Discussion

The three pairs of conjunctival appendages show clearly that the aedeagus of Sehirinae is similar in its general structure to that of Phloeidae, Scutellerinae and Tessaratominae and not at all close to that of Pentatominae (*cf.* Leston, 1952, *Publ. cult. Cia. Diam. Angola*, **16**: 9-26, for details of Scutellerinae; 1953, *Rev. brasil. Biol.*, **13**: 121-40, for details of Phloeidae; 1954, *Proc. R. ent. Soc. Lond.*, (A) **29**: 9-16, for details of Tessaratominae): it differs from Scutellerinae in having a retractible endosoma and from Phloeidae and Tessaratominae in having the sperm duct enter at the base of the reservoir. Phylogenetically, the aedeagus suggests that Sehirinae have retained the primitive type of Pentatomoid aedeagus: it would be unwise to speculate further on the position of the group from a consideration of a single structure, but Pruthi's suggestion that Cydninae+Sehirinae form a link between Scutellerinae and Pentatominae is not supported by the aedeagus of *Sehirus*.

Most figures of the Heteropterous basal plate show a single pair of connectives only. The three pairs present in *Sehirus* are homologous with those found in other Pentatomoidea although the dorsal and ventral pairs are here rigid. It is probable that the three pairs represents the basic pattern in all Heteroptera: a dorsal and ventral pair acting as the corner supports of

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TERMINOLOGY AND ABBREVIATIONS TO FIGS. 1 AND 2

9th segment (pygophore)

a.s.	aedeagal strut
b.d.	basal depression
d.c.	dorsal connective
l.c.	lateral connective
l.h.	left harpagone
m.g.	median groove
p.m.	posterior margin
v.c.	ventral connective

aedeagus

b.f.	basal foramen
c.a.1.	1st conjunctival appendages
c.a.2	2nd conjunctival appendages
c.a.3	3rd conjunctival appendages
d.	concentric sperm and erection ducts
e.	endosoma
g.	external gonopore
m.c.s.	median conjunctival sheath
p.	erection pump
p.m.	pump muscle
r.	seminal reservoir
t.	theca
v.	vesica

a, hypothetically, rectangular basal theca; a lateral pair connecting the aedeagus base with the harpagones. Bonhag and Wick (1953, *J. Morph.*, **93**: 241) figure the basal apparatus of a Lygaeid: they show only one pair of connectives, their promotor apodeme of the phallobase, which is clearly the capitate process of authors and the dorsal connective of the present study. However, they describe a remotor of the phallobase muscle, running from the ventral segmental wall (their fused gonocoxopodite) to the aedeagal base and inserted on the "stapes"; this insertion is homologous with the ventral connective. The muscle sheet attached above the base of the harpagones and to which the lateral connectives are attached is probably homologous with the adductor of the gonostylus (Bonhag and Wick).

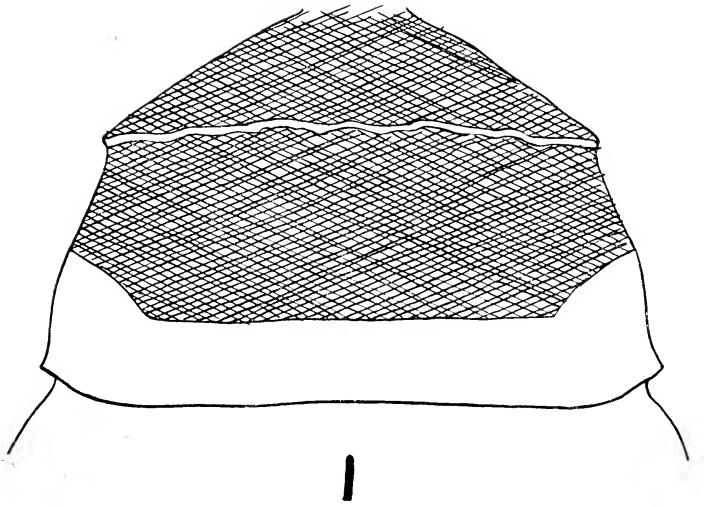
Conclusions

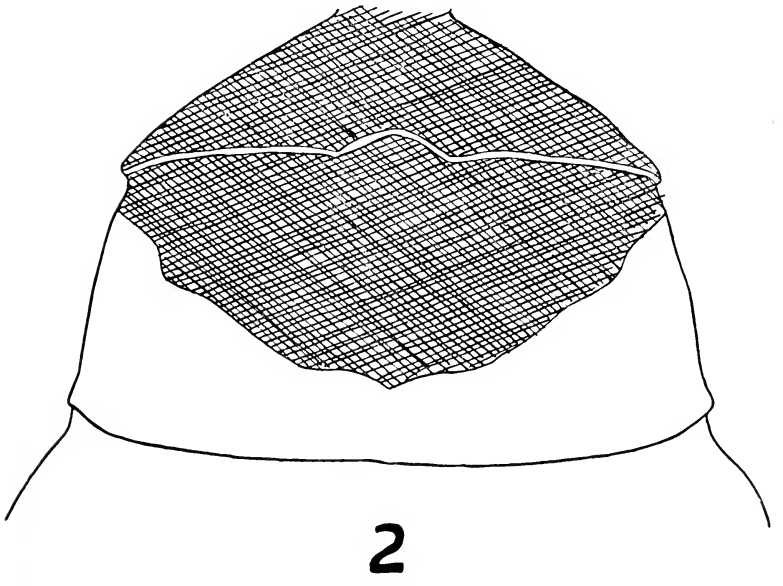
1. The male genitalia of *Sehirus bicolor* (L.) (Cydnidae) have been examined.
2. A well-defined aedeagal strut is present.
3. The harpagones are biramous.
4. The "basal plate" carries three pairs of connectives (apodemes); (*a*) dorsal connectives (homologous with the capitate processes of authors); (*b*) ventral connectives; (*c*) lateral connectives. It is suggested that these can be homologized throughout the Heteroptera.
5. The aedeagus bears three pairs of conjunctival appendages, suggesting a retention of the primitive Pentatomoid number and clearly separating Cydnidae from Pentatominae *sensu str.*
6. The seminal duct enters the reservoir basally whereas in Tessaratominae and Phloeidae it enters dorsally.
7. The endosoma is retractible, clearly differentiating this structure from that found in Scutellerinae *sensu str.* The vesica is a simple, non-diverticulate structure (*cf.* Dinidorinae).

Ancistrocerus gazella (Panzer) (=*A. pictipes* Thomson), an abundant but hitherto undetected Eumenine Wasp in Britain

By I. H. H. Yarrow, M.A., Ph.D., F.R.E.S.
(Dept. of Entomology, British Museum (Nat. Hist.))

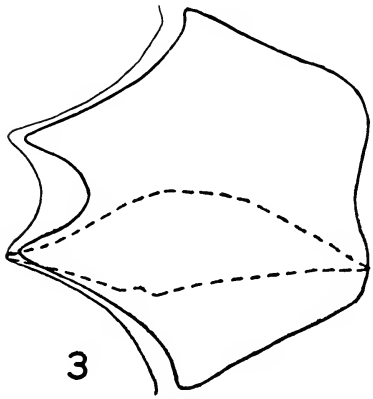
A. gazella (Panzer) has been discovered to be at least as common, if not more so, than *A. parietum* (Linnaeus) in the South of England and is likely to be found under the latter name in most collections from these parts. I have seen it from the following counties: Bucks., Cornwall, Devon, Dorset, Hants, Herts., Isle of Wight, Kent, Mddx., Norfolk, Pembroke (Skokholm Island), Suffolk, Surrey and Sussex. G. M. Spooner tells me he has seen it from E. Gloucestershire; it is absent from all our collections from the Midlands and the North, though *A. parietum* seems abundant over the whole of the country. The following key should make its recognition possible but it should be borne in mind that the black and yellow markings of most, if not all, eumenines are subject to considerable variation and on this account the strictly morphological characters, which vary to a lesser extent, are the more important. It is inevitable with a species which has evaded notice for so long for the distinctive characters to be somewhat less than obvious at first sight, and they are, in

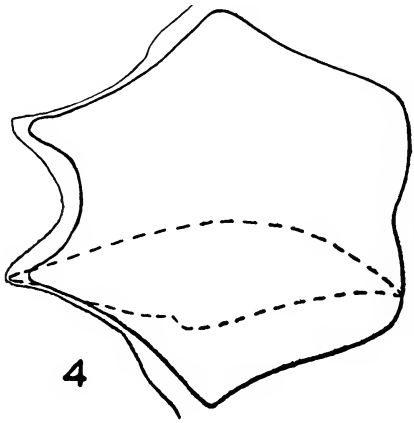




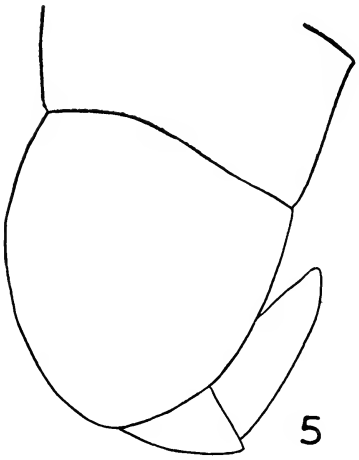
Figs 1 and 2. 1st abdominal tergite of *gazella* and *parietum* (♀).

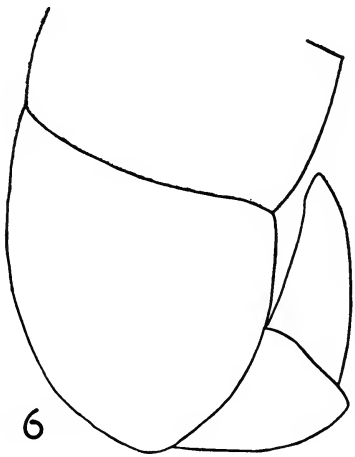
fact, to a large extent comparative; none the less, with a little experience the two species may be fairly certainly separated with a hand lens, if not with the naked eye.





Figs. 3 and 4. Clypeus of *gazella* and *parietum*, lateral aspect superimposed (♂).



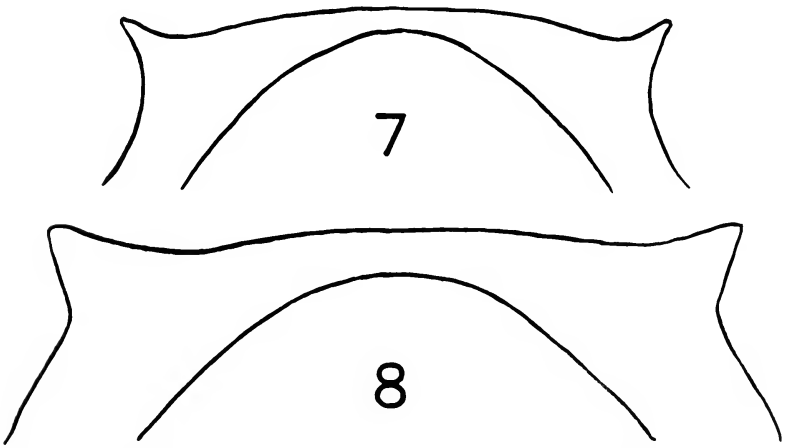


Figs. 5 and 6. Apical antennal segments of *gazella* and *parietum* (♂).

♀♀

1. Size smaller, wing expanse 16-21 mm. (18 mm. average), thorax less robust, pronotal angles often sharply pointed, posterior area of propodeum rather coarsely rugose and usually fairly shining; transverse carina of 1st tergite in the middle at most slightly notched (fig. 1), puncturation of 2nd tergite larger and more remote, the interspaces frequently greater than diameter of a puncture. Abdomen with yellow bands on tergites 1-4, sometimes a band or partial band on the 5th and very rarely a spot on the 6th, the band on the 1st tergite not sharply incised but parallel-sided across the disc (fig. 1) postscutellum frequently yellow marked; middle and hind tibiae usually with considerable black markings on the inner side apically ..... *gazella* (Panzer)

— Size larger, wing expanse 20-25 mm. (22 mm. average), thorax more robust, pronotal angles somewhat rounded, posterior area of propodeum usually rather finely diagonally striate and dull, occasionally coarser and somewhat shining; transverse carina of 1st abdominal tergite deeply and broadly incised in the middle (fig. 2); puncturation of 2nd tergite finer and closer, the interspaces for the most part less than the diameter of a puncture. Abdomen with yellow bands on tergites 1-5 and a yellow spot, rarely absent, on the 6th, the band on the 1st usually angularly incised in the middle (fig. 2). Postscutellum entirely black (in some Continental examples marked with yellow according to Blüthgen (Stettin ent. Ztg., **104** (1943): 155); middle and hind tibiae only a little darkened (usually brownish) on the inside apically ..... *parietum* (Linnaeus)



Figs. 7 and 8. Pronotal angles of *gazella* and *parietum* (♂).

♂♂

1. Apical identation of clypeus narrower and deeper, the clypeus considerably swollen, the surface rising somewhat abruptly from the apex (fig. 3), the punctures small and shallow; reflexed apical antennal segment rarely reaching apex of 10th (fig. 5). Pronotal angles sharp, frequently extending diagonally forward as points (fig. 7) (though this is not so marked in British as in Continental examples). Posterior area of propodeum and transverse carina of 1st tergite as in ♀ though less pronounced, puncturation of 2nd tergite coarser though no closer than in the next species. Abdomen with yellow bands on tergites 1-4, sometimes a partial band on 5th..... *gazella* (Panzer)

— Apical indentation of clypeus broad and shallow, the clypeus not very swollen, the surface rising gently from the apex and the punctures rather large and deep (fig. 4); reflexed apical antennal segment usually reaching 10th segment, often passing its apex (fig. 6). Pronotal angles often prominent but not sharp pointed (fig. 8). Posterior area of propodeum and transverse carina of 1st tergite as in ♀ but less pronounced and puncturation of 2nd tergite finer but no less close than in the previous species. Abdomen with yellow bands on tergites 1-6 ..... *parietum* (Linnaeus)

The Swift *Apus apus* L. as a predator of aphids

By D. F. Owen

(Edward Grey Institute of Field Ornithology, Oxford)

Introduction

This paper forms part of a detailed study of the food of the Swift in the breeding season, as shown from food samples collected from the young and adult birds at the nest, and as described elsewhere (Lack and Owen *in press*). The food balls (or meals) were collected as follows: 58 in July and August 1952-53 at Oxford and 12 in July, 1944 at Radley, Berkshire. Each meal comprised a compact mass of insects (together with some spiders), usually 300-1,500, many of which were still alive when collected. Thus, unlike most food samples from birds, the material was in good condition, though the number and variety of the species made the task of identification difficult. In this paper only the aphids are discussed. The Diptera and spiders have been written up separately (Parmenter and Owen (1954), Owen and Le Gros (1954)) and it is intended to write a paper on the Coleoptera. A general paper on the food and feeding habits of the Swift has also been written (Lack and Owen *in press*).

As Swifts are entirely aerial feeders all the aphids would have been caught in the air, though as Swifts sometimes feed very low some may have been caught only a few feet above the ground or the trees. Swifts usually feed close to their nests, but sometimes, particularly in bad weather, they may travel considerable distances for food.

Size and number of aphids

Most of the aphids caught by the Swifts were of the larger species, very few of the small species were taken, although these must have been present in the air in considerable numbers. This agrees with the suggestion that Swifts select insects of a certain size when hunting (Lack and Owen *in press*). However, even the largest aphids are rather smaller than the average size of insect that the Swift prefers to catch. In poor weather, when larger insects are scarce in the air, Swifts are forced to catch smaller insects and that was why in 1952 and 1953, aphids were more often found in the meals collected on dull days than on fine calm days. In July, 1944, aphids were very numerous in the Swift meals in fine as well as poor weather. In that year Broadbent and Doncaster (1949) found that aphids were exceptionally abundant, as shown by the results for twelve trapping stations in England and Scotland, being more common than in five other years. It was suggested that this was due to the dry weather. In 1952, however, Oxford had the driest July for twenty-one years and aphids were relatively unimportant in the diet of the Swift (though this does not necessarily mean that they were scarce in the air, since the Swifts were catching larger insects).

Of the 58 meals collected from Swifts in 1952 and 1953, 23 contained aphids, and all the 12 Radley meals contained aphids. Numbers in each meal varied considerably, often there were only 40 or 50, but some meals contained over a thousand, with very few other insects. Certain meals contained a very large number of one species, suggesting that the Swift had found a local swarm.

Species

A complete list of all the aphids identified from Swift meals in 1944 and 1952 is given in Appendix 1. (Aphids collected in 1953 were not identified.)

Many of the commonest species, such as *Acyrthosiphon pisum*, *Aphis fabae*, *Hyalopterus pruni*, *Macrosiphum euphorbiae*, *M. avenae* and *Metopolophium dirhodum*, have a peak time of movement in July, and they were therefore very available to the Swifts. Many are known as agricultural pests, and were almost certainly caught over cultivated fields, though some may also have occurred over other habitats, even the City of Oxford itself.

In both years one of the commonest species was *Acyrthosiphon pisum* (the Pea aphid), which occurs on *Papilionaceae*, and is often abundant on crops of peas, beans and clover. The name *Aphis fabae* is used in Appendix 1 to denote a complex of species which are very difficult to identify. They include the Black Bean aphid and their host range is very wide. *Megoura viciae* is also a pest of field beans, but it rarely occurs in such large numbers as the preceding species, and only 37 were caught by the Swifts in 1952 and only 4 in 1944.

The most numerous aphids in the Swift meals were those species particularly associated with grain, such as *Metopolophium dirhodum* (the Rose-Grain aphid), *Rhopalosiphum insertum* (the Oat-Apple aphid), *R. maidis* and especially *Macrosiphum avenae*, which in both years was the commonest of all the insects taken by the Swifts. In one meal collected at Radley there were 1,116 *M. avenae*.

Other common species in the Swift meals (with their host plants) included *Cavariella pastinacae* (primary host *Salix* spp., migrating to Umberliferae),

Dactynotus sonchi (*Sonchus* spp.), *Drepanosiphum plantanoides* (*Acer* spp.), *Euceraphis nigritarsis* (*Betula* spp.), *Hyalopterus pruni* (primary hosts *Prunus* spp., thence to *Phragmites* and *Arundo*), *Hyperomyzus lactucae* (primary host *Ribes* spp., thence to *Sonchus* spp. and *Lactuca sativa*), *Macrosiphum euphorbiae* (often common on potatoes, but has a wide host range), *Myzus persicae* (primary host *Prunus persica*, thence to a wide range of plants, including potatoes), and *Thecabius affinis* (primary host *Populus nigra*, thence to *Ranunculus* spp.).

Drepanosiphum plantanoides and *Euceraphis nigritarsis* differ from most other aphids in producing winged viviparous forms, so that although the greatest numbers are usually found in the air in May and June, many would be available throughout the summer near birches and sycamores.

The numbers of the other species (listed in Appendix 1) were very small, but the occurrence of some perhaps suggests that the Swifts had been feeding near the host plants.

Trapping records of air-borne aphids elsewhere indicate that the numbers of some species are, at least to some extent, influenced by the habitat. For instance, Freeman (1945) found that the commonest insect of all orders taken in aerial tow-nets in Lincolnshire was the Cabbage aphid *Brevicoryne brassicae*. This species was caught only in small numbers by Swifts at Radley and Oxford, and the large numbers in Lincolnshire were almost certainly due to the presence of a cabbage field nearby.

Acknowledgements

I am extremely grateful to F. H. Jacob and J. P. Doncaster for identifying the aphids and to R. Vaughan and to R. B. Freeman for collecting and sorting the Radley samples. J. P. Doncaster also gave much advice on the nomenclature of the aphids listed in Appendix 1 and in addition added notes on the ecology of the commonest species.

Appendix 1

Aphids identified in Swift meals

	Oxford, 1952	Radley, 1944
Acyrthosiphon malvae (Mos.)	8	2
A. pisum (Harris)	392	519
Adelges spp.	4	—
Anoecia corni (F.)	3	8
Aphis fabae Scop.	119	268
A. cognatella (Jones)	—	7
A. hederae Kltb.	—	8
A. ilicis Kltb.	—	28
A. nasturtii Kltb.	1	—
A. rumicis L.	—	2
A. sambuci L.	1	—
Aphis spp.	15	—
Brachycaudus cardui (L.)	—	2
Brevicoryne brassicae (L.)	10	9
Capitophorus hippophaes (Koch)	3	—
Capitophorus spp.	—	2
Cavariella aegopodii (Scop.)	1	13
C. pastinacae (L.)	28	—
C. theobaldi (Gill. & Br.)	4	6
Cinaria laricis (Wlk.)	1	—

	Oxford, 1952	Radley, 1944
Cryptomyzus galeopsidis (Kltb.)	1	—
Dactynotus cirsii (L.)	—	5
D. sonchi (L.)	23	—
Dactynotus (*Uromelan*) *jaceae* (L.)	9	25
D. (*Uromelan*) *solidaginis* (F.)	—	2
D. (*Uromelan*) *taraxaci* (Kltb.)	—	1
Dactynotus spp.	1	1
Drepanosiphum acerinus (Wlk.)	2	—
D. plantanoides (Schr.)	39	2
Euceraphis nigritarsis (v. Heyd.)	63	11
Hyadaphis foeniculi (Pass.)	2	—
Hyadaphis spp.	—	2
Hyalopterus pruni (Geoffr.)	83	35
Hyperomyzella rhinanthi (Schout.)	10	—
Hyperomyzus lactucae (L.)	32	30
H. lampsanae (Börner)	—	12
H. pallidus H.R.L.	—	1
Hyperomyzus spp.	—	3
Macrosiphum euphorbiae (Thos.)	179	7
M. funestum (Macch.)	1	—
M. rosae (L.)	—	5
Macrosiphum (*Sitobion*) *avenae* (F.)	1,764	3,515
M. (*Sitobion*) *fragariae* (Wlk.)	9	2
Megoura viciae (Buckt.)	37	4
Metopolophium dirhodum (Wlk.)	290	1,131
M. festucae (Theob.)	5	7
Microlophium evansi (Theob.)	1	—
Myzus cerasi (F.)	1	2
M. persicae (Sulz.)	24	44
Nasonovia ribis-nigri (Mos.)	4	1
Pemphigus filaginis (F.)	—	4
Pemphigus spp.	10	2
Phorodon humuli (Schr.)	1	1
Protrama spp.	1	—
Rhopalosiphum insertum (Wlk.)	98	31
R. maidis (Fitch.)	26	—
R. nymphaeae (L.)	3	—
R. padi (L.)	9	1
Sappaphis mali (Ferr.)	1	—
Sappaphis spp.	—	1
Schizolachnus pineti (F.)	1	—
Thecabius affinis (Kltb.)	31	4
Trama troglodytes Hey.	—	1
Tuberculatus querceus (Kltb.)	5	—
Tuberculoides annulatus (Hartig)	—	5
Unidentified	39	418

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Notes on some Derbyshire craneflies

By L. N. Kidd, F.L.S., F.R.E.S.

On 6th June, 1954, Dr. W. D. Hincks and I paid a visit to Combs Reservoir, near Chapel-en-le-Frith, Derbyshire, and were greatly impressed by the large number of craneflies seen flying and at rest on surrounding vegetation. In spite of rather showery weather we were able to put in about an hour's collecting, and subsequent examination of the material taken shows that the area is quite rich in species. Later in the day we visited an old wood near Chapel-en-le-Frith in order to compare the cranefly fauna here with that of the reservoir area, and were interested to find a marked difference between the species of the two habitats.

At Combs Reservoir some eighteen species of craneflies were collected and of these, six belonged to the genus *Tipula*, the commonest being *Tipula* (*Tipula*) *luna* Westhoff. Larvae of this species are known to be sub-aquatic. The remaining species of *Tipula* taken were *T.* (*Acutipula*) *maxima* Poda, *T.* (*Tipula*) *variipennis* Mg., *T.* (*T.*) *lateralis* Mg., all of which are more or less sub-aquatic, *T.* (*T.*) *oleracea* L. and *T.* (*T.*) *couckei* Tonn., this latter being apparently a rather rare species in the north of England. *Limonia* (*Limonia*) *nubeculosa* Mg., whose larvae have been reported as sub-aquatic, and *L.* (*Rhipidia*) *maculata* (Mg.), the larvae of which have been recorded as feeding in old cow-dung, were quite frequent. Other species taken whose larvae are said to be mainly aquatic or sub-aquatic were *Pedicia* (*Tricyphona*) *immaculata* (Mg.), *Limnophila* (*Phylidorea*) *ferruginea* (Mg.), *L.* (*Pilaria*) *nemoralis* (Mg.), *Erioptera* (*Erioptera*) *lutea* Mg. *v. taenionota* Mg. A solitary specimen of *Ula sylvatica* (Mg.), whose larvae develop in fungi, was also taken. The following species were also taken near the reservoir but I am unable to find, in the literature available, any reference as to their larval habits: *Limnophila* (*Phylidorea*) *fulvonervosa* (Schummel), *Cheilotrichia* (*Platytoma*) *cinerascens* (Mg.), *Ormosia* (*Ormosia*) *hederae* (Curtis), *Molophilus griseus* (Mg.), and *M. serpentiger* Edwards.

Of the species taken in the woodland near Chapel-en-le-Frith only two had been taken at Combs Reservoir. These were *Tipula* (*Tipula*) *luna* Westhoff and *Limonia* (*Rhipidia*) *maculata* (Mg.), both of which were quite plentiful. Larvae of the former species besides being sub-aquatic are known to inhabit soil and leaf-mould in wet hollows in woodland. Four other species of *Tipula* were taken in the wood, viz. *T.* (*Acutipula*) *vittata* Mg., *T.* (*Schummelia*) *variicornis* Schumm., *T.* (*Tipula*) *hortulana* Mg., and *T.* (*T.*) *vernalis* Mg. The first of these has been observed by Mr. D. Bryce and myself to oviposit in mud at the sides of streams, and *variicornis* probably breeds in similar situations. The pre-imaginal stages of *T. hortulana* Mg., were recorded by Cuthbertson as inhabiting soil in wet hollows in open deciduous woodland. The immature stages of *T. vernalis* Mg. occur in grasslands. Other woodland species taken whose larvae are said to occur in wet places, usually below leaf-mould, were *Limonia* (*Limonia*) *tripunctata* (F.), and *Ormosia* (*Ormosia*) *nodulosa* (Macq.). One species which seemed to be particularly common around clumps of Broad Buckler-fern was *Tasiocera fuscescens* Lacks., a species which was first described in 1939. Dr. P. M. Butler, who on the same day visited some higher ground nearby, brought back a specimen of *Tipula* (*Tipula*) *alpium* Berg., a common species in hilly districts.

The capture of a male *Dactylolabis transversa* (Mg.) in Monk's Dale on 29th May, 1954, is possibly worthy of mention. This rather uncommon species was taken on limestone rocks together with several specimens of *Dactylolabis sexmaculata* (Macq.), which appears to be quite frequent in limestone districts.

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Scoliocentra villosa (Meigen) (Dipt., Helomyzidae) and *Trichocera maculipennis* Meigen (Dipt., Trichoceridae) taken in Derbyshire caves

By L. N. Kidd, F.L.S., F.R.E.S.

In a previous note (*J. Soc. Brit. Ent.*, **4**: 136), I mentioned that *Scoliocentra villosa* (Meigen) was taken in an old lead-working in Derbyshire by Mr. John Armitage during November, 1950, and again in October, 1952. On 28th August, 1953, Mr. Armitage and I visited this lead-working in Deepdale, near Buxton, in the hope of making some further observations on this species. Having arrived at our destination we proceeded with the aid of a lamp to grope our way into the working, the entrance of which consists of a large fault in the limestone rock. Almost immediately, we began to encounter specimens of *Scoliocentra villosa* (Mg.) probably v. *villosula* Cz., and many were seen glistening with condensation as the light fell upon them. Although we continued for quite a good number of yards into the workings, numbers of males and females could still be found resting on the walls and roof of the passage.

This species has been found in a number of caves on the Continent during the months of June to January as pointed out by Séguy (*Faune de France*, **28**: 344), and he also draws attention to the fact that Dr. O. W. Richards has reported specimens from rabbit burrows. It would be interesting to know the life-history of this fly, for in spite of the fact that we searched very carefully, we could not find, in that part of the cave investigated, any decaying animal or vegetable refuse in which the larvae might develop.

It might be of interest to mention that the common Helomyzid *Leria serrata* (L.) was also present and two caddis, *Stenophylax permixtus* McLach., and *S. vibex* (Curtis) were also collected, the former being apparently the commoner of the two species. Several newly-emerged Tissue Moths *Triphosa dubitata* (L.) were collected and one or two pairs were seen in copulation.

We next visited Thirsthouse Cave in Deepdale and it was here that a solitary female of *Trichocera maculipennis* Meigen was taken. This would appear to be a rather uncommon species for Mr. Paul Freeman (*Handbooks for the Ident. of Brit. Insects*, **9** (2): 69) gives N. Lancs. and Midlothian as the

only localities from which it is recorded. However, the late Mr. Harry Britten took it well inside the copper mines at Alderley Edge, Cheshire, on 2nd March, 1936. It may well be that a thorough search of caves in other parts of the country would produce further records of this rather distinctive species.

Rare Trypetids (Diptera) at Miller's Dale, Derbyshire

By W. D. Hincks, D.Sc., F.R.E.S.
(Manchester Museum)

Mr. S. Shaw (1952, *J. Soc. Brit. Ent.*, **4**: 93) has reported the occurrence of the very local Trypetid *Euleia caesio* (Harris) at Miller's Dale in 1945 and 1951. It was again taken in the same small area of the dale on 15th August, 1953. On 10th July, 1954, the locality was visited again in the hope of obtaining more specimens but, although considerable stretches of luxuriant vegetation were swept, no Trypetids occurred until the identical area was reached where *Euleia* had been taken previously. Here two Trypetids were captured but it was not until later that it was realized that neither was *E. caesio* and, indeed, that two other species were represented. These proved to be *Rhacochlaena toxoneura* (Loew) and *Cryptaciura rotundiventris* (Fallén), both of which are rare species with relatively few recorded stations.

The food plant of *R. toxoneura* appears to be unknown and little seems to have been recorded relating to its British distribution. In the late Harry Britten's card-index, now in the Manchester Museum, there are records from Cheshire (Rostherne, 15.6.30, H. Britten; Northwich, 13.9.45, Mrs. Boyd) and Lancashire (Didsbury, 1.6.47, A. Brindle). This species is not recorded from Yorkshire and I know of no previous occurrence in Derbyshire.

Although there are a few scattered records from Cornwall to Bonhill, Dumbartonshire, *C. rotundiventris* seems to be even more local than the previous species. There are no records for Lancashire and Cheshire, Yorkshire or Derbyshire. Its food plant is in doubt but it is said to have been reared from burdock and also from *Heracleum*. Burdock was the dominant plant where the present specimen was taken but a few plants of *Heracleum* were growing in the same area.

It is interesting that in this small area of not more than a few square yards in extent there should occur three very local Trypetids, the biology of which is still largely unknown.

OBITUARY

Malcolm Burr, M.A., D.Sc. (Oxon), A.R.S.M., F.R.E.S., M.I.Biol., Hon. M.S.B.E.

The death of Malcolm Burr on 13th July, 1954, came as a great shock to entomologists everywhere, for although he was seventy-six years of age when he died, those who had the good fortune to meet him on his recent visit to

London early this year were amazed at his vitality. He was truly a man who was as young as he felt, but alas, shortly after his return to Turkey, where he had made his home, he was knocked down and instantly killed by a motor lorry in his beloved Istanbul.

Born at Blackheath on 6th July, 1878, Malcolm Burr was the son of the late Arthur Burr and for many years lived near Dover, but he travelled far and wide, often to remote places, and in this, his flair for languages must have stood him in good stead. Accounts of his experiences appeared from time to time in the *Entomologists' Record* and in his popular writings, the most famous of which is his book "Slouch Hat."

Although best known as an entomologist, Burr was by profession originally a mining engineer. He was geological adviser to the Kent Coal Commission from 1908 to 1914, and during the first World War he recruited and commanded the "Serbian" labour battalion in Salonika. Just before the outbreak of the last war he had for some time been in the Soviet Union, but from 1939 to 1945 he was engaged in work for the Foreign Office and the Ministry of Information in Yugoslavia and Turkey. During each World War his English home, together with his library, was destroyed by enemy action and he decided to remain in Turkey where, among other things, he was correspondent for the *Daily Telegraph* in Istanbul from 1950 to 1953, and was latterly Professor of English at the University.

Malcolm Burr had a wide and insatiable interest in entomology generally, but his special field of study lay among the Orthoptera and Dermaptera—especially the latter, in which he did much pioneer work and, in spite of his lost library, maintained a keen interest to the end, his last original work appearing as late as December, 1952. One of his most influential early contributions to the literature of the Orthoptera was his "Essai sur les Eumastacides" written in 1899. His first publication on the British Orthopteroids appeared in 1897 and his best-known one, "British Grasshoppers and their Allies," in 1936. The publication of the second edition of his most excellent layman's introduction to entomology, "The Insect Legion," preceded his death by only a few months.

Dr. Burr served on the Council of the (Royal) Entomological Society of London during 1903-04 and 1910-12 and was elected Vice-President for 1912. He was also a member of several foreign entomological societies, including the Russian, of which he was a life-fellow (though he informed us ruefully that this honour did not seem to be fully recognized of late!). For some years he was Hon. Secretary of the Executive Council of the International Entomological Congress. He was a member of the Society for British Entomology from 1935, and an honorary member from 1949 until his death, although his absence from Britain precluded his taking an active part in its affairs.

Well loved by all who knew him, Malcolm Burr's simple British Legion funeral in the beautiful Crimean Memorial Cemetery that he loved so well was attended by many mourners, both Turkish and British, many of whom were moved to tears. To his sorrowing widow, to whom he had been married for over fifty-one years, and to his four daughters who survive him, we offer our sincere sympathy in the great loss we share with them.

D.K.McE.K.

Annual General Meeting

The Annual General Meeting of the Society was held at Bournemouth on 23rd October, 1954. Dr. H. E. Hinton in the Chair. The following members were elected officers of the Society for the year 1954-55: President, Dr. H. E. Hinton, Ph.D., B.Sc., F.R.E.S.; Vice-Presidents, Dr. B. M. Hobby, M.A., D. Phil., F.R.E.S.; N. D. Riley, C.B.E., F.Z.S., F.R.E.S.; W. H. Thorpe, M.A., Sc.D., F.R.S., F.R.E.S.; Hon. Treasurer, Mrs. Murgatroyd; Hon. Editor, J. H. Murgatroyd, F.L.S., F.Z.S., F.R.E.S.; Hon. Secretary, S. C. S. Brown, L.D.S., R.C.S. Members of the Council: C. A. Basker, M.D.; R. B. Benson, M.A., F.R.E.S., Mem. Hon.S.E.Belg.; Dr. W. D. Hincks, D.Sc., M.Sc., F.R.E.S.; G. J. Kerrich, M.A., F.L.S., F.R.E.S.; E. Lewis, F.R.E.S.; A. A. Lisney, M.A., M.D., D.P.H., F.R.E.S.; A. H. Turner, F.Z.S., F.R.E.S. The Hon. Treasurer in her report stated that the balance at this date was £136. The Secretary reported that Membership to date was 243. During the year the Society had lost through deaths two Honorary Members, Harry Britten and Dr. Malcolm Burr; three Ordinary Members, Miss Chawner, Dr. Galbraith and H. W. Whitehead. The Hon. Editor reports that during the last twelve months the Society has published three *Journals* totalling 114 pp. and priced at 25*s.* 0*d.*; one *Transaction* totalling 16 pp. and priced at 5*s.* 0*d.*; giving a total of 130 pp. for the year at a face price of 30*s.* 0*d.* Two are in hand for publication early in November, a *Journal* of 44 pp. and a *Transaction* of 36 pp.

Ninth Congress of British Entomologists

Bristol, 22nd-25th July, 1955

An invitation from the Bristol Naturalists' Society to hold the next Congress in Bristol during the week-end 22nd-25th July, 1955, has been accepted by the Council of the Society for British Entomology. Mr. Cecil L. Bell, Secretary of the entomological section of the Bristol Society, has kindly undertaken to act as Congress Organizer, accommodation has been booked at a university hostel (at a cost for the week-end not exceeding about £3 15*s.* 0*d.*), and a comprehensive programme of lectures and other activities is already well under way.

As for the 1953 Congress at Leeds, copies of the Congress Programme will be distributed when ready, by post, to all those on our mailing list. This is as up to date as we have been able to make it, but any person wishing to make sure of receipt of a copy should send name and address either to Mr. Cecil L. Bell, 23 Harcourt Road, Redland, Bristol, 6, or to the Secretary of this Society at 454 Christchurch Road, Bournemouth.

These Congresses are open to all persons of either sex who are interested in entomology, and membership of the Society for British Entomology is not essential.

Transaction

With this *Journal* is distributed *Transaction*, Vol. 11, Part 12.

(*Continued from inside front cover*)

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(*Continued on inside back cover*)

JOURNAL OF THE SOCIETY
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VOL. 5 22ND MARCH, 1955 PART 3

THE IDENTITY OF *MEGASELIA* (*APHIOCHAETA*) *VESTITA* (WOOD, 1914) (DIPTERA, PHORIDAE); A DESCRIPTION OF THE MALE AND REDESCRIPTION OF THE FEMALE

By CHARLES N. COLYER, F.R.E.S.

At intervals during the past six years I have been able, through the courtesy of Mr. H. Oldroyd, of the British Museum (Nat. Hist.), to study the large collection of undetermined Phoridae from England and Scotland made by the late J. J. F. X. King. Among other interesting problems arising therefrom has occurred that of a series of five specimens, accumulated in the course of naming the material, which apparently belonged to Lundbeck's (1922) Group IV, but which would not run down satisfactorily with Lundbeck's or Wood's (1909-10) keys and seemed not to correspond with any descriptions of species belonging to that group.

I have been able to establish that the specimens in question are *Megaselia* (*Aphiochaeta*) *vestita* (Wood) after detailed study of the type, and material, from widely spread Palaearctic localities, kindly loaned by Father Schmitz from his collection. Only the female of this species has hitherto been described (Wood, 1914). Wood referred it to his Section D, and Lundbeck (*op. cit.*) merely mentioned it in the key to his Group V (p. 224), with characters obviously based on Wood, but with a modification in regard to the size. Lundbeck wrote "1.5-2 mm.," whereas Wood stated "$1\frac{1}{2}$ mm." Knowing Wood's propensity for understatement of size (*vide* Schmitz 1929a) and linking this with Wood's remark about *vestita* "falling into the neighbourhood of *pectoralis* and *clavipes*, but considerably larger than either . . .", one was prepared for the actual size of Wood's type to be considerably more than he had stated, and so it proved to be; in fact, 2.7 mm. Other material I have been able to examine ranges from 1.5 mm. to 2.4 mm., so that the type happens to be the largest specimen so far recorded.

Since he included *vestita* in his Group V, Lundbeck evidently considered the costal index to be less than 0.44 (measuring from the basal bristle, p. 212, *op.cit.*). Wood had stated of the costa "rather more than $\frac{2}{5}$ wing length," i.e. rather more than 0.40, probably measuring, as Lundbeck thought, in the same way, or perhaps from the actual base of the wing. Lundbeck followed Schmitz (1917, p. 134) in his method of measuring, and using this method in my study of Father Schmitz' material, I found the costal index in the males to be constant at about 0.45 and in the females somewhat variable at 0.45-0.47. As *vestita* was evidently not represented from Denmark when Lundbeck wrote, one is left to wonder whether he actually had a specimen or specimens before him when constructing his table and making an amendment to Wood's statement of size; it is possible that he had material from Father Schmitz,

but from the information now available, it would seem that one specimen only, from Holland, was in Father Schmitz' possession up to the time when Lundbeck wrote. This specimen was a male. It is perhaps worth notice that Lundbeck stated "only female described" and not "only female known" and this may be an indication that he was at least aware that Father Schmitz had a male of the species, even if he had not seen it. The uncertainty hitherto would have been avoided if Lundbeck had keyed the species in his Group IV and perhaps double-keyed the male to Group V.

Another feature of the species which might cause some confusion to the student unfamiliar with the genus *Megaselia* is the nature of the scutellar bristles and hairs. In some specimens there is a pair of anterior hairs in addition to the two strong bristles, which, although weak, are sufficiently long to give the impression that the specimens ought perhaps to be referred to the group of species with four scutellar bristles. The character of these hairs, however, is not the same as one finds in such species as *M.* (*M.*) *giraudii* (Egger) and its allies.

Schmitz (1929b) gave the distribution of *vestita* as England, Holland, mid-Germany, Hungary (Körösmezö, now Russia), Russia (Archangelsk), and Finland (including Lapland). In 1940, he gave additional localities, viz., Austria, including Styria and the Tyrol; and Silesia. To these may now be added Scotland and further records from England.

It seems desirable that a more precise and accurate definition of the species should be available in the literature and this follows, based on representative material from the recorded distribution:

Megaselia (*Aphiochaeta*) *vestita* (Wood).

♂. Frons wider than high (about 3:2), black, a little shining, in some specimens more strongly; the bristles stout and the hairs numerous and relatively strong, as much as one-third of the length of the praeocellars in some cases, giving a very hirsute appearance. Supra-antennals strong and equal, the upper, in most cases, very noticeably more approximated than the praeocellars, and the lower even more so. Antials inwardly directed, a little lower than the anterolaterals, and closer to them than to the upper supra-antennals. Antennae a little larger than usual, black; arista not long, about the same length as the width of the frons, finely pubescent. Palpi broad and robust, the lower edge well curved, black; bristles strong.

Thorax black, shining, the shine partly obscured by dense, brownish-black pubescence, but nevertheless clearly seen by a good light. The pubescence abnormally long posteriorly, the hairs just before the scutellum partly overhanging it, so stout as to be almost bristle-like, almost half as long as the dorsocentrals. Pleura also dark, a little more brownish than the dorsum, shining, especially anteriorly. Mesopleura with long bristly hairs similar to those on the dorsum, of uniform length and strength. Scutellum with two strong bristles and two anterior weak hairs, sometimes as much as one-third of the length of the bristles.

Abdomen black, dull; venter dark. Sixth segment not much longer than the preceding ones. Abdominal hairs sparse and generally not very conspicuous, a little more noticeable on the hind margins and at the sides; longer on the sixth segment, as much as one-third of the length of the tergite on the sides. Hypopygium (fig. 1) not large, higher than long, asymmetrical, black with greyish dusting, in oblique light giving a faintly silvery shine. On the right side, shining brownish at the broad keel-like apex below the anal tube; in the middle of the lower margin, in some specimens, a very small excision or "kink," probably due to exsiccation; a few tiny hairs on the shining apex, two stronger, bristle-like hairs near the upper margin, i.e. almost on the dorsal surface, and a row of three stronger ones along the anterior half of the lower margin, of about equal length. The left side lacks the shining keel-like prolongation below the anal tube but is otherwise similar. Anal tube rather long and slender,

greyish-black, a little paler or greyish-brown at the apex; hairs fairly prominent, the apical ones almost as long as the anal tube itself. Ventral plate small, yellowish or brownish, roughly triangular, the apex narrow.

All legs, including the coxae, brownish-black, shining, rather thickly pubescent. Fore tarsi a little stout, with the fifth segment a little dilated, the pulvilli and claws prominent. Hind femora moderately dilated, the hairs on the basal half of the ventral edge of moderate length, about 8-9 in number; the anteroventral hairs in the apical fourth stout and prominent. Dorsal seam of hind tibiae deflected anteriorly at about the basal third; posterodorsal cilia moderately strong, about 14 in number, of which about 7 in the apical half are stouter and more prominent than the remainder.

Wings faintly to moderately tinged with yellowish-brown. Veins brown, the thin veins clearly pigmented and the adjacent membrane in the darker specimens faintly infuscated. An erect bristle at the base of the third vein on the upper surface of the wing. Third vein rather stout; fork rather acute and with apex of third vein not curved, lumen very small. Fourth vein (first thin vein) obliterated at origin, then moderately curved, thereafter almost straight. Costal cilia long or moderately long, 17-19 in each row, from humeral crossvein to end of costa. Costal index 0.45. Ratio of segments, 23:9:5, therefore 1 over half as long again as 2+3. Halteres, including the peduncle, black. Length, 1.5-2.2 mm.

♀. Similar to the male, but antennae a little smaller; the frontal hairs and thoracic pubescence finer and more sparse, giving the impression that the frons and thorax are more shining. The wings more strongly tinged in most specimens, with the membrane adjacent to the thin veins more strongly infuscated. The hairs below the basal half of the hind femora short, weak and decumbent. The weak anterior scutellar hairs in some specimens longer, nearly half as long as the bristles. Costal index variable, 0.45-0.47. Ratio of segments, 42:17:10, i.e. 1 more than half as long again as 2+3. Sixth tergite about the same length as the preceding ones. Length, 1.5 to 2.7 mm.

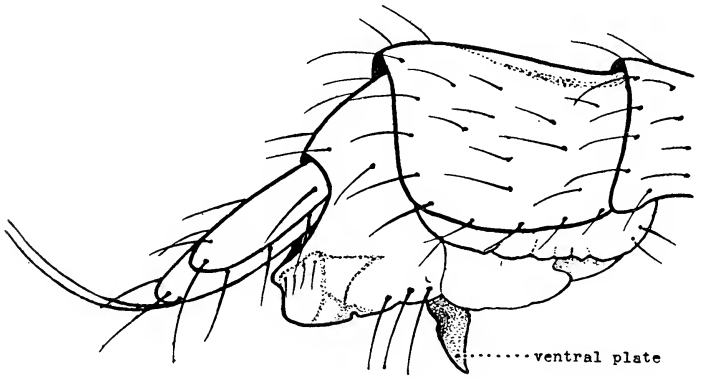

Fig. 1. *Megaselia* (*Aphiochaeta*) *vestita* (Wood), male hypopygium, right side. From dried specimen.

The male described and the female redescribed from the following material: England, type, ♀, 30.iv. (12 or 13), Stoke Wood (Tarrington), Herefordshire, J. H. Wood; ♀, 20.vii.08, Orford, Suffolk, J. J. F. X. King; ♀, 22.vii.08, ditto, Scotland; ♂, 23.v.08, Gailes, Ayrshire, J. J. F. X. King; ♂, 23.vi.22, Nethybridge, Inverness-shire, J. J. F. X. King; ♀, 2.vi.23, ditto, Holland, ♂, 31.vii.16, Sittard, H. Schmitz; ♀, 12.viii.23, Slagharen, H. Schmitz; ♀, 16.iv.39, Valkenburg, H. Schmitz. Austria, ♀, 13.viii.32, Planggeross, im Pizztal, Tirol, H. Schmitz; ♀♀, 28.v.47, Haller Mauern, Lielelalm, Steiermark, +ca. 1500 m., in coll. Schmitz, H. Franz leg.; ♂,

28.vi.48, Schwarzensee, Kl. Sölk, Nied. Tauern, Steiermark, +1153 m., in coll. Schmitz, H. Franz leg. Silesia, ♂, 28.v.23, Wölfelsgrund im Riesengebirge, in coll. Schmitz, O. Duda leg. U.S.S.R., ♀, no date, Archangelsk, in coll. Schmitz, Hellén leg.

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GENERA AND SPECIES OF ANTHOMYIIDAE ALLIED TO *CHIROSIA* (DIPTERA)

By J. E. COLLIN, F.R.E.S.

Among the Anthomyiidae with a distinct posteroventral, as well as an anteroventral, apical spur to hind tibiae (which by itself is certainly not always a good group character), and hairs on lower side of costa, there are two groups of species at present known under the names of *Pycnoglossa* and *Chirosia* which have often been placed in two distinct sub-families because the eyes of the male are more widely separated in the latter. Actually the two groups are very closely related to each other, in fact they may well prove congeneric. They both comprise species in which the males retain (often in a very modified condition) one of the upper orbital bristles of the females as well as cruciate frontal bristles. Sometimes (in those placed in *Chirosia*) the male frons is almost as wide as that of the female, and may bear the full complement of *three* upper orbitals, but the type (*albitarsis*) of this supposed genus has the frons somewhat narrower, and only one upper orbital present; in another species (*albifrons*) the male frons is still narrower, connecting up with species placed under the name *Pycnoglossa* which have the frons as narrow as in many normal Anthomyiid males, but all still retain a pair of small upper orbital bristles usually just in front (but sometimes further in front) of the ocellar triangle, as well as small undoubted cruciate frontal bristles. Females of the wider-fronted species of *Chirosia* appear to have no character in common by which they can be differentiated from many species at present placed in *Pycnoglossa*. However, the type species *only* of *Pycnoglossa* (*flavipennis*) *does* possess one distinctive character in both sexes, namely an arista with long shaggy hairs, *not confined to single rows above and below*, and though it has the male genitalia of the *Chirosia* pattern, the name *Pycnoglossa* may perhaps be retained for this species only. The species of

both groups usually have an enlarged theca of the proboscis, but this is certainly not always the case in at least the males, though if not particularly enlarged while the scutellum is bare beneath, and no isolated strong bristle is developed on the upper front part of mesopleura, a species is congeneric.

Another related group, in which the males also retain small cruciate bristles on frons, and the single upper orbital bristle, was given the name of *Melinia* by Ringdahl, but as pointed out by Huckett in 1946 (*Bull. Brooklyn Ent. Soc.*, **XLI**: 110) it will have to be known in future under the prior generic name of *Craspedochaeta* Mcq. It has quite distinctive male genitalia (figured by Schnabl & Dziedzicki and Huckett), and the proboscis is not so stout as it usually is in *Chirosia* and *Pycnoglossa*, while the posterior upper orbital bristle in the female is more equal in length to the one in front of it, and, in combination with these characters, there is a more distinct isolated strong bristle on the upper margin of the mesopleura in front (beneath the anterior notopleural bristle), while scutellum has hairs beneath at tip.

The fact that there is some variation in the stoutness of the proboscis in species of *Chirosia* has caused some authors to describe species of this genus not only under the generic name of *Melinia* (*Craspedochaeta*), but also under that of *Acrostilpna*, a name given by Ringdahl to a closely related group with type *latipennis* Zett. Species of *Acrostilpna* have a slender proboscis, and in the male cruciate frontal bristles, *but no upper orbital*, the male genitalia (figured by Schnabl & Dziedzicki and Huckett) are distinctive, and the strong upper front mesopleural bristle is developed, which helps to distinguish them from *Chirosia*.

It will be noted that the distinctive characters of the *Pycnoglossa-Chirosia* group are mainly those usually regarded as primitive, and it is an interesting fact that the life-history of many (if not all) the species is associated with that primitive group of plants the Filices or Ferns. Species of *Chirosia* may well be the present-day representatives of a primitive Anthomyiid stem from which some of our more specialized groups among the Anthomyiinae have been evolved.

Key for the identification of British species of *Pycnoglossa* and *Chirosia*

Both sexes

1 (2). Arista with long straggling pubescence in more than two rows. Larger species with small head and yellowish wings..... .....1. *Pycnoglossa flavipennis* Fln.

2 (1). Arista short haired above and below, or almost bare....(*Chirosia*)

Males only

3 (12). Frons at narrowest part not wider than greatest width of third antennal joint. Anterodorsal bristle on middle tibiae always present even if only small.

4 (9). Abdomen with shining black reflections from some points of view.

5 (6). Hind femora without a row of distinct posteroventral bristles, at most only fine hairs becoming somewhat longer towards base. Lateral margins of scutellum bare below usual strong bristles.. .....2. *cinerosa* Zett.

6 (5). Hind femora with a row of strong posteroventral bristles. Lateral margins of scutellum with several small setae below strong bristles.

7 (8). Arista very obviously pubescent. The small pair of upper orbital bristles nearer to front ocellus than to the pair of cruciate frontal bristles. Mesolobe of genitalia short and broad, neither bilobed nor bispinose.....3. *setifemur* Ringd.

8 (7). Arista only microscopically pubescent. Mesolobe narrowed towards tip and ending in two long spinose bristles....4. *signata* Brischke

9 (4). Abdomen dull greyish without shining black reflections though a narrow median stripe may be present.

10 (11). A larger darker species (more like *cinerosa* and *setifemur*) with strongly bristled femora as in the latter, and both posteroventral and anteroventral rows of setae to hind tibiae, the latter stronger, about 7-8 in number and the lowermost one strongest..... ..... 5. *similata* Tiens.

11 (10). A smaller greyer species with weakly bristled legs, no posteroventral setae to hind tibiae, and anteroventral row limited to 2-3 fine setae. Genitalia very unusual and remarkable..6. *aberrans* sp. n.

12 (3). Frons at narrowest part at least wider than greatest width of third antennal joint, often almost as wide as in female.

13 (14). Front tarsi with first and second joints mainly yellowish-white. Abdomen dusted greyish with (viewed from behind) a broad indistinct darker stripe ..... 7. *albitarsis* Zett.

14 (13). Front tarsi entirely dark.

15 (16). Abdomen very similar to that of *albitarsis*, and without shining black reflections from any point of view. Middle tibiae without anterodorsal bristle.....8. *crassiseta* Stein

16 (15). Abdomen viewed from behind with shining black reflections, or almost entirely shining black.

17 (18). Abdomen entirely shining black when viewed from behind. Legs weakly bristled with only one small antero- and two small postero-dorsal bristles to middle tibiae.....9. *montana* Pok.

18 (17). Abdomen grey with shining black reflections.

19 (20). Frontalia wider than combined width of grey orbits. Lobes of fifth sternite large, prominent, and with some long strong bristles at end. Middle tibiae with a strong anterodorsal bristle as well as others posterodorsally and behind.....10. *parvicornis* Zett.

20 (19). Frons narrower, frontalia not so wide as combined width of silvery-grey orbits. No anterodorsal bristle to middle tibiae..... ..... 11. *albifrons* Tiens.

Females of *Chirosia* (so far as known)

1 (4). Abdomen dull greyish without any shining black reflections. (if in doubt and sternopleurals 2:2, consult alternative section.)

2 (3). Middle tibiae with two anterodorsal bristles. Abdomen almost without longer upright bristles.....7. *albitarsis* Zett. (Note: It is possible that specimens resembling *albitarsis* but with only one anterodorsal bristle on middle tibiae may prove to be the hitherto unrecognized female of *albifrons* Tiens.)

3 (2). Middle tibiae with only one anterodorsal bristle. Abdomen with numerous long upright bristles.....8. *crassiseta* Stein

4 (1). Abdomen viewed from behind all shining black, or at least with shining black reflections.

5 (6). Sternopleurals 1:1, and no lateral setae below strong bristles on scutellum ..... 2. *cinerosa* Zett.

6 (5). Sternopleurals 1:2 or 2:2, and lateral setae below strong bristles on scutellum.

7 (12). Abdomen with shining black reflections obvious, and with long outstanding discal bristles on last three tergites.

8 (9). Aristal pubescence obvious, with hairs much longer than arista is stout at base.....3. *setifemur* Ringd.

9 (8). Aristal pubescence very short, not longer than arista is stout at base.

10 (11). Larger blacker species. Sternopleurals 2:2. Arista only microscopically pubescent, almost bare.....4. *signata* Brischke

11 (10). Smaller greyer species. Sternopleurals 1:2. Arista distinctly though very shortly pubescent ..... 10. *parvicornis* Zett.

12 (7). Abdomen with shining black reflections much less distinct, and with long upright discal bristles on last two tergites only. Sternopleurals 2:2..... 6. *aberrans* sp. n.

NOTES ON SPECIES

1. *Pycnoglossa flavipennis* Fln. (1823) has a distribution in Britain from the north of Scotland to the southern counties of England without being very common. Its life-history appears to be unknown, but it has been taken from June to September, always in association with Ferns.

2. *Chirosia cinerosa* Zett. (1845) appears to be more plentiful in Scotland than elsewhere, but has been found in Devon and Hants. The larvae have been recorded as mining the leaves of Bracken without causing them to curl up, but these records probably relate to the next species. The adults may be found in June.

*3. *C. setifemur* Ringd. (1939). This is the name given to the *C. cinerosa* of Stein *nec* Zett. It is another species more commonly found in Scotland, but has also been taken in Sussex. It has been bred by Mr. M. Niblett from mines in the leaves of Bracken growing in Surrey, and I have taken it in Norfolk, all in June and July.

4. *C. signata* Brischke (1888). In this species the theca of proboscis is not particularly stout in the male, which has caused Ringdahl to redescribe it as *Melinia betuleti* in 1935, and Tiensuu as *Melinia carinata* in 1939. The male genitalia figured by these two authors for their species agree in every respect with the genitalia of a specimen in my collection bred from a larva feeding in the curled-up fronds of *Athyrium filix-femina* and identified as *Chirosia signata*, so that there can be little doubt concerning the correctness of this synonymy. Further it is practically certain from Tiensuu's figure of the genitalia of his *Melinia bisinuata* (1939) that this is also a species of *Chirosia* and not a *Melinia*. *C. signata* has been taken in Scotland, Wales (Merioneth), and Cornwall, in April and May. It was incorrectly placed in *Pegohylemyia* by Kloet and Hincks.

*5. *C. similata* Tiens. (1939). This was described by Tiensuu as a species of *Acrostilpna*, apparently because of its more slender proboscis, though it is certainly a species of *Chirosia*. At present I have only seen two British males taken by C. J. Wainwright, one in Wyre Forest (Worcester), the other, which he kindly gave to me, at Ottery St. Mary (Devon), in May.

*6. *Chirosia aberrans* sp. n. ♂ ♀.

A grey species with frons in male about as wide as *second* antennal joint, and very distinctive genitalia. Female with sternopleurals 2:2, strong outstanding discal bristles on abdominal tergites 4 and 5 only, and costa more obviously spinose than usual.

♂. Head differing from that of *cinerosa* in having slightly wider, greyer frons, somewhat less prominent lower part of occiput, wider jowls below eyes, somewhat

* Species marked with an asterisk are additions to the British List.

wider upper facial orbits, which are very silvery viewed from above, but with blackish reflections in side view. Arista practically bare. Proboscis very little swollen.

Thorax greyer than in *cinerosa* with indications of three brownish stripes, acrostichals closer together, irregular, a lower anterior sternopleural bristle developed though not very strongly. Scutellum with 3-4 small setae on lateral margins, no fine hairs beneath tip.

Abdomen grey with shifting dark reflections giving it in some lights a mottled appearance from a side view, and when viewed from behind with a dark median stripe (slightly wider at base of each tergite), and a narrow dark base to each tergite. Bristles nowhere so long or strong. Genitalia very distinctive, mesolobe bent down almost at right-angles at middle, and bicuspidate at tip, with short bristles on each point, in addition a pair of complicated processes apparently arise from its base on each side, lobes to fifth sternite shorter, narrower, and blunter at end, than in *cinerosa*.

Legs more weakly bristled, bristles of posteroventral row on basal half of hind femora practically as long as the anteroventrals, but not so strong. No median dorsal bristle to front tibiae, and no longer outstanding posteroventral setae to hind tibiae. Wings not so yellowish.

♀. Agreeing with male in most characters. Frons wide and viewed from in front particularly grey. Proboscis not so stout as in *cinerosa*. Posterior orbital bristle almost equal in length to the next one. Abdomen greyer than in *cinerosa*, but with distinct blackish reflections, and longer outstanding discal bristles on tergites 4 and 5 only. Posteroventral bristles on hind femora confined to 1 or 2 near base.

Length from 3.5 to 4.5 mm.

Described from specimens taken at Upton (Norfolk) on 21st May, 1929, and Horning Ferry in the same county on 25th May, 1953, but specimens were also taken in marshy ground at Dungeness (Kent) on 1st June, 1936. It appears to have some association with the Marsh Fern. Mr. E. A. Fonseca has taken it on a peat-moor at Sharpham (Somerset), and I am informed that the Marsh Fern grows freely on peat-moors in the West.

7. *C. albitarsis* Zett. (1845). This is a species found commonly upon Bracken, the larvae mining in the leaf-stems of that plant. It has a distribution in Britain similar to that of *Pycnoglossa flavipennis*. In the female the front tarsi are entirely dark.

8. *C. crassiseta* Stein (1908). Is to be found on Bracken, and has a similar life-history to that of *albitarsis*, but appears to be confined to the southern half of England, where it is, however, never so abundant as *parvicornis*.

9. *C. montana* Pok. (1893) is at present known from only the Highlands of Scotland, found early in June.

10. *C. parvicornis* Zett. (1845). This is a common and widely distributed species found on Bracken, the larvae causing the terminal leaves to curl up. Records of its appearance indicate a flight period during May and June only.

*11. *C. albifrons* Tiens. (1938). This species has been taken sparingly on Bracken during May, June and July, in Cornwall, Hants, Berks., Worcester and Cambs.

Craspedochaeta Mcq. (1850)=*Melinia* Ringd. (1929)

A comparison of the male genitalia and other generic characters of the S. American *C. punctipennis* W., type of the genus *Craspedochaeta*, with those of *M. pullula* Zett., type of *Melinia* Ringd., as given by Huckett (1946), should convince anyone of the synonymy of these two generic names. The genus is one with an almost world-wide distribution, having been recorded from Europe, Africa, N. and S. America, and Australia. Huckett (1946) was of the opinion that both the European species *C. pullula* Zett. and *Karli* Ringd. (the latter under the earlier name of *mimetica* Mall.) occur in N. America, but his figures of the male genitalia of the N. American *pullula* do not satisfactorily agree with those of our European species, and there must be considerable doubt as to their specific identity; as this may also very well be the case in regard to *C. mimetica* Mall. (1918) and *C. Karli* Ringd. (1929),

* Species marked with an asterisk are additions to the British List.

I propose for the present to follow Ringdahl (1950) in retaining the latter name for our European species. Our British species therefore remain as *C. pullula* Zett., *Karli* Ringd., and *cannabina* Stein.

I have already in this paper expressed my conviction that some species have been incorrectly placed in this genus by Ringdahl and Tiensuu, and should be included in the genus *Chirosia*. Further there is another species, described by Ringdahl in 1950 as **Melinia luteipennis*, which also should not remain in *Craspedochaeta*. It has been taken in various counties in the South of England, as well as in Wales, Yorkshire, and Scotland (Perthshire) in June, while I have also seen specimens from Denmark. Previous to Ringdahl's description it stood in my collection as an aberrant *Acrostilpna* under the MS. name of "*insignis*." It resembles *Acrostilpna latipennis* in the male in having no small orbital bristles in front of ocellar triangle, but differs in having *no cruciate bristles on frontalia in either sex*, proboscis not particularly slender, or shining, and front mouth-edge not prominent. With this combination of characters it can scarecly remain in either *Craspedochaeta* or *Acrostilpna*. Except for the development of the posteroventral apical spur to hind tibiae (which certainly is not always of generic importance), it possesses so many of the characters of a black-legged *Pegomyia* that it probably ought to be placed in that genus.

C. pullula Zett. is easily recognized by its clouded crossveins (which are clear in the other two species). It is a common and widely distributed species.

The males vary in the extent of approximation of the eyes on the frons, but there appear to be no differences in the genitalia between specimens with wider, and those with narrower, frons. Both types of males have all tibiae dark, but some females have the four posterior tibiae extensively pale. The problem whether these differences represent anything more than variations, or whether there is any correlation between these differences in each sex of the two forms has not yet been elucidated.

C. Karli Ringd. has a more obviously pubescent arista than *C. cannabina* which it otherwise resembles. I have taken it at Barton Mills (Suffolk) in May and June, also at Chippenham Fen (Cambs.), Upton (Norfolk), and in Scotland, and Mr. E. A. Fonseca in the New Forest (Hants) in July.

C. cannabina Stein. All my specimens of this species were bred in April and May, by Mr. E. B. Basden, from nests of various birds built in hedges. In the male the lobes of fifth abdominal sternite agree with those of *C. punctipennis* W., figured by Huckett in 1946, in having a small curved spine on inner margin near base. In each of the three species these lobes are of distinctive shape.

Acrostilpna Ringdahl (1929)

Species of this genus have, in both sexes, a slender shining black proboscis, a somewhat produced front mouth-edge, cruciate bristles on frons, and a distinct anterior mesopleural bristle beneath anterior notopleural, while the male has no minute upper orbitals, and distinctive genitalia. Thus characterized we have only one British species, *latipennis* Zett., because, as stated under *Chirosia*, the species described by Tiensuu in 1939 as *A. similata* is a *Chirosia*.

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* Species marked with an asterisk are additions to the British List.

The larvae of *A. latipennis* is said to mine in the stems of *Athyrium filix-femina*. It is not an uncommon species in Scotland (Inverness- and Perthshire) in June and July, but I have also taken it in the New Forest (Hants) in June.

Huckett in his 1946 paper on the American species of *Acrostilpna* includes *A. latipennis* Zett. as a species with the discal surface of the scutellum bare, which is not the case in our *latipennis*, moreover in his figure of the male genitalia the paralobes are much less deeply cleft at tip, and lobes of fifth abdominal sternite have a bluntly conical projection at middle of inner margin, which is not present in our British species.

Pseudophaonia steini Ringd. (Dipt., Muscidae) in Suffolk

By E. C. M. d'Assis-Fonseca, B.Sc., F.R.E.S.

The above species was taken in considerable numbers by Messrs. J. E. Collin, J. Cowley and myself at Barton Mills (Suffolk) on 5th June, 1954. Towards late afternoon, noticing some males of an unfamiliar-looking Muscid resting on nettle-leaves in the sun, I captured about half-a-dozen specimens. On examining one of these Mr. Collin immediately recognized it as *Pseudophaonia steini* Ringd., a species which he tells me he has sought repeatedly since capturing the first British specimen (a male) at Barton Mills on 19th September, 1938 (Collin, 1944, *Ent. mon. Mag.*, **80**: 135). A closer examination of the area around the nettle patch revealed that the flies were in fact being attracted by some rather fresh cow-dung nearby, and it was immediately observed that the dung was also attracting a small species of Staphylinid beetle (unidentified), which was hovering to and fro in a dense swarm a few inches above the surface. The flies were mostly settling on the dung and a large number of specimens was easily captured by one or two sweeps of the net. Some equally fresh horse-dung a short distance away showed the same attraction for both beetles and flies.

Our captures of *steini* on that day contained a very large preponderance of males, and it was hoped that females might be more abundant on a subsequent visit. When, however, the same patches of dung were examined two days later, the weather having turned rather cooler, no specimens of *steini* were found, nor was there any sign of the swarm of beetles. A careful search throughout the area brought no better luck. It was assumed from this experience that the weather conditions and the state of freshness of the dung were probably important factors, and it was further thought that the presence of a swarm of Staphylinid beetles might well be an indication that the flies were also present. This was indeed confirmed when Mr. Collin visited Barton Mills again on 2nd July, a warm sunny day, and found *P. steini* in numbers (females predominating on this occasion) on patches of fresh cow-and horse-dung over which the same beetles were again hovering. Ringdahl (1945) states that he found *steini*, together with *Pseudophaonia major* Ringd. and species of *Polietes* and *Mydaea*, on horse-dung which was so fresh as to be almost steaming, but he makes no reference to a swarm of beetles.

Since *P. steini* is little known in this country, I give below a translation of Ringdahl's original description (as *Trichopticus steinii*) made in 1913. Later (1922) Ringdahl erected a new genus, *Polietella*, for his species, but in 1945

recognized that it was synonymous with *Pseudophaonia* Malloch (1918). The words in brackets are additional to the original description.

Pseudophaonia steini Ringd.

♂. Head somewhat flat, as broad as thorax, eyes bare or very sparsely haired, separated by a black frontal stripe (about twice as wide as third antennal segment), frons not prominent, cheeks and jowls rather narrow, mouthedge not protruding. Face entirely silvery-grey pruinose, a white lunule above base of antennae. Antennae black, as long as face, third segment almost three times as long as second. Arista (very) long plumose. Proboscis black, somewhat short and thick (palpi somewhat spatulate and very bristly). Thorax black, ash grey pruinose, especially at sides, with four black stripes, outer pair broader. Dorsum with scattered bristles, otherwise bare, four post-sutural dorsocentrals, acrostichals strong and biserial. Scutellum blackish-grey. Abdomen elongate-oval, as long as thorax, thickly yellowish-grey pruinose, with faint greyish shifting spots, dorsal stripe reaching to apex and slightly broadened out at hindmargin of each segment. Legs black, hind tibiae usually faintly transparent reddish, claws and pulvilli rather short. Front tibiae with two-three distinct bristles below middle, middle tibiae with one anterodorsal, usually four posterodorsal, and two-three posteroventral bristles. Hind femora with a complete anteroventral row of bristly-hairs, becoming longer and stronger towards apex of femur, hind tibiae with a long dorsal bristle at apical third, posteroventrally along almost whole length with long bristly-hairs, and ventrally at apex with a long erect spur similar to that in *Trichopticus hirsutulus* and *nigritellus*. Wings hyaline, slightly yellowish at base, costal spine absent, cubital and discal veins diverging, the discal vein straight, hinder cross-vein straight, somewhat shorter than its distance from small crossvein, squamae unequal, whitish, halteres yellow. Length about 6 mm.

♀. Frons rather broad with distinct crossed bristles. Abdomen with distinct shifting spots and dorsal stripe. All tibiae transparent reddish-yellow, the front ones darker. Bristling of front and middle tibiae as in male, hind tibiae with three-four anteroventral bristles, without apical spur. In all other respects similar to male.

The function of the conjunctiva in copulation of a shieldbug, *Piezodorus lituratus* (Fabricius) (Hemiptera, Pentatomidae)

By Dennis Leston, F.R.E.S.

Introduction

The aedeagus of shieldbugs (Pentatomoidea) has been studied by Dohrn (1866), Sharp (1890), Pruthi (1925), Baker (1931), Balfour-Browne (1932) and Piotrowski (1950); in most cases the aedeagus has been figured and described after maceration and in a retracted state. When not copulating the aedeagus is withdrawn within the 9th segment and the vesica and conjunctival appendages lie collapsed within the theca; thus to view these structures the aedeagus must be dissected out and its endosoma teased out manually. In most shieldbugs this is a hazardous procedure and too risky to be attempted on holotypes (but in Scutellerinae sensu str. a comparatively simple operation; *cf.* Leston, 1952). Sailer (1952) has, however, managed to show sufficient of the conjunctiva in *Mecidea* to demonstrate its taxonomic importance whilst Bonnemaison (1952) has figured the erected male genitalia of *Eurydema*.

Recently the expanded aedeagus has been studied in many shieldbugs (Leston, 1952, 1953a, 1953b, 1953c, 1954a, 1954b, 1954c); expansion was obtained by manipulation of museum material after KOH maceration and neutralizing and staining in acid fuchsin in acetic acid. The present paper considers the naturally expanded aedeagus in order to see if structures are missed by manipulatory methods and attempts to elucidate the functions of the parts in copulation in relation to the female ovipositor.

Observations

By sweeping gorse a number of *Piezodorus lituratus* (F.) were obtained at Oxshott, Surrey, during late May, 1954. Placed in a breeding cage with stems of the host-plant and given top lighting, the bugs ascended the stems and went through a complex courtship. Male stridulation (not previously noticed in this species) played an important part in the preliminaries; subsequently males butted the sides of the female abdomen in a manner similar to that described in *Dolycoris* (Teyrovsky, 1949). Connection was obtained from a lateral position and mating proceeded in the familiar tail-to-tail posture; prior to coupling the males extruded the entire 9th segment and rotated it some 45° on either side of the mid-line whilst the gonopods too were extruded and rotated slightly. The long 8th-9th intersegmental membrane enables extrusion and rotation to occur; complete reversal—i.e. rotation through 180°—is possible and has been noted in other genera (e.g., in *Nezara* and *Palomena*). No movement of the female plates was noticed during courtship and whether opening of the valvifers is controlled directly by the female or due, in part, to grasping of the 2nd valvifers by the male gonopods remains unelucidated.

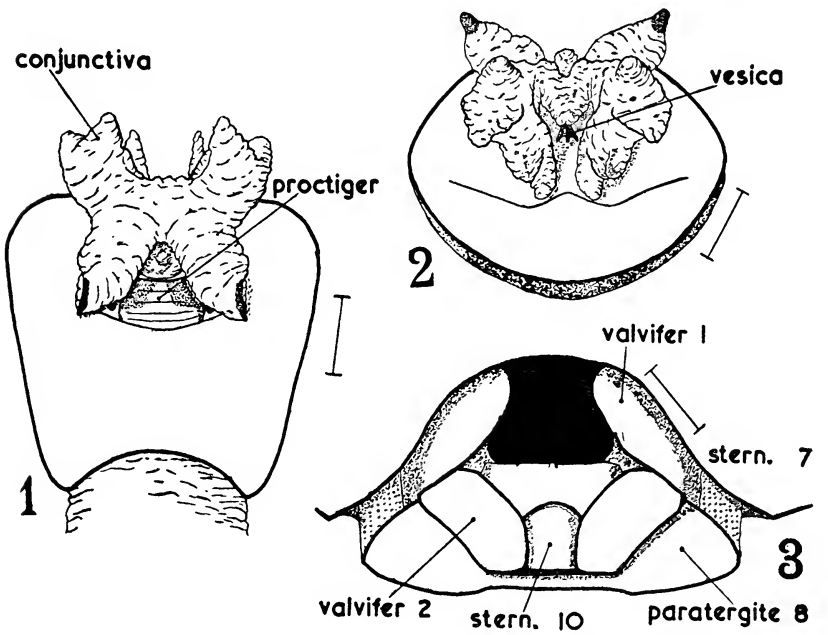
During copulation the vagina opens by a dorsal shift of the 8th and following segments. The intersegmental membranes between sternum 7 laterally and paratergite 8 are stretched as are also the membranes between the 1st and 2nd valvifers. The aedeagus, when expanded (by body fluid pumped by the muscled basal plate pump through the concentric canal surrounding the sperm duct), pushes the proctiger (anal flap) up and fills most of the genital atrium. It is far wider across than the female opening and must therefore be expanded fully only after insertion. Bonnemaison (1952) states that expansion is produced by the action of muscles attached to the basal plate and by seminal pressure; the basal plate muscles are in fact primarily concerned with the preliminary swinging into action of the aedeagus which, when at rest, points towards the male's head. Seminal fluid plays no direct part in erection for it is led straight through the theca in a narrow duct to the base or side of the so-called reservoir and does not fill the theca or appendages. As Baker (1931) has shown, the basal plate is connected laterally to the gonopods; swinging out of the aedeagus, therefore, also leads to erection of the gonopods.

During copulation the male gonopods are pressed firmly against the outside of the 2nd valvifers and their somewhat hooked tips facilitate the process. The 2nd valvifers are held between the gonopods externally and the sclerotic-tipped dorsal conjunctival appendages internally. The paired and bifid ventral conjunctival appendages lie within the vagina ventrally and press outwards upon the inner surface of the 1st valvifers. It will be seen, therefore, that the entire external opening into the vagina is closed by the conjunctival appendages within it pressing the valvifers backwards and sandwiching them against the gonopods.

In *P. lituratus* the vesica, through which runs the sperm duct, is a short and narrow sclerotic tube supported laterally by a pair of sclerotic wings, the sclerotized median conjunctival appendage (median penis lobe of Baker, 1931). It is not clear as to whether the sperm duct enters the spermatheca but the apices of the sclerotic wings correspond in shape to the sclerotization

surrounding the entrance to the spermatheca and thus entry of the apical vesica, with the external gonopore, into the spermathecal duct is probable.

Comparison of the naturally erected aedeagus with that obtained by manipulation of dead material showed that manipulation can, if properly carried out, give an accurate picture of the aedeagus and its attendant structure and appendages: however, allowance must be made for not quite complete expansion of membranous parts. So far success has been met with in all shieldbugs upon which instrumental erection has been attempted save for Brachyplatidae and Dinidorinae.



Figs. 1-3. *Piezodorus lituratus* (F.). 1, Male 9th segment, dorsal aspect, with genitalia expanded. 2, Male 9th segment, terminal aspect, with venter downwards. 3, Female ovipositor in copulating position, terminal aspect, with venter uppermost. Scales=0.5 mm.

Attempts have been made to use the collapsed aedeagus in comparative studies: this has led to considerable error—e.g., Pruthi found two pairs of conjunctival appendages in *Sehirus*, from which he concluded that they bridged the gap between Pentatominae and Scutellerinae. Leston (1954c) has shown that *Sehirus* possess three pairs of appendages, a character held in common with such primitive groups as Phloeidae, Tessaratominae and Pyrrhocoridae. Variation in number and position of the conjunctival appendages, especially reduction from the primitive tri-flabellate state, provides an important taxonomic character in the Pentatomoidea, albeit only a single character which cannot, of course, stand alone.

Bonhag and Wick (1953) have studied the interrelations of the male and female genitalia during copulation in a Lygaeid, *Oncopeltus fasciatus* (Dallas). They subjected mating pairs to rapid refrigeration, a method of value in the study of forms with filiform aedeagi. The present study has been made by plunging copulating pairs into boiling water: no abnormal contraction or expansion took place and, because of the elasticity of the conjunctiva, the bugs could be disconnected without collapse of the appendages.

Conclusions

1. Studies of the aedeagus of Pentatomoidea and related groups are of little value unless the aedeagus is expanded.
2. Expansion can usually be obtained by manipulation after KOH and acetic acid treatment.
3. Naturally expanded aedeagi can be obtained by plunging mating pairs into boiling water; where the aedeagus is non-filiform it can readily be separated from the female.
4. During copulation in Pentatominae the male gonopods are adpressed against the outside of the 2nd valvifers of the female.
5. The conjunctival appendages of male Pentatominae lie within the vagina during copulation and completely block the external opening of the latter. The dorsal appendages lie behind the 2nd valvifers, pressing these against the male gonopods: the ventral appendages press backwards behind the 1st valvifers.
6. The vesica probably enters the opening of the spermathecal duct and is assisted in maintaining contact by the median, sclerotized, conjunctival appendage. In *Piezodorus* and many other Pentatominae the median appendage takes the form of a pair of rigid wings to the apical vesica.
7. During copulation the vagina opens by a dorsal shift of the 8th and following segments, leading to stretching of the 7th-8th intersegmental and 1st-2nd intervalviferal membranes.

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COLEOPTERA TAKEN BY SWIFTS (*APUS APUS* L.)

By D. F. OWEN

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INTRODUCTION

Previous papers on the food of the Swift *Apus apus* have dealt with the spiders (Owen and Le Gros, 1954), the Diptera (Parmenter and Owen, 1954) and the Aphididae (Owen, 1954), while a more general paper on the food and feeding habits of the Swift has also been written (Lack and Owen *in press*). This paper deals with the Coleoptera found in meals obtained from young and adult Swifts at the nest (as described already) from Oxford and Radley (Berkshire). Each of the meals obtained comprised a compact ball of 300-1,500 insects (plus some spiders), many of which were still alive. Almost all the meals were collected in July.

As Swifts are entirely aerial feeders all the beetles obtained would have been caught in the air.

SPECIES TAKEN

All the beetles in 12 meals collected at Radley in 1944 have, so far as possible, been identified. The beetles in 7 meals collected at Oxford in 1949-51 have been identified to families, and the most numerous species in 19 meals collected at Oxford in 1952 have been identified specifically. A complete list is given in Appendix 1. The names are from Kloet and Hincks (1945).

The 12 Radley meals contained 1,201 beetles of 19 families and at least 81 species, representing about 13% of the food in these meals. The number of beetles in a meal ranged from 6 to 274. The most numerous families were the Nitidulidae (33% of total), the Chrysomelidae (25%), the Staphylinidae (15%) and the Curculionidae (13%). The commonest species were *Meligethes aeneus* (26% of all the beetles taken) and *Phyllotreta nemorum* (18%). These two were the fourth and sixth commonest of all the insects in the Radley meals. Other species were each taken less than 90 times, and many were recorded only once or twice.

In the 7 meals collected at Oxford in 1949-51 there were 974 beetles of 9 families. The commonest families, in order of numbers taken, were the Nitidulidae, the Curculionidae and the Chrysomelidae.

The most numerous families in 19 meals collected at Oxford in 1952 were the Chrysomelidae, the Curculionidae and the Hydrophilidae. The commonest species were *Phyllotreta atra*, *Sitona lineatus* and *Phyllotreta nemorum*.

There are some interesting differences in the numbers of certain species taken at Radley in 1944 and at Oxford in 1952. Many *Helophorus* spp. were found in 1952 but only 2 in 1944. These beetles often fly over water, where they could have been caught by the Swifts, but they may also fly over open fields. *Sitona lineatus*, a pest of beans, was very numerous on some days in 1952, but was not found at all in 1944. *Phyllotreta* spp. were numerous in both years, but in 1952 *P. atra* was the commonest and in 1944 *P. nemorum*.

TABLE 1

Daily variation in the numbers of some species, 1944

Species	Dates (July) 13 (1)*	14 (1)	15 (2)	16 (1)	17 (3)	19 (2)	22 (2)
Tachyporous chrysomelinus	1	22	8	3	4	10	—
T. hypnorum	1	23	14	5	8	33	—
Meligethes aeneus	4	31	19	2	33	221	—
M. picipes	6	16	22	5	5	9	—
Typhoea stercorea	—	—	15	12	—	—	—
Adalia decempunctata	—	2	—	—	44	2	—
A. bipunctata	1	—	—	—	11	—	—
Lema melanopa	—	—	—	24	1	—	—
Phyllotreta vittula	—	2	1	—	10	—	—
P. nemorum	—	1	1	—	209	15	—
Apthona euphorbiae	—	2	1	1	—	1	6
Sitona puncticollis	—	17	—	—	12	2	—
Phytonomus nigrirostris	—	4	—	—	25	4	—
Stenocarus fuliginosus	38	—	1	—	5	5	—
Ceuthorhynchus pleurostigma ..	—	1	4	—	4	2	—

* Number of meals examined.

Table 1 shows that in 1944 there was a marked tendency for species to be confined to a few meals on certain days. Thus, although *Meligethes aeneus* was the commonest species (310 specimens), it was common only on 19th July, when in two meals there were 221. Of the 48 *Adalia decempunctata*, 44 were in three meals collected on 17th July and of the 25 *Lema melanopa* 24 were in one meal. In the three meals collected on 17th July there were 209 *Phyllotreta nemorum* and only 17 on all the other days. Similarly, 25 out of 33 *Phytonomus nigrirostris* were taken on this day. *Tachyporus chrysomelinus* and *T. hypnorum* appeared in fair numbers on most days, but were more numerous on 14th and 19th July than on other days.

It appears that the numbers of different species of beetles in the air fluctuate considerably from day to day, with the result that the Swifts catch certain species in large numbers on some days and hardly at all on other days. Evidently the numbers of different species in the air change from day to day because of hatching, dying and also the weather, the Swifts catching any that happen to be available. It is also possible that Swifts sometimes find local

concentrations of particular species. For instance in one meal containing 58 insects collected at Oxford in 1950, there were 39 *Amara familiaris* Duft. (Carabidae), suggesting that the Swift had found a local swarm.

Comparison with trapping records

It is interesting to compare the records of beetles caught by Swifts with aerial trapping records. Freeman (1945) found that during two summers, beetles comprised 5.6% of the total insects trapped in Lincolnshire, and that there were fewer beetles in the air in July than in the other months from May to October. Throughout the summer, not necessarily in July, the commonest families trapped were the Staphylinidae (especially *Tachyporus*, *Oxytelus* and *Atheta*), the Lathridiidae and the Chrysomelidae (especially *Phyllotreta undulata* and *Chaetocnema concinna*). The Curculionidae were mainly confined to June, the commonest species being *Sitona lineatus*, *S. hispidulus* and *Apion dichoum*. Hardy and Miln (1938) found that the Chrysomelidae and the Staphylinidae were the most numerous families trapped at various places in England during the summers of four years.

If the above records are compared with the results from Swift meals it will be seen that there are some differences, also some similarities, in the numbers of some of the families represented. The chief difference was the scarcity of the Lathridiidae in the Swift meals and their abundance in the traps.

Size of prey

Almost all the beetles taken were small. This agrees with the results from other orders where it was found that Swifts avoided both very large and very small species, and also that smaller insects were taken chiefly on dull windy days, when other larger prey was not available (Lack and Owen *in press*).

At Oxford on 29th June, 1949, Miss M. M. Betts watched Swifts trying to catch large beetles, eventually identified as *Amphimallus solstitialis* L., which were flying over some grass and trees. The Swifts often caught one of these beetles, but often dropped one as they were too large to swallow comfortably. This beetle is well above the average size of insect that the Swift usually takes.

Acknowledgements

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Appendix 1

List of Coleoptera in Swift meals

(*a*) Families, with commonest species in brackets (1944 only).

		Radley, 1944 (12 meals)	Oxford, 1949-51 (7 meals)
1.	Carabidae	—	40
2.	Hydrophilidae	6	11
3.	Silphidae	2	1
4.	Leiodidae	1	—
5.	Staphylinidae	194	274
	(*Tachyporous chrysomelinus* (L.)) ..	(48)	
	(*T. hypnorum* (F.))	(86)	
	(*Tachyporous* sp.)	(28)	

		Radley, 1944 (12 meals)	Oxford, 1949-51 (7 meals)
6.	Elateridae	1	—
7.	Nitidulidae	392	445
	(*Meligethes aeneus* (F.))	(310)	
	(*M. picipes* Sturm.)	(63)	
8.	Cucujidae	1	—
9.	Cryptophagidae	4	—
10.	Phalacridae	10	—
11.	Lathridiidae	10	2
12.	Mycetophagidae	27	—
	(*Typhoea stercorea* (L.))	(27)	
13.	Coccinellidae	69	8
	(*Adalia decempunctata* (L.))	(48)	
	(*A. bipunctata* (L.))	(12)	
14.	Anobiidae	3	—
15.	Pythidae	1	—
16.	Anthicidae	3	—
17.	Chrysomelidae	306	47
	(*Lema melanopa* (L.))	(25)	
	(*Phyllotreta vittula* Redt.)	(13)	
	(*P. nemorum* (L.))	(226)	
	(*Apthona euphorbiae* (Schr.))	(11)	
18.	Bruchidae	1	—
19.	Curculionidae	160	146
	(*Sitona puncticollis* Steph.)	(31)	
	(*Phytonomus nigrirostris* (F.))	(33)	
	(*Stenocarus fuliginosus* (Marsh.))	(49)	
	(*Ceuthorhynchus floralis* (Pk.))	(11)	
20.	Scolytidae	8	—

(*b*) Species caught less than 10 times at Radley, 1944. Numbers refer to families as above.

2, *Helophorus brevipalpis* Bed., *Megasternum obscurum* (Marsh.). 3, *Sciodrepa fumata* (Spence). 4, *Leiodes scita* (Ev.). 5, *Proteinus ovalis* Steph., *Oxytelus inustus* Gr., *O. nitidulus* Gr., *O. tetracarinatus* (Block), *Platysterhus arenarius* (Geoff.), *Quedius cinctus* (Pk.), *Tachyporus pusillus* Gr., *T. formosus* Matth., *Amischa analis* (Gr.), *Atheta atramentaria* (Gyll.), *Atheta* sp. 6, *Adrastus nitidulus* (Marsh.). 7, *Brachypterus glaber* (Steph.), *Meligethes viridescens* (F.), *M. difficilis* (Heer), *M. erythropus* (Gyll.), *M. lugubris* Sturm, *Meligethes* sp. 8, *Monotoma conicicollis* (Aub.). 9, *Cryptophagus affinis* Sturm., *Atomaria fuscata* (Schoen.), *A. pusilla* (Pk.), *Atomaria* sp. 10, *Phalacrus coruscus* (Panz.), *Olibrus aeneus* (F.), *Stilbus oblongus* (Er.). 11, *Lathridius lardarius* (Deg.), *Enicmus transversus* (Ol.), *E. histrio* Joy, *Corticaria elongata* (Gyll.), *Corticarina gibbosa* (Hbst.). 13, *Calvia quattuordecimgutta* (L.), *Propylea quatourdecimpunctata* (L.), *Paramysia oblongoguttata* (L.). 14, *Anobium punctatum* (Deg.), *A. fulvicorne* Sturm. 15, *Salpingus ater* (Gyll.). 16, *Notoxus monocerus* (L.), *Anthicus floralis* (L.), *A. antherinus* (L.). 17, *Gastrophysa polygoni* (L.), *Phyllotreta undulata* Kuts, *P. atra* (F.), *Longitarsus ochroleucus* (Marsh.), *L. gracilis* Kuts., *Chaetocnema concinna* (Marsh.), *C. hortensis* (Geoffr.). 18, *Bruchus loti* Payk. 19, *Apion violaceum* Kirby, *A. pisi* F., *A. assimile* Kirby, *Sitona hispidulus* F., *S. humeralis* Steph., *Curculio salicivorus* Pk., *Phytonomus nigrirostris* (F.), *P. fuscocinereus* (Marsh.), *P. posticus* (Gyll.), *Ceuthorhynchus floralis* (Pk.), *C. assimilis* (Pk.), *C. quadridens* (Panz.), *C. erysimi* (F.), *Rhinoncus castor* (F.). 20, *Scolytus multistriatus* (Marsh.), *S. scolytus* (F.), *Polygraphus polygraphus* (L.), *Dryocoetes villosus* (F.).

(*c*) Families and chief species found in 19 meals from Oxford, 1952.

Hydrophilidae	97	(all *Helophorus* sp.)
Staphylinidae	38	
Cantharidae	3	(all *Cantharis fulvicollis* F.)
Coccinellidae	23	(6 species, each represented by less than 10 individuals).
Chrysomellidae	623	(*Phyllotreta vittula* Redt. 15, *P. nemorum* (L.) 128, *P. atra* (F) 462, *P. nigripes* (F.) 11, and 3 other *Phyllotreta* spp. represented by less than 10 specimens each)

Curculionidae 428 (*Sitona lineatus* (L.) 384, *Phytonomus nigrirostris* (F.) 7, *Ceuthorhynchus* sp. 9)

Coleoptera indet. 14

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THRIPS ON THE STINKHORN FUNGUS (*PHALLUS IMPUDICUS* PERS.)

By KENNETH G. V. SMITH, M.I.BIOL., F.R.E.S.
(Hope Dept. of Entomology, Oxford)

During an investigation of the Diptera associated with the Stinkhorn (*Phallus impudicus* Pers.) one specimen of this fungus was found to be infested with Thysanoptera. Dr. Guy Morison informs me that despite search on all the larger fungi, including a few specimens of *P. impudicus*, he has never found them frequented by thrips. The fungus was an old one, broken due to the feeding of slugs and lying on its side in long grass. The gleba containing the spores had been removed by the feeding of flies. The nearest flowers were a few *Lychnis dioica* L. about fifteen yards away, but no thrips were found on these or on the surrounding grasses, which were swept thoroughly.

These observations were made in Wolverhampton, Staffs., on 26.x.54 and the following list of thrips found on the fungus are fairly common Staffordshire species:

Taeniothrips atratus Hal., 8 ♀♀.
T. vulgatissimus Hal., 1 ♀.
Thrips flavus Schrank, 19 ♀♀.
T. fuscipennis Hal., 1 ♀.
T. major Uzel, 3 ♀♀.

The thrips were distributed over the whole of the fungus and it is doubtful if the odour or the gleba attracted them since several other fruiting bodies in the area were not infested. Sunlight may have been a deciding factor, however, since the main colony of the fungus was shaded beneath trees, whereas this single specimen was isolated and exposed to sunlight most of the day. Sunlight was also found to be an important factor governing the number of flies attracted to this fungus.

Full details of the Diptera associated with *P. impudicus* are to be published elsewhere. Best thanks are due to Dr. Morison for kindly naming the thrips and for useful discussion.

Two interesting British Records of Thysanoptera

By T. Lewis

(Zoology Section, University of Nottingham; School of Agriculture, Sutton Bonington, Loughborough)

1. *Abiastothrips schaubergeri* (Priesner, 1920) (Phlaeothripidae)—new to Britain.

On the 14th July, 1954, whilst collecting thrips at Box Hill, Surrey, I took an unfamiliar member of the suborder Tubulifera on wheat (*Triticum aestivum* L.), which subsequently proved to be a (macropterous) male of *Abiastothrips schaubergeri* (Priesner) and, since this species has not hitherto been found in Britain, opportunity is now taken to place the above on record. The specimen will be deposited in the British Museum (Nat. Hist.).

Although the thrips was found in the inflorescence it had probably alighted on the wheat accidentally, since the adults and larvae almost certainly feed on spores of certain, perhaps minute, fungi growing on dead wood (Dr. G. D. Morison, *in litt.*, 1954).

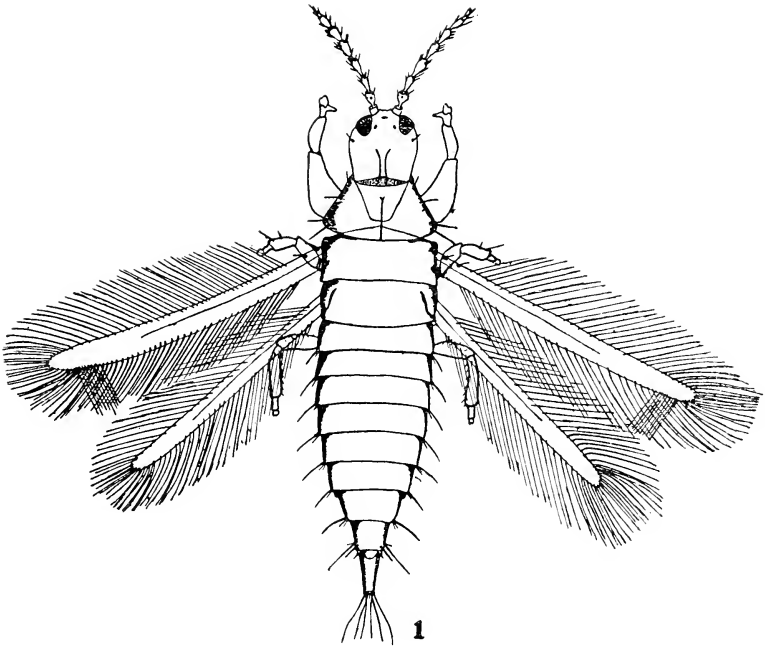
The species (originally included in the genus *Trichothrips*) was based on a single (macropterous) female caught in flight in Upper Austria (Priesner, 1920). Subsequent to the original description a male and three second instar larvae were taken in stems of *Rubus* in Germany and larvae (probably belonging to this species) were also found in great numbers under the bark of dead oak in Holland (*cf.* Priesner, 1928, who cites the relevant literature). Dr. G. D. Morison (*in litt.*, 1954) also notes that adults have been reared from old galls of *Andricus circulans* Mayr. (*Cynips kollari* (Hartig.)) in Czechoslovakia.

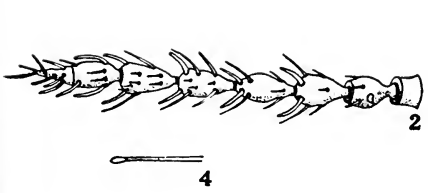
Abiastothrips was originally described as a subgenus of *Trichothrips* by Priesner (1925), but it was subsequently given generic status and redefined by its author (1928). Since the genus is new to the British list, the characters used by Priesner may be repeated as follows:

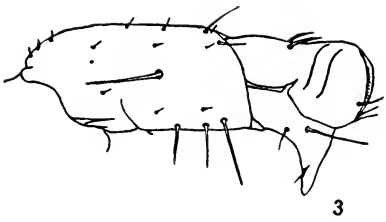
Antennae 8—segmented, the 7th and 8th segments fused together. Head about as long as broad, cheeks without spines or warts; mouthcone rounded, labrum extending somewhat beyond the labium; interspace between the insertion of the antenne unusually large, but not quite so great as the marginal eye-length. Body-bristles almost hyaline. Wings of even breadth in the middle, with supernumerary cilia. Fore femur of female not thickened, that of male somewhat thickened; fore tarsus of both sexes toothed. Tube short.

Abiastothrips tracks down in Morison's (1949) key to the British genera of Phlaeothripidae as far as the last genus, *Phlaeothrips*, but may be separated by adding the following to the key:

"Antennae only about 1.5 times as long as head, segment I short and broad, II longer and narrower than I; segments VII and VIII fused together; fore femur little enlarged in ♀, greatly enlarged in ♂; wings macropterous; body-bristles long and tapering, those on prothorax and abdominal segments 2, 3, 4 and 8 capitate (fig. 4). Abdominal segment 9 of ♂ extended like a small scale over base of tube.....*Abiastothrips* Pries."







Figs. 1-4. 1, *Abiastothrips schaubergeri* (Priesner) ♂. 2, *Id.* Left antenna (dorsal). 3, *Id.* Fore Tarsus. 4, *Id.* Capitate hair (from second abdominal segment).

Priesner (1928) also gives descriptions of the (macropterous) male, female and the second larval instar but it is scarcely necessary to repeat these in the absence of more than a single species. The accompanying figures are given to aid identification. The species is also figured by Priesner (1920, 1926, 1928).

2. *Euchaetothrips kroli* (Schille, 1910) (Thripidae)—new to Nottinghamshire.

On 19th and 30th September and 9th and 20th October, 1954, *Euchaetothrips kroli* (Schille) was taken on *Glyceria maxima* (Hartm.) at Kingston-on-Soar, Notts., adult males and females, pupae, prepupae and first and second instar larvae being collected on each occasion except the last, when only adults and pupae occurred. The record is apparently new for the county.

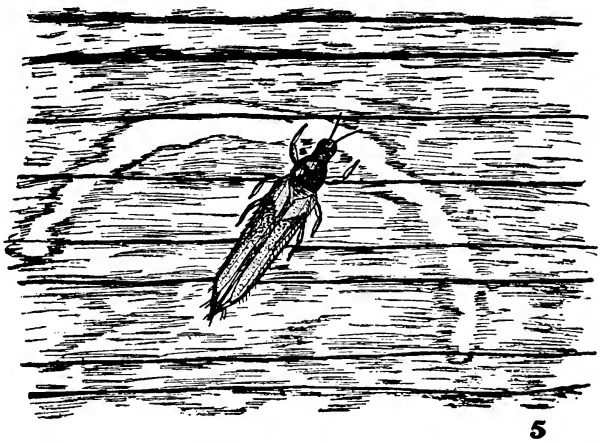


Fig. 5. *Euchaetothrips kroli* (Schille), female anchored to leaf (redrawn from Ahlberg, 1924).

The females of *E. kroli* exhibit an unusual habit not noticed in other thrips. Small, silvery-grey, crescent-shaped areas can sometimes be seen on the younger leaves of the grass. These are made by a female thrips, which, after inserting her ovipositor, is sometimes unable to withdraw it. As a result the thrips becomes anchored to the leaf and concentric lesions are produced by the insect as it sucks the sap from the only areas of tissue that it can reach (fig. 5). Presumably, when all accessible sap has been exhausted the insect dies.

An explanation of this peculiarity is suggested by Ahlberg (1924), who describes the biology of the species.* He believes that the rich store of silicic acid in this grass makes the cell walls unusually strong, and this coupled with the well developed teeth of the ovipositor make withdrawal difficult and occasionally impossible. It is, however, interesting to speculate whether or not this apparently disadvantageous occurrence has any function in the perpetuation of the species. *Glyceria maxima*, the only known host-plant in which oviposition occurs, is a semi-aquatic grass thriving in rather exposed situations, and it might be postulated that the anchoring of the

females to the host-plant by means of their ovipositors may be a mechanism which ensures that eggs are laid even in unfavourable conditions such as high winds or temporary inundation.

During the present season all immature forms and adult males had disappeared by 27th October, but the females overwinter in the shrivelled leaf sheaths of the grass Ahlberg (*l.c.*), and it is interesting to note that this year they were found alive and active on the 14th November after the host-plants had been completely inundated for four days.

Bagnall (1924) records specimens in England from August to October. *E. kroli* occurs also in Germany, Czechoslovakia, Poland, Austria and Hungary. Ahlberg (*l.c.*) and Priesner (1928) give full accounts of the species, the former author including several figures, one of which is reproduced here.

Thanks are due to Dr. G. D. Morison of Aberdeen for his help in identification and permission to use information contained in his letters, to Mr. D. K. McE. Kevan for assistance with the manuscript and literature, and to the Royal Entomological Society of London for the loan of Priesner's monograph.

* Ahlberg uses the name *E. ingens* Priesner, but this is a synonym of *Thrips kroli* Schille, 1910 (*cf.* Priesner, 1928).

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THE IDENTITY OF THE BRITISH *STRONGYLOGNATHUS* (HYMENOPTERA: FORMICIDAE)

By WILLIAM L. BROWN, JR.
(Museum of Comparative Zoology, Harvard University)

The following formal synonymy is required at this time:

Strongylognathus testaceus (Schenck)

Eciton testaceum Schenck, 1852, Jahrb. Ver. Nat. Nassau, 8: 117, 143, worker, female, male. Type loc.: Nassau, Germany.

Strongylognathus testaceus, Emery, 1922, Gen. Insect., 174: 286, synonymy.

Strongylognathus diveri Donisthorpe, 1936, Ent. mon. Mag., 72: 113, figs. 1, 2, 7, worker. Type loc.: Studland, Dorsetshire, England. Syntypes presumably in British Museum (Nat. Hist.), not seen. NEW SYNONYMY.

In checking carefully Donisthorpe's original description of *S. diveri* against series of *S. testaceus* from France, Germany, Austria, Switzerland and Italy in the Wheeler and Finzi Collections (det. Forel, Emery, Wheeler, Menozzi, Finzi), I found that Donisthorpe's comparison of the two species amounted simply to a list of the slight allometric divergences holding between the largest and smallest workers of the ordinary *testaceus*. Specimens of all three castes from Wareham, Dorset, kindly sent by Mr. C. A. Collingwood as representative of *S. diveri*, were compared with my continental series, with the result that the British specimens are considered to be well within the normal continental range of variation in the worker caste. The Wareham sexual forms are also exceedingly like those of my German, etc., samples, though the Wareham female is just a shade larger than any of the few females I have at present. The worker thoracic features emphasized by Donisthorpe as diagnostic appear to me to be the same in British and continental series, subject only to slight individual variations distributed geographically at random. The British form does not appear to me to be distinguishable by means of any reliable character or combination of characters.

The British *Strongylognathus* (Hym., Formicidae)

By I. H. H. Yarrow, M.A., Ph.D., F.R.E.S.

(Department of Entomology, British Museum (Natural History))

It is perhaps a pertinent moment to put on record certain facts regarding this little known British ant which have so far escaped publication. Professor O. W. Richards, who received the original specimens from Captain Diver, has kindly given me the following details: "When Captain Diver captured the first British specimens of *Strongylognathus* he recognized that they were something unusual and showed them to me. It was at once evident that they belonged to a genus new to Britain and, comparing them with the material then available in the British Museum, it seemed to me that they were a sub-species of *S. testaceus* (Schenck). They differed in having a much less strongly sculptured head, especially posteriorly. The specimens were then handed over to Mr. Donisthorpe who decided to describe them as a new species but did not mention the important difference in head-sculpture." It is not known for what reason Donisthorpe entirely ignored the head-sculpture character though it cannot have been because he failed to notice it since he had access to Richards' notes and indeed used Richards' figures to illustrate his description. Mr. W. L. Brown of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass., in a paper sinking *S. diveri* Donisthorpe as a synonym of *S. testaceus* (Schenck) (*antea*, pp.) has found that the characters used by Donisthorpe to distinguish *diveri* are no more than slight allometric divergencies well within the known range of variation of the European *testaceus* and Brown (*in litt.*) tells me that the head-sculpture character is of the same order, certain series from Mara, Austria and Czechoslovakia being considerably less sculptured than the British. In the British Museum (Natural History) there is a single specimen from Berlin

and a second from an unknown European locality which are comparable with British examples but all others I have seen have the head at the back considerably more sculptured. All castes of this ant are now known from Britain though Donisthorpe saw only workers: I have been unable to detect any difference between the sexuals of *diveri* and *testaceus* and the head sculpture of the female is pronounced in all specimens examined.

In Britain this ant is known from a relatively small area around Poole Harbour in Dorset (South Haven Peninsula, Studland, Arne and Corfe) and from Hurn, near Christchurch, and all specimens seen from some six or seven colonies have the head smooth; on the other hand, in a colony discovered very recently at Matley, near Lyndhurst, in the New Forest, by Mr. A. J. Pontin, there are occasional specimens in which the head is not smooth and indeed one of these is quite as strongly sculptured as Continental examples. The host species, *Tetramorium caespitum* (L.) abounds in these areas but though I have investigated a large number of their nests I have yet to see *Strongylognathus* alive. It is obviously no easy matter to obtain the number of nest samples of both British and Continental *testaceus* required for a study of variation and such a collection may take years to assemble; at the present time I feel it is worth while to record the fact that the more sculptured head, apparently typical of many more southerly Continental localities, remains a great rarity in this country and still remains unknown in the *diveri* type locality.

I should like to take this opportunity of thanking Professor O. W. Richards for the loan of nest series from Britain and from Holland as well as for the paragraph quoted, Mr. M. Bibikoff for the loan of specimens from Switzerland, Messrs. S. C. S. Brown, C. A. Collingwood and P. Harwood for details of colonies discovered in Dorset and Hampshire, and Mr. A. J. Pontin who has a note in press (*Ent. mon. Mag.*) at the moment.

Reviews

Handbooks for the Identification of British Insects. Published by the Royal Entomological Society of London, 14th September, 1954. Vol. X, Part 4 (a). Diptera Cyclorrhapha, Calyptrata (1), Section (a). Tachinidae and Calliphoridae. By F. I. van Emden. 133 pp., 42 blocks comprising nearly 800 figs. 20*s.* 0*d.*

This recently published excellent work by Dr. van Emden brings our knowledge of these two difficult families up to date, and it may now be said that this large and important group of flies, with over 300 British species, which less than thirty years ago was practically unknown except to the expert, can today be studied with equal confidence with the popular Syrphidae. The first step towards lifting this interesting group of Diptera out of obscurity for the rank and file of British dipterists was taken in 1928, when the late Mr. Colbran J. Wainwright published his "British Tachinidae" in the *Transactions of the Entomological Society of London.* Unfortunately the generic "Tables" in this first complete British work on the two families proved too difficult for the majority of dipterists, and the publication in 1946-7, in the *North Western Naturalist*, of Dr. C. D. Day's "British Tachinid Flies" provided a welcome spur to the flagging interest in this group. Yet a third work on these two families was in preparation by the late Mr. H. L. F. Audcent, but although this was completed in 1950 it has unfortunately remained unpublished.

The introductory part of Dr. van Emden's work is devoted to a general description of the Calyptrata with a key to the four families which it comprises, definitions of the terminology used, a list of the British species of Tachinidae arranged in systematic

order of their hosts, and a review of the present knowledge of the various methods of oviposition adopted by the different groups. The identification "Tables," which form by far the greater part of the work, are greatly enhanced in value by the excellent figures which copiously illustrate the important characters, each block of figures being arranged on the lower half of alternate pages so that in almost every case a figure appears on the same double page as the text to which it refers. As each species is keyed out, much valuable information relating to distribution, flight-period, frequency, hosts, etc., is compactly given wherever it is known, and in addition synonymy is noted where necessary.

Previous authors of "Tables" for the identification of species of this group have usually made use of "artificial" characters. Dr. van Emden's work is therefore particularly valuable in that it departs from the normal practice, the division into subfamilies, tribes, subtribes and genera being progressively achieved by means of true group-characters, which provide a clue to the *natural* relationship between the groups. Dr. van Emden has set a high standard which it is hoped will be maintained in the Handbooks still to be published. E.A.F.

Handbooks for the Identification of British Insects. Vol. IV, part 8 (a). Coleoptera, Staphylinidae, section (a), Piestinae to Euaesthetinae. By C. E. Tottenham. 9″×6″, 79 pp., 196 figs. Published by the Royal Entomological Society of London, 30th November, 1954. Price 15*s.* 0*d.*

The important and largest family of British Coleoptera, the Staphylinidae, has not been treated in detail since the second volume (1888) of Canon Fowler's "British Coleoptera." It is true that Joy's keys (1932) have been of the greatest service to experienced coleopterists but they lack the fullness requisite for general use. Mr. Tottenham's work, therefore, will be widely welcomed. The first part, now published, deals with the more primitive subfamilies Piestinae, Micropeplinae, Pseudopsinae, Phloeocharinae, Metopsiinae, Protaininae, Omaliinae, Oxytelinae, Oxyporinae, Steninae and Euaesthetinae; it includes 44 genera and nearly 250 species, over a quarter of the British species of the family. Users of Fowler and Joy will notice some changes in nomenclature following the work of Blackwelder and of Tottenham himself, a tendency towards a reduction in the size of the genera and a liberal use of subgenera. Figures of the male genitalia such as are provided for the species of the genus *Stenus* are a useful addition to the British literature on the family. It is difficult in a few words to provide an adequate picture of the local distribution of a species and experienced coleopterists will have their own special faults to find with Mr. Tottenham's brief summaries. Misprints such as "bicoornis" for *bicornis* on page 52 are very few indeed. Only after long usage can a publication such as this be fully appraised but our first impressions are favourable indeed and we congratulate the author on the first quarter of his formidable task. W.D.H.

The Physiology of Insect Metamorphosis. By V. B. Wigglesworth, C.B.E., M.D., F.R.S. viii+149 pp., 4 pls., 45 text figs. Cambridge: University Press, 1954. Price 12*s.* 6*d.*

This is the first of a series of monographs in experimental biology to be published by Cambridge University Press. Each of the series is to be limited to 40,000 words. With this limited space at his disposal, Professor Wigglesworth has succeeded in presenting a remarkably comprehensive account of the many and varied aspects of insect metamorphosis. His style is clear and straightforward; there are no frills, and he is therefore able to convey as much in one page as many cannot in six, and still it is most readable. The framework of the book is provided by the argument that metamorphosis is after all only one example of polymorphism, albeit a most striking one. As he says, "The study of metamorphosis therefore provides a useful introduction to a consideration of the differences in form in different individuals of a species, which is called 'polymorphism,' and the differences in form of the different parts of an individual, which is commonly called 'differentiation'."

The book is very well produced: there are hardly any misprints. *Trypoxylon* is not a sawfly (p. 25) but a wasp. The text-figures are all pertinent and most are very good, as are the four plates. The bibliography consists of just over 380 titles. These include

nearly all of the most important papers published on insect hormones in recent years, and the value of this part of the book is the greater because the titles are given in full.

The statement (p. 81) that, "Implantation of extra corpora allata into worker bees does not induce them to produce eggs . . ." is not correct as it stands nor in its context. The real point here is that implantation of extra corpora allata from other worker bees does not induce worker bees to lay eggs, but the implantation of corpora allata from the queen does so (Altmann, 1952, *Z. Bienenforsch*, 1: 124). I think this is what we would expect, since, as shown by Müssbichler, an increase in the size of the ovaries of worker bees parallels an increase in the size of their corpora allata. In this connection we may note a further confusion: it is not the absence of brood that enables the ovaries of worker bees to grow because they then have more food for themselves. It is the absence of an inhibitory substance, which they obtain continually in small amounts from the queen, that permits their ovaries to grow. Of course if worker bees are starved sufficiently their ovaries will be absorbed even if in the absence of a queen these have become large. It seems as if, perhaps, the inhibitory substance produced by the queen acts not directly upon the ovaries of the worker bees but first directly or indirectly upon their corpora allata.

In *Rhodnius* growth and moulting are initiated in the larva by the ingestion of a single meal of blood. If it does not get a meal, or if does not get one that is large enough, it will not moult or grow. Wigglesworth has shown that the actual stimulus for moulting is the stretching of the abdomen, as occurs when it has a meal of the appropriate size. This stretching provides a stimulus carried by the nerves to the brain. The brain then secretes a hormone which activates the prothoracic gland, and the latter in turn secretes a hormone which initiates moulting in the epidermis. The period when the larva of *Rhodnius* neither moults nor grows for lack of food is called a diapause period by Wigglesworth (p. 46). I feel this is a most unfortunate use of the term diapause. If we are going to describe this sort of thing as diapause, we must invent a new term for the extraordinary phenomenon that is now by fairly general agreement called diapause. Diapause manifests itself as a state of arrested development that may usually be distinguished sharply from the type of developmental arrest that is a simple function of temperature, humidity, or other unfavourable circumstance in that (1) the factors that initiate it do so well in advance of the advent of diapause or the appearance of the unfavourable conditions, sometimes even in the preceding generation; and (2) the physiological changes that must occur before diapause is terminated occur more quickly under ordinarily unfavourable conditions, *e.g.* low temperature, than under those which are at other times most favourable to rapid development. Once diapause is terminated, however, the speed of development again becomes directly related to temperature within the physiological range.

C. M. Williams has not found a diapause hormone in *Platysamia* or the other Saturniidae on which he has worked. If *Platysamia* has a diapause hormone, the results of some of the experiments by C. M. Williams are subject to other interpretations. Wigglesworth seems to accept the proposition that there is no diapause hormone in *Platysamia*. Not only has one been demonstrated experimentally in a number of genera of Saturniidae but also in a number of unrelated families of moths as well as in other orders of insects. I find it difficult to believe that a hormone known to effect diapause in Asiatic and European Saturniidae is not involved in the control of diapause in the Saturniidae that inhabit the United States.

It is nice to see that Wigglesworth points out some of the absurdities inherent in the Berlese theory of development, a theory that has been accepted for several decades almost without question. We also welcome the fact that he has finally abandoned the use of the word nymph and now speaks of the larva of *Rhodnius* and other exopterygotes. It is difficult to imagine that anyone with a wide interest in entomology, to say nothing of insect physiology, can afford to be without this book.

H.E.H.

A Revised Key to the adults of the British Species of Ephemeroptera. By D. E. Kimmins. $8\frac{1}{2}'' \times 5\frac{1}{2}''$, 72 pp., 30 figs. Freshwater Biological Association Scientific Publication No. 15. Price 3*s.* 0*d.*

We are glad to welcome the publication of the second edition of this booklet on the Ephemeroptera of the British Isles. The first edition, which has already proved its worth, has been enlarged and brought up to date, and the figures and text have been

re-arranged with advantage to the reader. Since the first edition appeared in 1942 six new species have been added to the British Fauna and a number of changes have been made in the nomenclature. These have been incorporated in the second edition.

The standard of the new booklet is high. Mr. Kimmins' diagrams are clear and accurate and his text is lucid and logically arranged so that the reader should experience little difficulty in using the booklet. The first edition (Scientific Publication No. 7) included a key to the families and genera of the nymphs, but in the second edition this has been omitted. Since 1942 considerable progress has been made in the taxonomy of the immature stages of insects and this is most conspicuous in the Ephemeroptera. It has been decided, therefore, to issue in the near future a new publication dealing with the nymphal stages of Mayflies. It would have been useful if this material could have been included in the present publication, but the existence of a steady and continued demand for the first edition after the original stock had been exhausted has made it necessary to publish the present booklet as soon as possible.

In the foreword to the first edition Dr. Worthington, then Director of the Freshwater Biological Station, expressed the hope that it would "stimulate scientific work and observation on the Ephemeroptera." The widespread demand for the new publication shows that this hope was realized. It is, therefore, a pity that the ecological notes on the species make little reference to the general distribution of species within the British Isles.

The price of the present publication has been increased to 3*s*. 0*d*., but in view of its high quality there can be few who will object to this. E.J.P.

Transaction

With this *Journal* are distributed *Transaction*, Vol. 12, Part 1, and Title Page and Contents for Vol. 11 of the *Transactions*.

Ninth Congress of British Entomologists

Entomologists are reminded that this Congress will be held in Bristol, 22nd-25th July, 1955. A full programme of lectures has been arranged, a collecting trip to the pools at Charterhouse will take place on the Sunday, and the Congress will wind up on the Monday with a visit to the delightful Zoological Gardens at Clifton. Programmes of the Congress will be posted to those on our mailing list early in May.

All those interested in entomology are cordially invited to attend, and Membership of the Society for British Entomology is not necessary.

(*Continued from inside front cover*)

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A Consideration of Cephalic Structures and Spiracles of the Final Instar Larvae of the Ichneumonidae. By B. P. Beirne, 1941. 68 pp., 31 figs., 5*s*. 6*d*.

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(Continued on inside back cover)

JOURNAL OF THE SOCIETY
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VOL. 5 | 15TH NOVEMBER, 1955 | PART 4

A KEY TO THE FEMALES OF THE BRITISH SPECIES OF *SARCOPHAGA* (DIPT., CALLIPHORIDAE)

By C. D. DAY, M.A. (CANTAB.), D.P.H.
and E. C. M. D'ASSIS-FONSECA, B.Sc., F.R.E.S.

The following Key is intended as a complement to the Key to the males of this genus included in "British Tachinid Flies," by C. D. Day (*Northwestern Naturalist*, T. Buncle & Co., Arbroath).

1-66. 3 subequal postsutural dorsocentrals.
2-13. 5th tergite red or partly so.
3-6. 2nd tergite with strong median marginals. Mid-femoral organ* present on apical quarter, though often very inconspicuous.
4-5. 5th tergite an entire arch, at least the ventral half black with distinct whitish pruinosity. Mid-femoral organ usually slightly reddish.. ..... *haemorrhoa* Mg.
5-4. 5th tergite divided or incomplete above so that it appears deeply notched, more narrowly black ventrally and with little or no pruinosity. Mid-femoral organ usually black ..... *frenata* Pand.
6-3. Median marginals on 2nd tergite weak and reclinate, or entirely absent.
7-8. Frontal bristles continued on to cheek in a straight row. 5th tergite an entire arch, wide and rounded, usually extensively reddish. Tegula of wing fulvous. Mid-femoral organ absent..*pernix* Harr.
8-7. Frontals (the lower 2 or 3 on cheek) standing in a curve towards eye. Tegula black.
9-12. Yellowish-grey or grey-brown species. 5th tergite divided or incomplete above, marginals not conspicuously stout or crowded together. Mid-femoral organ present.
10-11. Mid-femoral organ almost apical, usually somewhat reddish, about $\frac{1}{4}$ length of femur. 5th tergite largely shining black below with little or no pruinosity, upper marginals $\frac{1}{3}$-$\frac{1}{2}$ as stout as those on 4th.... ..... *arcipes* Pand.
11-10. Mid-femoral organ central, narrow, black (rarely badious), $\frac{1}{4}$-$\frac{1}{3}$ length of femur. 5th tergite mainly black with normal pruinosity, upper marginals fine and hair-like.....*incisilobata* Pand.

* For description see note at end of Key.

12-9. Dark silvery-grey species. 5th tergite a complete arch, though from behind usually appearing pointed above, upper marginals very coarse, almost as stout as those on 4th, so close together as to appear touching one another. Mid-femoral organ absent. . *ebrachiata* Pand.

13-2. 5th tergite black (in immature specimens sometimes appearing faintly reddish on margin).

14-53. 2nd tergite with strong median marginals, usually erect or semi-erect.

15-32. Wing with V.1 setose.

16-25. Presutural acrostichals present.

17-22. 5th tergite an entire arch, rounded or somewhat pointed.

18-19. Abdomen aeneous-black, almost devoid of pruinosity, 2nd-4th tergites each usually with 2 to 4 small basal white flecks which do not reach more than half-way to hindmargin..... *dissimilis* Mg.

19-18. Abdomen not as above.

20-21. 2nd-4th tergites each with a median pair of faint light markings extending $\frac{2}{3}$ of distance to hindmargin. Mid-femoral organ absent ..... *obscurata* Rohd.

21-20. Abdomen with normal variable pruinose tessellations. Mid-femoral organ present (see Nos. 3 and 4)..... *haemorrhoa* Mg.

22-17. 5th tergite divided or incomplete above. Mid-femoral organ absent.

23-24. Dark bluish-black species. Presutural acrostichals not especially small. V.1 with 1-3 setae. Wing-expanse usually over 12 mm... ..... *clathrata* Mg.

24-23. Light grey-brown species. Presutural acrostichals very small. V.1 with 8-13 setae. Wing-expanse usually under 12 mm..... ..... *setipennis* Rond.

25-16. Presutural acrostichals absent.

26-31. 5th tergite an entire arch.

27-28. Abdomen with normal variable pruinose tessellations. Mid-femoral organ present (see Nos. 3 and 4)..... *haemorrhoa* Mg.

28-27. Abdomen not as above. Mid-femoral organ absent.

29-30. Abdomen as No. 18..... *dissimilis* Mg.

30-29. Abdomen as No. 20..... *obscurata* Rohd.

31-26. 5th tergite divided or incomplete above. Mid-femoral organ absent ..... *setipennis* Rond.

32-15. V.1 bare.

33-44. Presutural acrostichals present.

34-39. Prescutellar acrostichals present, usually well developed. 5th tergite divided or incomplete above.

35-36. Mid-femoral organ present, large, conspicuous, well-defined, orange-red or chestnut, $\frac{1}{2}$ femur width on apical half..... *hirticrus* Pand.

36-35. Mid-femoral organ absent.

37-38. Dark bluish-black species. Bristles on lower part of cheek all fine and hair-like, uniserial and close to eye-margin..... *clathrata* Mg.

38-37. Lighter bluish-grey species. Bristles on lower part of cheek more than uniserial with a few stronger bristles further from eye-margin ..... *agnata* Rond.

39-34. Prescutellar acrostichals absent or very weak. Mid-femoral organ absent.

40-41. 5th tergite an entire arch (usually pointed in dry specimens), terminal opening facing directly backwards. The uniserial row of bristles on lower part of cheek uniformly fine and hair-like. Distinctly brownish-grey species ..... *filia* Rond.

41-40. 5th tergite divided or incomplete above. One or more much stronger bristles among those on lower part of cheek.

42-43. Smaller brownish-grey (often copper-tinged) species. Mouthedge produced distinctly further than frons..... ..... *nigriventris* Mg. or *villeneuvei* Böttch.

43-42. Larger bluish-grey species. Mouthedge produced at most as far as frons ..... *agnata* Rond.

44-33. Presutural acrostichals absent.

45-46. Mid-femora with a patch of brassy adpressed hairs in front towards apex, sometimes also behind. Mid-femoral organ absent..... ..... *sinuata* Mg.

46-45. Mid-femora without this patch of hairs.

47-48. 5th tergite an entire arch (usually pointed in dry specimens), terminal opening facing directly backwards. Mid-femoral organ absent.... ..... *filia* Rond.

48-47. 5th tergite divided or incomplete above.

49-50. Mid-femoral organ absent ..... *agnata* Rond.

50-49. Mid-femoral organ present.

51-52. Upper marginals on 5th tergite about $\frac{2}{3}$ as stout as those on 4th. Mid-femoral organ central, about $\frac{1}{4}$ femur width, fusiform, $\frac{1}{4}$ length of femur, often conspicuously reddish.....*rosellei* Böttch.

52-51. Upper marginals on 5th tergite much weaker, almost hair-like. Mid-femoral organ separated from apex of femur by about its own length, $\frac{1}{5}$-$\frac{1}{4}$ length of femur, normally black....*crassimargo* Pand.

53-14. Median marginals on 2nd tergite absent, or weak and reclinate.

54-57. 5th tergite an entire arch. Mid-femoral organ absent.

55-56. 5th tergite a wide rounded arch. Frontals continued on to cheek in a straight row.....*pernix* Harr.

56-55. 5th tergite usually a somewhat pointed arch in dry specimens. Frontals (the lower 2 or 3 on cheek) standing in a curve towards eye.....*pumila* Mg.

57-54. 5th tergite divided or incomplete above.

58-63. Mid-femoral organ present.

59-60. Mid-femoral organ as No. 35. Normally (small) presutural acrostichals present ..... *hirticrus* Pand.

60-59. Mid-femoral organ rather inconspicuous, narrow, blackish. Normally presutural acrostichals absent.

61-62. 5th tergite more narrowly exposed, with normal pruinosity, not shining. Mid-femoral organ central (see No. 11)..... .....*incisilobata* Pand.

62-61. 5th tergite more broadly exposed, thinly pruinose, semi-shining above. Mid-femoral organ on about third quarter of femur (see No. 52) ..... *crassimargo* Pand.

63-58. Mid-femoral organ absent.

64-65. Frons broad, about $1\frac{1}{4}$ times an eye-width. 5th tergite narrowly divided above, then abruptly widened out to form a conspicuous concavity which usually faces posterodorsally, upper $\frac{3}{4}$ of lateral margin with marginals in a single row, uniformly about $\frac{2}{3}$ as stout as those on 4th tergite ..... *melanura* Mg.

65-64. Frons distinctly narrower. 5th tergite widely divided above and not forming a conspicuous concavity, upper marginals fine and hair-like, a few stronger ones below ..... *laciniata* Pand.

66-1. 4-5 postsutural dorsocentrals, two or three of the front ones usually weak. Mid-femoral organ, with rare exceptions, present in all species.

67-68. 2nd tergite with strong median marginals, usually erect or semi-erect. Mid-femoral organ as No. 51. (Normally only 3 postsutural dorsocentrals) ..... *rosellei* Böttch.

68-67. 2nd tergite without strong median marginals, sometimes with weak reclinate ones.

69-80. Jowls entirely black-haired (care should be taken to distinguish jowls from lower part of occiput which is abundantly white-haired in all species).

70-71. Body tessellation bluish-black. 5th tergite black, laterally compressed, somewhat triangular, and conspicuously projecting beyond 4th tergite. 2nd tergite without trace of median marginals. Mid-femoral organ central, normally black, elongate oval, about $\frac{1}{2}$ length of femur ..... *scoparia* Pand.

71-70. Body tessellation greyish. 5th tergite not as above.

72-73. Upper marginals on 5th tergite fine and hair-like. Mid-femoral organ as No. 11. (Normally only 3 postsutural dorsocentrals) .... *incisilobata* Pand.

73-72. Upper marginals on 5th tergite usually strong and bristle-like, but if hair-like then mid-femoral organ much longer and broader.

74-75. 5th tergite usually somewhat reddish about margin, upper marginals mainly long and hair-like, very numerous, not in a regular row. 2nd tergite usually with small reclinate median marginals. Mid-femoral organ, black (rarely badious) and not very conspicuous, about $\frac{3}{4}$ length and $\frac{1}{3}$ width of femur. Cheeks and orbits usually conspicuously brassy .... *carnaria* L., *subvicina* Rohd. or *vulgaris* Rohd.

75-74. 5th tergite entirely black, upper marginals stronger and in a more regular row. 2nd tergite without median marginals. Mid-femoral organ narrower, only $\frac{1}{5}$-$\frac{1}{4}$ femur-width.

76-77. 5th tergite very broadly divided above, the two halves connected by a black, semi-shining membraneous portion about $\frac{1}{3}$ as broad as 4th tergite is long. 6th sternite with a pair of conspicuous, polished black, hemispherical convexities, widely separated by a deep V-shaped groove. Mid-femoral organ reddish, about $\frac{3}{5}$ length and $\frac{1}{4}$ width of femur, well the apical side of middle. A very short reddish front femoral organ usually present towards apex .... *similis* Pand.

77-76. 5th tergite at most only narrowly divided above, usually appearing only deeply notched. Mid-femoral organ at, or slightly the apical side of, middle.

78-79. Marginals on 5th tergite about $\frac{1}{2}$ as stout as those on 4th. Mid-femoral organ usually reddish, about $\frac{2}{3}$ length of femur. 6th sternite simple ..... *teretirostris* Pand.

79-78. Marginals on 5th tergite only $\frac{1}{4}$-$\frac{1}{3}$ as stout as those on 4th. Mid-femoral organ usually blackish, $\frac{1}{3}$-$\frac{1}{2}$ length of femur. 6th sternite with a pair of dull black, somewhat flattened, rounded convexities, narrowly separated by a V-shaped groove..... *aratrix* Pand.

80-69. Jowls at least partly clothed with long silky white hairs in addition to the normal black ones.

81-84. 5th tergite black, a complete (though sometimes notched) arch. Mid-femoral organ resembling that of *barbata* (see No. 87). Front femoral organ sometimes visible on apical third.

82-83. 5th tergite strongly notched above. 6th sternite with a continuous comb-like transverse row of 6-8 strong semi-erect bristles near the almost straight hindmargin. Bristles on lower part of cheek fine and short, hardly stronger than those above..... *albiceps* Mg.

83-82. 5th tergite a rounded arch. 6th sternite distinctly broadly emarginate at middle of hindmargin, and without a continuous row of semi-erect bristles. Some of the bristles on lower part of cheek distinctly longer and stronger than those above..... *exuberans* Pand.

84-81. 5th tergite at least broadly red on margin.

85-86. 5th tergite deeply notched and incomplete above, distinctly shining on upper half. Prescutellar acrostichals absent. 5th sternite red behind, 6th sternite entirely red with a large, bare, shining, conspicuous central convexity. Mid-femoral organ resembles that of *carnaria* (see No. 74) ..... *haemorrhoidalis* Fall.

86-85. 5th tergite an entire arch. Prescutellar acrostichals present.

87-88. 5th tergite entirely red, angular above, dulled by whitish pruinosity, upper marginals fine, almost hair-like. Mid-femoral organ black or slightly badious, extending almost to apex, $\frac{2}{3}$-$\frac{3}{4}$ length of femur. 5th sternite all black, 6th sternite red with central small shining elevation ..... *barbata* Thoms.

88-87. 5th tergite broadly red on margin, rounded above, upper marginals stronger, about $\frac{1}{2}$ as stout as those on 4th tergite. Mid-femoral organ as in *barbata* (see No. 87). 6th sternite mainly blackish.... ..... *exuberans* Pand.

The mid-femoral organ, a description of which has already appeared (Fonseca, 1953, *J. Soc. Brit. Ent.*, **4**: (8) 167-8), is an area on the posterior face of the middle femora of the females of certain species. It appears to be some form of sensory- or secretory-organ, and is always entirely bare (i.e. without trace of the small adpressed hairs which clothe the rest of the femur) and usually devoid of pruinosity. Its colour is generally black, but in some species it may be reddish or even conspicuously red, and the surface is usually diagonally, coarsely striated. Some difficulty may be experienced at first in distinguishing this femoral character in some of the species, and the femur should be carefully examined from various angles in a good light.

A second British record of *Myopa occulta* Meig. (Dipt., Conopidae) with notes on related species in the genus

By Kenneth G. V. Smith, M.I.Biol., F.R.E.S.
(Hope Dept. of Entomology, University Museum, Oxford)

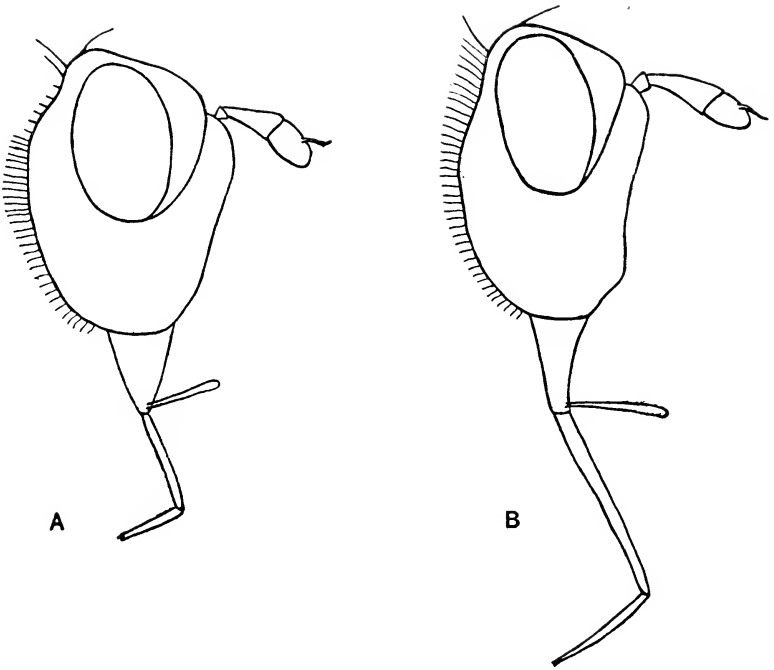
On August 5th, 1948, Mr. H. W. Andrews took a single male of *Myopa occulta Meig.* at Breamore, Hampshire, swept from rough herbage. Mr. J. E. Collin confirmed the identity, stating that it was the first undoubted British specimen that he had seen. Mr. Andrews kindly allowed me to include this species in a key to the British Conopidae (Smith, 1952: 204-5), and Parmenter (1952:29) also briefly refers to this specimen of Andrews'.

In the Dale collection at the Hope Department there is a female *M. occulta* bearing a white label with the date July 18th, 1844, in black ink. This type of label represents the counties Hants, Devon, Dorset and Cornwall in Dale's system. In J. C. Dale's catalogue the following entry is made against *M. occulta*: "♂ Chalk hill, Bordean, Hants, J. C. Dale, July 18th, 1844." Bordean is a small parish in north Hampshire three miles west of Petersfield. Dale had obviously confused the sex here as is easily done in a superficial examination of Conopidae (*vide* Faulkner, 1931: 63, also Colyer and Hammond, 1951: 181).

Myopa occulta belongs to a group of *Myopa* species which have no cheek-beard. Kröber (1925) recognizes five species in this group from the Palaearctic region. Three of these, *Myopa fasciata* Mg., *M. dorsalis* F. and *M. occulta* Mg. are West European species which have been recorded from Britain, though *M. dorsalis* should be deleted from the British List.

Myopa fasciata Mg. has been recorded from South Kerry (Eire), Dorset and Hampshire (*vide* Smith, 1952: 207). In the Hamm collection in the Hope Department there are specimens from Berkshire and two dwarf males from Hampshire and Oxford which Hamm had separated from his main series of *fasciata*. At first I thought that these two males might belong to a new species as they were so much smaller than any *fasciata* I had seen and the second and third antennal joints were of equal length whereas in *fasciata* the second joint is usually stated to be one and a half times as long as the third. I sent one of these dwarf males to Mr. J. E. Collin, who critically examined some thirty specimens of British and Continental *fasciata* and found considerable variation in the relative lengths of the second and third antennal joints. Subsequently I examined some twenty specimens in the Hope Department and found similar variation. The relative lengths of the second and third antennal joints is therefore an unreliable character on which to separate species of *Myopa* in this group and in the absence of other characters it can only be concluded that the Hamm specimens are merely dwarfs of *fasciata*.

Myopa dorsalis F. has been recorded from Hampshire, Shropshire, Cheshire and Lancashire. Specimens labelled *dorsalis* in various collections which I have examined have been dark forms of *fasciata*. Mr. J. E. Collin considers that *dorsalis* does not occur in Britain, but is strictly a South European species.



A, Side view of head of *Myopa occulta* Meig. B, Ditto *Myopa fasciata* Meig.

Myopa fasciata and *M. occulta* are the only two species of this beardless group of the genus at present known to be British and may be distinguished as follows. *Myopa occulta* is a small blackish species with a whitish yellow face and a very short proboscis (fig. 1A). The pale hairs on the upper part of the occiput are shorter and less numerous than in *M. fasciata* (fig. 1, compare A and B) (Kröber 1925: 32 and Séguy 1928: 39 do not mention this difference, but it is confirmed by Mr. Collin). In the two British *occulta* the third joints of the antennae are blackish at the tip (Kröber and Séguy give clear orange). The second and third antennal joints are of equal length in *occulta*, but this character may be unreliable as discussed above. The femora are thick with two parallel rows of stout, blunt, black spines on the ventral surface. Similar spines are present in *fasciata*, but are much shorter. Further the long black bristles as present in *fasciata* are almost absent in *occulta*. *Myopa fasciata* visits flowers of *Daucus*, *Taraxacum*, *Leontodon*, *Jasione* and thistles. Kröber (1925: 32) gives *Trifolium* and *Dorycnium* for *M. occulta*. The hosts of both species are unknown.

Thanks are offered to Mr. J. E. Collin for his kindly criticism and advice, to Mr. H. W. Andrews for the loan of his specimen of *Myopa occulta* and to Messrs. S. Shaw and C. H. Wallace Pugh for correspondence relating to the published records of *M. dorsalis* in Britain.

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FURTHER HYMENOPTERA RECORDS FROM BEDFORDSHIRE

By V. H. CHAMBERS, PH.D., A.R.C.S.

HYMENOPTERA ACULEATA

Since my account of this group was written (Chambers (1949a)) I have collected or recognized the following species from the county.

DRYINIDAE

Mesodryinus britannicus Rich. One female of this distinct but seldom seen species was swept from birch at Warren Wood, Clophill, on 31st July, 1948.

Prenanteon ruficornis (Dal.) var. *longicornis* (Dal.). A large female taken from bushes, Noon Hill, Pegsdon, Shillington, on 30th August, 1953. *Prenanteon* males are frequently taken from grass.

Anteon brevicorne (Dal.). This species has been taken freely in both sexes on birch from early May until mid-July, with hardly a break in the series, in the following localities: Flitwick Moor; various woods at Clophill; Rowney Warren; Aspley Heath and Wood; King's Wood, Heath and Reach; Odell Great Wood.

A. brachycerum (Dal.). With the previous species on birch, but appearing rather earlier, my captures extending from mid-April to early June. Flitwick Moor; Deadmansea Wood, Whipsnade; Aspley Heath; King's Wood; Warren Wood; Rowney Warren.

A. flavicorne (Dal.). Taken during June and July on aspen, *Salix caprea* and *S. viminalis*. Flitwick Moor; King's Wood; Maulden Wood; Radwell, Felmersham. The var. *bensoni* Rich. already recorded frequently accompanies this species.

A. jurineanum Latr. Males only have been swept from grass in June, at Whipsnade Heath; Sharpenhoe hills; Shefford; Colworth.

A. fulviventre (Hal. in Curt.). Females only swept sparingly from grass from June to August. Whipsnade Heath; Shefford; Forty Foot Lane, Souldrop.

A. cameroni Kief. One brachypterous female taken from *Lolium perenne*, Ravensdell Wood, Studham, 16th July, 1950. I have often wondered whether there is a Homopteron associated with this grass preferred as a host by *Anteon* species, as I so frequently find males (undetermined) in numbers with it, even in small clumps at the margin of arable fields.

Aphelopus serratus Rich. Swept from birch, hornbeam and elm: King's Wood; Warren Wood; Flitwick Moor; Whipsnade; Colworth; Millbrook Warren; Barton. My records extend from late May to early July, with one

female taken on 13th August; so that, as with *A. melaleucus* (Dal.) and *A. holomelas* Rich., it is possible that it is bivoltine.

Embolemus ruddii West. Three males swept at once from bushes, Noon Hill, Pegsdon, 26th September, 1953.

BETHYLIDAE

Bethylus dendrophilus Rich. One female swept from grass, Yelnow Lane, Colworth, 18th April, 1953.

CLEPTIDAE

Cleptes semiaurata (L.). Rowney Warren, a male swept from birch, 6th July, 1952.

C. nitidula (Fab.). Sharpenhoe hills, a male swept from grass, 25th June, 1949.

CHRYSIDIDAE

Omalus aeneus (Fab.). This species has been taken only sparingly, at the Litany, Totternhoe (this locality has since been destroyed by clear-felling and ploughing); King's Wood; Aspley Wood; Colworth.

O. violaceus (Scop.). Two examples swept from aspen, Flitwick Moor, 19th May, 1948.

Chrysis fulgida L. King's Wood, one female, 16th May, 1948.

FORMICIDAE

Ponera coarctata (Latr.). One worker taken by Mr. A. J. Newson at Sundon rubbish dump, 16th May, 1948.

Lasius alienus (Foerst.). Workers taken on the ground, Sharpenhoe Clappers, April, 1954; Noon Hill, Pegsdon, August, 1953.

L. brunneus (Latr.). Workers taken in numbers attending aphids on nettles and *Melandrium*, Warren Wood, May-June, 1950; one worker swept from bushes, Hanger Wood, Stagsden, 8th May, 1954.

L. umbratus (Nyl.). A female flew after dark into a lighted room at home, Luton, 30th September, 1948; a dealated female swept from grass, Flitton Moor, 25th May, 1953.

TIPHIIDAE

Tiphia femorata Fab. Taken by the late D. O. Boyd at Sandy, 18th August, 1946, and I took one female at Sandy Heath four years later. The other species *T. minuta* v.d. Lind. already recorded, has since been found at Lidlington and King's Wood, but is evidently uncommon.

POMPILIDAE

Calicurgus hyalinatus (Fab.). Represented by a male taken on 11th July, 1953, at King's Wood, Heath and Reach, a well-worked locality.

Pseudagenia carbonaria (Scop.). Both sexes in good numbers running on a limestone wall near Colworth, Sharnbrook, 7th June, 1952.

VESPIDAE

Ancistrocerus gazella (Panz.). A search in my collection for this species recently distinguished in Britain (Yarrow (1954)) showed that nearly all my examples doing duty as *A. parietum* (L.) are to be referred to it. I have only one female *A. parietum*, taken at Ampthill on 29th June, 1935.

Symmorphus connexus (Curt.) (*bifasciatus* (L.)). A male and female at burrows in a stump, King's Wood, and a female from a decayed apple bole, Deadmansea Wood, previously labelled *sinuatissimus* Rich., belong to this species; confirmed by Dr. I. H. H. Yarrow.

Vespula austriaca (Panz.). One male taken at the State Forest, Clophill, 22nd August, 1953.

SPHECIDAE

Corynopus coarctatus (Scop.). Since 1947 I have frequently taken this by sweeping from several parts of Flitwick Moor and from near Radwell Causeway, Felmersham.

APIDAE

Prosopis pictipes (Nyl.). Represented by a single male and female from Warren Wood and Flitwick Moor, respectively.

Halictus laevigatus (K.). Represented by a female from Deadmansea Wood, September, 1948; also just over the Hertfordshire boundary on the Icknield Way, Hexton. I find it as a constant visitor to plum flowers at Wheathampstead, Herts.

Anthophora bimaculata (Panz.). A female at the roots of an uprooted tree, Warren Wood, 13th July, 1952.

Osmia aurulenta (Panz.). At last I can record this species, having found it in numbers on the steepest slope of Sharpenhoe Clappers, at *Hippocrepis*, on 18th May, 1952, and in 1953. It is possible that this is one of the few slopes of our chalk escarpment that have never been disturbed by the plough, and that unlike the widely distributed and abundant *O. bicolor*, this species is intolerant of such disturbance. *O. bicolor* I now find is not restricted entirely to the chalk downs, as a female was taken on *Rubus* near a limestone wall, Sharnbrook, May, 1952.

TENTHREDINOIDEA

The following 24 species, added since the publication of my supplementary list (Chambers (1949b)), bring the county list up to 289 recorded species.

PAMPHILIIDAE

Neurotoma saltuum (L.). A female caught in the Yelnow Lane, near Sharnbrook, 25th May, 1952. The remains of a web, with larval skins, was found in a hawthorn tree on Whipsnade Heath, 29th July, 1950, a few days after Mr. R. B. Benson found one a few miles away in Hertfordshire.

Pamphilius hortorum (Klug.). The only evidence I have for including this species is a larva in a b-type roll upon a *Rubus* leaf found at Clophill, 17th June, 1950. From this emerged on 29th May, 1951, an ichneumonid *Ctenopelma tomentosa* Desv., determined by Mr. J. F. Perkins.

CEPHIDAE

Hartigia xanthostoma Evers. This has frequently been taken in association with *Filipendula* at Flitwick and Flitton Moors, and in the White Lane-Yelnow Lane area in the north of the county. *H. linearis* (Schr.) occurs at King's Wood, Clophill and near Colworth.

TENTHREDINIDAE

Tenthredo colon Klug. Taken on several occasions in King's Wood.

Pachyprotasis antennata (Lep.). Males in flight during fine rain on the margin of Odell Great Wood, 6th June, 1954.

Loderus eversmanni (K.). Single examples taken with *L. vestigialis*, Yelnow Lane, 25th May, 1952, and at Flitton Moor a year later.

Dolerus pratensis (L.). Two females, Flitton Moor, May, 1953.

Harpiphorus lepidus (Klug). A male and female upon young leaves and flowers of oak, Rowney Warren, 3rd June, 1951.

Monostegia abdominalis (F.). In a scrub-covered, former arable field, Streatley; Rowney Warren; White Lane, Odell Great Wood, associated with *Lysimachia nummularia*.

Allantus togatus Panz. Flying freely around *Salix caprea*, Maulden Wood, June, 1954.

A. melanarius (Klug.). A female taken flying over *Cornus*, in the Yelnow Lane, near Colworth, 25th May, 1952.

Ametastegia albipes (Thoms.). Males taken in a small osier holt near Billington, 12th July, 1952.

Empria liturata (Gmelin). This species appears to be fairly common, having been taken on a variety of plants at Radwell; Yelnow Lane; Clophill; Flitwick Moor; Sharpenhoe Clappers.

Pareophora pruni (L.). Yelnow Lane, one male, 25th May, and larvae, 7th June, 1952, taken on *Prunus spinosa*.

Monophadnoides puncticeps (Kon.). Sharpenhoe Clappers; Flitwick Plantation; Totternhoe Meads; Hanger Wood, Stagsden; all in April.

Parna tenella (Klug.). Rowney Warren, one female, 3rd June, 1951; one male settled on oak, Warren Wood, 15th May, 1954. In both localities the native lime *Tilia cordata* is abundant and is no doubt its host-plant.

Metallus albipes (Cam.). Adults emerged from 21st May to 28th August, 1954, from mines in raspberry leaves collected at Heath Wood, Whipsnade, September, 1953.

Priophorus laevifrons Bens. A female swept from apple and hawthorn, Millbrook Warren, 25th May, 1953.

Hoplocampa flava (L.). A male associated with *Prunus spinosa*, White Lane, Odell, 8th May, 1954.

Euura venusta Zadd. Females on *Salix caprea* at Deadmansea Wood, May, 1945, and Maulden Wood, June, 1954.

Pristiphora biscalis (Foerst.). This sawfly was abundant during 1952-4 on *Prunus* in the Yelnow Lane-White Lane area, at Hanger Wood, Stagsden, and Long Lane, Toddington.

P. paedida (Kon.). One female, in association with *Pyrus*, Noon Hill, Pegsdon, 29th May, 1950.

P. fuscata Bens. Adult and larvae on *Thalictrum flavum*, Radwell Causeway (Chambers (1953)).

P. abbreviata (Hart.). A female beneath a pear tree in a garden, Barton, 19th April, 1954.

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Note on *Colletes halophila* Verhoeff

By F. J. Manning, B.A., Ph.D., F.R.E.S.

The recent article by Dr. Yarrow (*J. Soc. Brit. Ent.*, 5 (1): 39) on the characters and distribution in Britain of *Colletes halophila* Verhoeff has once again brought into prominence this little-known species of *Colletes*. Dr. Yarrow's article, however, took into consideration mostly British material. Such action, no doubt, was deliberate and fully justifiable since little was previously known about such material, but just as our knowledge of this has grown so also has that of the continental material. It is my purpose in the present article to say a few words about the latter.

Distribution

The known distribution of *C. halophila* on the continent is along the maritime sands of the north-west coast from the Dutch localities of Zeeburg, near Amsterdam, the island of Rozenburg and nearby Pernis, and the island of Walcheren, westwards to Le Touquet, France. Two of the localities mentioned above are new, viz. Walcheren and Le Touquet. The precise nesting sites of the species on the island of Walcheren lie at Vlissingen and further along the coast at least as far as Dishoek. The nests of *C. halophila* here are made in the consolidated sands of the dunes or base of the sea wall, and the females fly almost exclusively to *Aster tripolium* L., though individuals have also been taken on *Diplotaxis tenuifolia* (L.)*. The males also fly freely to *A. tripolium* but have been picked off other composites in considerable numbers, e.g. *Hieracium*, *Crepis*, *Hypochaeris*, *Leontodon*, *Matricaria*, *Senecio*, *Achillea* and *Circium*. This colony has been kept under observation by me for the last three years and when its full range is properly ascertained may prove to be the most extensive known on the continent.

The Le Touquet colony may also be quite extensive but the actual nesting grounds have not been found although I have taken specimens quite freely from *Diplotaxis tenuifolia* growing in the dunes south of the promenade. It is reasonable to infer that the nests are somewhere in the dunes themselves. The Le Touquet site is the most westerly known to date and suggests that it is one of a series extending along the north coast of Belgium and France. It also indicates that the species may be found in suitable localities along the south coast of England and gives added interest to Dr. Yarrow's suggestion of its presence south of the Thames.

The species is not known to occur in N. Germany or Denmark, and, in the summer of 1954, I myself searched for it over a period of three weeks along the west coast of Jutland, without success. On the island of Romo where heather is separated from *Aster tripolium* by less than two hundred yards, *C. succincta* was taken at the heather but *C. halophila* was not taken at *Aster*. Admittedly, the season was cool and wet and the collecting had to be done under a sullen sky. At Fano again *C. succincta* was captured on heather near the sea but *C. halophila* was not found on nearby yellow composites. At Hjerting, north of Esbjerg, where heather and *Tanacetum* meet a few feet

* On 21st August, 1955, I revisited the site and found *C. halophila* flying to *Melilotus* spp. in far greater numbers than to *Aster* and *Diplotaxis*. The weather was very warm.

from the sea, *C. succincta* was captured at the heather and *C. daviesana* Smith at the *Tanacetum*—actually within a yard of each other.

STATUS

The case for considering *C. halophila* as a distinct species appears to be strengthened when continental material is considered, and may be presented as follows:

C. halophila is confined to the maritime sands of NW. Europe but is not oligolectic, visiting quite a range of dune flowers (even the females are known to visit *Aster*, *Melilotus*, *Diplotaxis*, *Limonium* and *Senecio*, and the males visit many other additional flowers); in contrast *C. succincta* is a heathland species, oligolectic on heather (*Calluna* and *Erica*) and, at those places where heath meets coastal sand, it is still oligolectic on heather.

C. halophila has its own particular parasite, *Epeolus rozenburgensis* van Lith (1948, *Tijdschr. v. Entom.*, **91**: 105-12) and is not known to be molested by the parasite commonly attacking *C. succincta*, i.e. *Epeolus cruciger* (Panzer).

C. halophila is, on average, distinctly larger than *C. succincta*. In the female the first tergite and mesopleurae are more coarsely punctate, and the dense hairs at the sides of the base of the first tergite are usually quite shaggy in fresh specimens and contain a relatively high proportion of long, offstanding hairs towards the rear as well as at the base.** In the males the first tergite is also relatively more coarsely punctate than that of *C. succincta* and the region of the genae behind the malar area towards the hypostomal carina, seen from the side of the face, appears to be distinctly domed.

DIPTERA AND OTHER INSECT VISITORS TO THE FLOWERS OF *RANUNCULUS SARDOUS* CRANTZ.

By L. PARMENTER, F.R.E.S.

This flower is well distributed in this country from Argyll and Angus southwards and is known from 80 out of the 112 vice-counties in Great Britain. It is found in damp fields and waste land, particularly in the fields about estuaries. Knuth, 1908, mentions as visitors only "honey-bee, 2 Syrphidae, 2 Muscidae and one of the Siricidae" but I have seen no further records. When staying at Flatford Mill in July, 1951, Mr. F. J. Bingley asked me to collect and note the visitors to the plant as a contribution to the paper on the species for the Biological Flora to be published in the *Journal of Ecology*. The flowers studied were in the fields on the Suffolk side of the River Stour. About one hour was devoted on two hot sunny days to the searching of the flowers. The total catch was 123 specimens belonging to 24 species of 9 families as follows:

STRATIOMYIDAE

Nemotelus notatus Zett., 1 ♂, 2 ♀♀.
N. uliginosus (L.), 15 ♂♂, 6 ♀♀.

** This character was apparently deliberately omitted by Yarrow, since it was given in Verhoeff's original description; I find it very useful for continental material, th. rare cases of shagginess in *C. succincta* not detracting from its general usefulnesse

EMPIDIDAE
Drapetis assimilis (Fln.), 1 ♂.
Empis albinervis Mg., 1 ♂, 1 ♀.
Hilara angustifrons Strobl, 1 ♂.

DOLICHOPODIDAE
Syntormon pallipes (F.), 1 ♀.

SYRPHIDAE
Liogaster metallina (F.), 2 ♂♂, 5 ♀♀.
Melanostoma mellinum (L.), 1 ♂, 1 ♀.
Sphaerophoria scripta (L.), 1 ♀.
Syrphus balteatus Deg., 1 ♀.

OTITIDAE
Meliera picta (Mg.), 9 ♂♂, 10 ♀♀.

SEPSIDAE
Saltella scutellaris (Fln.), 9 ♂♂, 10 ♀♀.

CHLOROPIDAE
Cetema sp., 2 ♀♀.
Meromyza nigriventris Macq., 1 ♀.
M. pratorum Mg. var. *decora* Frey, 1 ♀.
M. saltatrix (L.), 2 ♂♂, 1 ♀.
M. variegata Mg., 1 ♀.

TACHINIDAE
Dinera grisescens (Fln.), 2 ♂♂, 5 ♀♀.
Eriothrix rufomaculata (Deg.) var. *monochaeta* Wain., 2 ♂♂, 3 ♀♀.
Siphona geniculata (Deg.), 1 ♂, 1 ♀.

MUSCIDAE
Coenosia pumila (Fln.), 6 ♂♂. 10 ♀♀.
Helina duplicata (Deg.), 5 ♂♂.
Orthellia caesarion Mg., 1 ♂.
Phaonia incana (Wied.), 1 ♀.

Other visitors were 1 *Meligethes* sp. (Col., Nitidulidae) and of Lepidoptera—4 Meadow Brown *Maniola jurtina* (L.) (Satyridae), 1 Small Heath *Coenonympha pamphilus* (L.) (Satyridae) and 2 Essex Skipper *Thymelicus lineola* (Ochs.) (Hesperidae).

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SYNDYAS NIGRIPES ZETTERSTEDT, AN EMPID GENUS AND SPECIES NEW TO THE BRITISH FAUNA

By J. E. COLLIN, F.R.E.S.

A number of specimens of the above named species were swept by me from the herbage in a bog in Mark Ash Enclosure of the New Forest on 15th July, 1954, and it was still present four days later when two West Country friends, Mr. E. A. Fonseca and Mr. J. Cowley, joined me for some collecting in the Forest. Curiously enough this genus belongs to the same sub-family (Hybotinae) of the Empididae as *Syneches muscarius* F., which was first discovered in this country in 1953 in the neighbouring county of Dorset by Mr. E. A. Fonseca, while collecting with Dr. C. D. Day of Dorchester at "The Moors," near Wool, and furthermore both genera are represented in Europe by a single species only.

Syndyas nigripes Zett. is both smaller and of far less striking appearance than *Syneches muscarius* F., and might easily be mistaken for a very small shining species of *Hybos*, but the basal section of the discal vein is evanescent, and the hind tibiae are more dilated towards the tip than any part of the comparatively slender hind femora. In *Hybos* the hind femora are always much the stouter. It was described by Zetterstedt in 1842 as *Ocydromia nigripes*, but in 1857 was placed by Loew, together with two African species, in a new genus *Syndyas*. Other species of this genus have been described from N. America, Ceylon, and the East Indies.

Ninth Congress of British Entomologists

Bristol, 22nd-25th July, 1955

This Congress was held in Bristol at the invitation, and with the co-operation, of the Entomological Section of The Bristol Naturalists' Society, and the capable Secretary of that Section, Mr. Cecil L. Bell, F.R.E.S., acted as Congress Organiser.

By kind permission of the Bristol University authorities the party was accommodated, and all meetings were held, in the Clifton Hill House hall of residence where, thanks to the care and interest of the warden, Miss J. W. MacLeod, and Miss Carpenter, all those present were very comfortable. Visitors began to gather early on Friday afternoon, 22nd July, and were duly signed in. After dinner the party saw a fine series of colour films, "Some Gold Coast Animals," taken and exhibited, with a very interesting running commentary, by Mr. A. Bassindale, M.Sc.

At 9 a.m. on the Saturday the party assembled to look over a very interesting series of exhibits which had been prepared—notably two illustrating research work on immature Diptera undertaken by Dr. Hinton's students. Unfortunately limitations upon our space preclude a full description of all these exhibits. At the Opening Meeting the Congress was welcomed to Bristol by Professor J. E. Harris, M.A., Ph.D., Professor of Zoology, University of Bristol. In an interesting short speech he remarked that Dr. Hinton constituted a "one-man" entomological section at Bristol, but that if number of species was to be the criterion he would be able to claim ninety per cent. of lecture time.

Dr. H. E. Hinton, Ph.D., B.Sc., F.R.E.S., then followed with his Presidential Address entitled "New and little-known protective devices of insect pupae." This Address is printed as *Transaction*, Vol. 12, Part 2, issued with this *Journal*. A lively discussion followed in which Professor Buxton and Messrs. Benson, Blasdale, Dyte, Jenkins and Kerrich took part.

The next item was an interesting and informal address by Professor P. A. Buxton, C.M.G., M.A., F.R.S., entitled "Fungus flies." Professor Buxton stated that his subject had its peculiar difficulties, partly because some of the Diptera are by no means easy to identify and also because the fungi themselves can hardly be named except by submission to specialists. In his investigations he made use of a simple technique, putting fungi of one species in a breeding jar with moist sawdust, covering the top with very fine gauze and collecting such flies as emerged over a period of some months. From

450 such "collections" made from about 150 species of fungi, he had bred 100 species of Diptera belonging to 16 families. More complex rearing methods are required because as soon as a rapidly growing fungus is removed from its mycelium it begins to degenerate and no longer provides an appropriate food for some of the insects which feed in it.

Using the very simple breeding pot method, it has been shown that some fungi, particularly among the soft, rapidly decomposing groups, have a large Dipterous fauna, whereas others are apparently attractive to very few sorts of flies or even to none at all. Moreover, some of the Diptera reared from fungi may be reared also from a variety of other vegetable material, particularly when it is decomposing, e.g. species of *Trichocera*. Other flies again live in fungi only but may be reared from a wide range of different families; others again appear to live in one species of fungus, or at most in very few.

Though the enquiry had not got very far a number of interesting insects, some of them never reared before, had turned up. Specimens of some of them were exhibited.

An interesting discussion followed in which Drs. Hinton, Hincks and Wood-Baker and Messrs. Blasdale, Dyte, Kerrich, Kevan, Kloet and Stride joined.

The party then adjourned to the front of the building where the official Congress photograph was taken. This is printed, slightly reduced, facing p. 138. Copies, measuring $8\frac{1}{2}'' \times 6\frac{1}{2}''$, can be obtained from the photographers, Messrs. Navana Studios, 19 St. Augustine's Parade, Bristol, 1, price 5*s*. 3*d*. each, post free.

After the lunch interval Mr. Robert B. Benson, M.A., F.R.E.S., read an address on "Endemic British Sawflies." Mr. Benson remarked when people speak of "endemic" British forms they often mean no more than that the forms are restricted in their distributions today to the British Isles; and from this we are meant to infer that the forms diverged from their parent forms to become the distinct entities they now are, entirely after they had been isolated geographically in these islands, that their divergence took place after their isolation, that in fact they were born here. But this does not necessarily follow at all. In fact my thesis is that this is probably very rarely true, and that the only measure of divergence against a time scale in these endemic forms is when you have two or more very closely related "endemic" local British forms as in the Whitebeams—*Sorbus* species of the *aria* complex—or the island races of *Bombus*, where they can be checked against each other. But I have made no special study of such groups and it is essential, in discussions on biogeography, to restrict your examples to animals or plants that you have special knowledge of, and to study the whole of their range and variation. For this reason I take sawflies as examples to illustrate the points I want now to elaborate.

Tenthredo celtica Benson, a recently described sawfly that in Britain replaces the continental *T. temula* Scopoli and at first thought to be a true British endemic species, was later found also to replace *T. temula* in Spain and the lowlands of Italy, but not in the Alps, where *T. temula* occurs. The distributions of *T. celtica* and *temula* show them to be an ordinary atlantic/continental pair.

The distribution of *Dolerus possilensis* Cameron is very interesting and suggestive. It is common in Britain and was formerly thought to be an

endemic British species but a single specimen of it has recently been found in Finland. The British and Finnish races of it must therefore be fragments of a once much wider distribution.

The supposed endemic British melanic race of *Dolerus scoticus* Cameron should be compared with a similar melanic race of *D. gessneri* André. *D. gessneri* and *scoticus* have rather similar world distributions each with a melanic race in Europe and E. Asia, and a red-banded race in Scandinavia, but *D. gessneri* is more widespread than *D. scoticus* both in Europe and America. The western melanic race of *D. gessneri* also occurs today in sub-alpine regions in Central Europe and the similar race of *D. scoticus* may well have formerly occurred there too, and may still.

On the other hand the British race *stephensii* Leach of *Arge pagana* Panzer, though it could be atlantic in origin, is of rather peculiar interest because, apart from this race, *A. pagana* is a species of remarkable uniformity and wide Eurasian distribution from the Atlantic to the Pacific.

Mr. Benson's thoughtful address was discussed in some detail by Miss Longfield, Dr. Hinton and Messrs. Cowley, Kloet and Kerrich, comparisons being made with certain butterfly species in particular.

The final address of the day was given by Dr. M. V. Brian, Ph.D., who took as his subject "Caste determination in the genus *Myrmica*." Dr. Brian said that his approach to the subject was an ontogenetic one. Individual larvae were cultured optimally and experimentally and their rate of development, their rate of growth and the rate of growth and development of their wing buds recorded. Only the third instar has been investigated.

Female larvae that form workers show much more variation in development rates than those forming queens, mostly through accelerations that start in the middle of the instar between stages that have been signified brain 0.5 and brain 1.0. In some cases workers result from growth failures without concomitant cessation of development. These changes that lead to "deviation" from the queen type of development are accompanied by a reduction or cessation of wing growth and of ovary growth which causes the absence of the former from the adult; the ovary is modified into a single tubule in the adult by development of its accessory structures in the transformation stages that follow the third instar.

Deviation is irreversible (determination). There is a stage in the latter part of the third instar when deviations (which are rare) produce intercastes; once this is past at first small but perfect queens, then larger and larger ones result. Although this stage is short, it seems that the proportion of deviants is less than that expected by chance and some mechanism suppressing such (and hence intercastes) must exist.

Three factors contribute to the likelihood of the larvae achieving queen form as an adult: high specific growth rate, low development rate and large stature (size at a given maturity). The last is a combination of the first two at an earlier period. It has been shown that at sub-growth temperatures (as occur naturally in winter) a physiological change takes place which enables a combination of these to be sustained longer. This, owing to its similarity to plant processes, has been called vernalisation.

There is also evidence that a high proportion of carbohydrate to protein in the diet tends to an acceleration of development relative to growth. Worker

feeding methods varying seasonally and with temperature and with food availability and possibly even as a result of their ability to discriminate between deviated and non-deviated larvae have been discussed.

Dr. Hinton, Dr. Wood-Baker and Mr. Blasdale took part in the discussion which followed Dr. Brian's address.

At 7.15 p.m. the party assembled in the lounge at Clifton Hill House for a reception by Dr. H. E. Hinton, President of the Society for British Entomology, and Mrs. Hinton, supported by Mr. Harry Savory (President, Bristol Naturalists' Society) and Mrs. Savory. After an excellent dinner and the toast "The Queen," Mr. G. J. Kerrich, in an excellent speech, proposed a toast to the University of Bristol, the Bristol Naturalists' Society and the Bristol, Clifton and West of England Zoological Society. Professor J. E. Harris responded.

At 10.30 on the Sunday morning a strong party boarded a motor coach for a day's collecting at Charterhouse Pools, Charterhouse-on-Mendip, Somerset N. The weather was hazy and, at this altitude in the Mendips, rather cool until later in the day. With one large open pool, three smaller, shaded ones and with areas of woodland, gorse and heather in the vicinity, much valiant net-work was done by the party, who returned to Bristol at 5 o'clock pleasantly tired.

Immediately after tea a short meeting of delegates from local societies was held. On the proposal of Dr. Hincks and Mr. Kloet (representing the Manchester Entomological Society) it was resolved to recommend to Council that the next Congress to be organized by the Society should be held in Manchester in 1957.

After dinner the party embarked upon a long discussion on the day's collecting, and many specimens were exhibited and discussed. The following reports of the day's captures have so far been received. It is hoped that further reports will be sent in, and these will be published in the next *Journal*.

Mr. W. A. Wilson writes: I took the following beetles:—

Staphylinidae: *Stenus flavipes* Steph.

Chrysomelidae: *Hydrothassa aucta* F. (on *Ranunculus* spp.); *Galerucella nymphaeae* L. a. *saggitariae* Gyll. (on *Polygonum* spp.); *Cassida flaveola* Thunb.

Curculionidae: *Apion onopordi* Kirb. (on Thistle spp.); *Phyllobius viridicollis* F.; *Miccotrogus picirostris* F.; *Phytonomus arator* L. (on *Lychnis alba*); *Ceuthorhynchus contractus* Marsh.; *Cionus alauda* Hbst and *C. scrophulariae* L. (both on *Scrophularia* spp.).

All taken by general sweeping where no habitat is specified. So far as I am aware *Phyllobius viridicollis* F. is new to Somerset.

Mr. J. Cowley sends the following notes:

All observations were made at Charterhouse-on-Mendip (v.c. Somerset North) except those specially noted as from Clifton (Bristol, v.c. Gloucester West).

ORTHOPTERA

Omocestus viridulus L., *Myrmeleotettix maculatus* Thunb.

ODONATA (weather unsuitable)

Ischnura elegans Lind., *Enallagma cyathigerum* Charp., *Coenagrion puella* L.

NEUROPTERA

Chrysopa septempunctata Wesmael, Clifton, in house (according to Killington, 1937, *Monogr. Brit. Neuropt.*, a common species in gardens even in large towns, but he does not record it from Gloucestershire, nor does A. F. Peacey, 1953, *Ent. Rec.*, **65**: 184-5, so that this would seem to be a new record).

MECOPTERA

The rarer *Panorpa cognata* Ramb. occurred together with the common *P. communis* L. and *P. germanica* L. in the marshy area below the embankment of the lowest pool; in a casual survey *P. cognata* seemed only little less numerous than the other two species.

TRICHOPTERA (not specially searched for)

Phryganea varia F., *Adicella reducta* McL., *Plectrocnemia conspersa* Curt. (these last two species have not previously been reported from Somerset North).

DIPTERA

Asilidae

Isopogon brevirostris Mg.

Dolichopodidae

Dolichopus discifer Stann., *D. plumipes* Scop., *D. popularis* Wied., *D. griseipennis* Stann., *D. trivialis* Hal., *D. ungulatus* L., *Hercostomus germanus* Wied. (uncommon; the adults have the habit, observed on this occasion and unusual in the family, of feeding at flowers; only one previous Somerset record, from Leigh Woods), *H. nigriplantis* Stann., Clifton, at the garden pool (uncommon, and not recorded from Gloucestershire in Audcent's list of the Diptera of Somerset and Gloucester, 1949, *Proc. Bristol nat. Soc.*, 27: 409-70), *Hypophyllus obscurellus* Fall.

Syrphidae

Criorhina berberina F. and f. *oxyacanthae* Mg., *Sericomyia lappona* L., *Volucella pellucens* L., *V. bombylans* L., *Syrphus laternarius* Müll., *Leucozona lucorum* L.

Dr. C. S. Wood-Baker took the following Aphididae at Charterhouse Pools, 24th July, 1955:

Acyrthosiphon malvae Mosley on *Agrimonia eupatorium* L.

A. malvae subsp. *geranii* (Klt.) apterae on *Geranium robertianum* L.

Macrosiphoniella millefolii Deg. apterae and alatae amongst inflorescences of *Achillea millefolium* L.

Nasonovia ribis-nigri Mosley apterae on *Hieracium pilosella* L.

Ovatus crataegarium Wlk. apterae on terminal young shoots of *Crataegus oxyacantha* L.

O. menthae Buckt. apterae and alatae on *Mentha piperita* L.

Hyalopterus arundinis F. alatae and young on *Phragmites vulgaris* Dr., *Sparganium erectum* Huds., and *Typha latifolia* L.

Doralis ? *fabae* Scop. apterae and alatae on inflorescences of *Valeriana* (? *officinalis* L.).

Euceraphis betulae L. alate vagrant on *Mentha piperita*.

The following aphids cannot be immediately identified further: *Dactynotus* spp. on *Hieracium boreale* Fr. and on *Leontodon autumnalis* L. *Doralis* sp. on *Melampyrum pratense* L.

The following were observed and identified but no samples taken:

D. fabae colonies on *Phaseolus vulgaris* and freshly established on *Rumex crispus* L. and *Cirsium lanceolatum* L., larger colonies on *C. arvense* L.

Megoura viciae Klt. small colonies of half-grown apterae on *Vicia* sp.

Doralis oxyacanthae Schr. apterae and alatae on *C. oxyacantha* attended by *Formica fusca* L.

Sitobion fragariae Theob. few apterae on *Rubus fruticosus* L.

Uromelan jaceae L. small colonies of apterae on *Centaurea nigra* L.

Collected at Clifton Hill House, Bristol, 23rd July, 1955:

Dactynotus (? *cichorii* Koch) apterae and young under radical leaves of *Hieracium boreale* Fr.

Capitophorus similis V. d. Goot apterae under leaves of *Petasites fragrans* Presl.

Doralis fabae Scop. apterae and young on inflorescences of *Capsella bursa-pastoris* L.

D. epilobiina Wlk. apterae and alatae on *Epilobium parviflorum* Schreb.

D. ilicis Klt. under leaves of *Ilex aquifolium* L. var. together with predacious *Cecidomyiid* larvae; apterae and dead alatae.

NINTH CONGRESS OF BRITISH ENTOMOLOGISTS

BRISTOL, 22nd-25th July, 1955

Names (reading from viewer's left to right) are as follows:

Front Row: Mr. M. F. Jenkins, Bristol; Mr. C. E. Dyte, Bristol; Mr. J. R. Chiswell, Bristol; Mr. D. C. Lee, Bristol; Mr. D. Johns, Bristol; Miss M. E. Eaton, Bournemouth.

Second Row: Mr. R. B. Benson, London; Mrs. V. J. Wynne, Bridgwater; Mr. G. J. Kerrich, Dorking; Mrs. Benson, London; Dr. H. E. Hinton, Bristol (President); Mrs. Kerrich, Dorking; Professor P. A. Buxton, London; Miss C. Longfield, London; Mrs. Murgatroyd, Bournemouth.

Third Row: Mr. G. O. Stride, Weston-super-Mare; Dr. C. S. Wood-Baker, Chislehurst; Dr. M. V. Brian, Corfe Castle; Mr. C. H. Wallace Pugh, Oswestry; Mr. C. L. Bell, Bristol; Mr. P. Blasdale, Ilkeston; Mr. J. H. Murgatroyd, Bournemouth; Mr. W. A. Wilson, Minehead; Mr. W. Wilkinson, Rotherham; Mr. A. H. Turner, Taunton; Mr. E. C. Fonseca, Bristol; Mr. J. Cowley, Bridgwater; Mr. G. S. Kloet, Wilmslow; Dr. W. D. Hincks, Manchester; Mr. D. K. McE. Kevan, Sutton Bonington; Mr. L. Parmenter, London.

[*Photo by:* Navana Studios, 19 St. Augustine's Parade, Bristol, 1

Collected at Leigh Woods, 23rd July, 1955:
Sitobion avenae F. alatae on *Holcus lanatus* L.
Hyadaphis sii Koch on *Lonicera peri-clymenum* L. causing leaf-curl; remnants of large colonies, together with predacious Cecidomyiid larvae, also Coccinellid and Syrphid larvae.

On Monday morning the party gathered to hear an address by Dr. C. G. Johnson, Ph.D., entitled "Some ecological aspects of insect spread by dispersal in the upper air." Dr. Johnson remarked that two approaches to the study of dispersal are possible: one towards the mechanics of the process, the other towards its ecological significance. Less is known about the second aspect—particularly of the relation of immigrants to the environment to which they are transported and of the factors influencing the survival of individuals and populations. Some recent work on aphids epitomizes some of these problems—for example the balance of behavioural and population factors in determining flight rhythms: the excursions to altitudes of many thousands of feet: the dependence of host selection on previous flight experience and the state of the ovaries. The importance of the first or early flights in the ecology of many species was also discussed.

Muscle autolysis is known to occur in a wide variety of insects—e.g. Homoptera, Heteroptera, Hymenoptera, Diptera, Coleoptera. In the past, however, the ontogenetic and phylogenetic aspects have been confused. In some beetles there appears to be a cyclical change in the condition of the wing muscles which is associated alternatively with the development and quiescence of the ovaries and with hibernation. The importance of diurnal flight in dispersal by convection, the importance of local topography and presence or absence of katabatic winds in the dispersal of crepuscular species was also discussed.

Recent studies also show that the diminution of aerial density with altitudes between 10 and 5,000 ft. above ground follows a consistent relation capable of fairly simple mathematical expression. The relative numbers in higher or lower zones of the air varies with season, time of day, and species. This is of great significance in measuring the dispersability of various insects on different occasions. Attention was drawn also to the importance of the low residual densities which remain at the higher altitudes overnight, after the majority of the aerial populations have descended. These may be more significant in long distance spread than the higher densities at the lower altitudes.

Long discussion followed Dr. Johnson's address, in which Miss Longfield, Dr. Hinton, Dr. Wood-Baker and Messrs. Benson, Jenkins, Kerrich, Kloet, Lee and Turner joined.

Mr. J. R. Chiswell, B.Sc. (Department of Zoology, University of Bristol), then followed with an address entitled "The anatomy of the gut of Tipulid larvae of different feeding habits."

Mr. Chiswell noted that the feeding habits of Tipulid larvae are very diverse. Most species are herbivorous and feed on the living or decaying tissues of flowering plants, mosses, liverworts, algae, and fungi. Most Pediciini and many Hexatomini are carnivorous and feed on small oligochaets, insect larvae, and mites. In view of the varied nature of the food, it is scarcely surprising that there is considerable variety in the form and proportions of the gut. In this short summary it is only possible to give a very brief account of the gut and its principal modifications. The relative lengths of the fore-, mid-, and hind-guts will be expressed as percentages of the total length of the

gut. The gut is almost straight, i.e. its length does not exceed that of the body. The fore-gut is a simple, narrow tube: in herbivorous species it is short (20-25%) and food is passed rapidly through it into the mid-gut; in carnivorous species it is considerably longer (30-55%) and food is usually retained in its hind part, the oesophagus, for some time, so that some digestion and possibly absorption may occur in it. An oesophageal invagination is always present; it is long in herbivorous species but extremely short in carnivorous species. The mid-gut is several times as wide as the fore-gut: in herbivorous species it is comparatively long (40-50%), and a peritrophic membrane is always present; in carnivorous species it is short or very short (15-30%), and the peritrophic membrane appears to be absent. The hind-gut is about the same length (30-40%) in herbivorous and carnivorous species and is composed of a narrow anterior colon and a wider posterior rectum. Diverticulae of the gut are developed in some herbivorous species. In all Tipulinae, four caeca arise near the anterior end of the mid-gut and a dorsal diverticulum arises from the anterior end of the rectum. The length of the rectal diverticulum varies considerably and it is longest in species which feed in decaying wood. The diverticulum is filled with food fragments and innumerable bacteria, and it is possible that the latter play some part in the digestion of cellulose, especially in wood-feeding forms. Rectal diverticula also occur in two genera of Hexatomini, *Epiphragma* and *Austrolimnophila*, both of which feed on decaying wood. The four Malpighian tubes arise from the posterior end of the mid-gut, one pair dorso-laterally and one pair ventro-laterally. In many carnivorous Hexatomini, the whole or the greater part of each of the two dorsal tubes is greatly dilated and is filled with a suspension of minute granules, which are probably largely composed of calcium carbonate. Similar "lime sacs" are developed in *Erioptera stictica* Meig., which feeds on organic debris in mud. The lime sacs do not open into the gut during the larval life and the function of the calcium carbonate is uncertain. It may simply represent a store of excess calcium from the food.

Dr. Hinton, Dr. Johnson, Dr. Wood-Baker and Messrs. Dyte, Kerrich and Kevan joined in the discussion which followed this very interesting address.

In a witty closing speech Dr. Hinton thanked all those who had contributed to the success of the Congress and provided such an enjoyable week-end. Miss C. Longfield then proposed a vote of thanks to Dr. Hinton for his able and genial chairmanship of the Congress.

After lunch a party visited the delightful zoological gardens at Clifton (by kind invitation of Dr. Richard C. Clarke, Director of the Bristol, Clifton and West of England Zoological Society). A very pleasant afternoon was enjoyed and the party then dispersed.

G.J.K., J.H.M.

Accounts

The Receipts and Payments Account for the year ended 31st December, 1954, and the Statement of the Society's financial position at that date are printed on p. 142.

The Hon. Treasurer, Mrs. M. Murgatroyd, reports that there has been a general reduction in income during the year. Subscriptions, Rebate of Income Tax under Covenants and especially Sales of Publications are all down on the previous year.

Review

The Entomology of Spurn Peninsula (*SE. Yorkshire*). Reprinted from *The Naturalist*, 1951-4. 8½″ × 5½″, 96 pp., 5 figs., paper covers. A. Brown & Sons Ltd. Price 7*s.* 6*d.* (plus 2½*d.* postage) from E. W. Classey, 22 Harlington Road East, Feltham, Middlesex.

This neat symposium, by members of the Entomological Section of the Yorkshire Naturalists' Union under the leadership of Dr. W. D. Hincks, is of great interest as shewing what can be done by a team of specialists persistently working a small area over a period of about seven years. This sandy peninsula, about three and a half miles long and seldom more than a hundred yards in width, has, by consistent attack, produced an astonishing total of species (nearly 2,200 excluding birds). Early hopes that the investigation would provide some important ecological data were, however, soon dashed—the varying habitats being so small and so close to one another that in the majority of cases no satisfactory conclusions can be reached.

Altogether a considerable and very useful contribution towards our better knowledge of the Yorkshire fauna.

J.H.M.

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954

RECEIPTS

	£ s. d.	£ s. d.
To Subscriptions Received for:		
1952	2 2 0	
1953	12 9 7	
1954	195 4 9	
1955 (in advance) ..	8 8 0	
		218 4 4
Sales of Publications		61 15 7
Rebate of Income Tax under Covenants ..		23 5 4
Balance being Excess of Payments over Receipts for the year		92 5 7
		£395 10 10

	£ s. d.
Balance at Bank, 1st January, 1954 ..	96 0 7
Less Excess of Payment over Receipts ..	92 5 7
Balance at Bank, 31st December, 1954 ..	£3 15 0

PAYMENTS

	£ s. d.	£ s. d.
By Publications:		
Journals	279 1 7	
Transactions	80 14 6	
		359 16 1
Subscriptions		12 6
Printing and Stationery		6 15 1
Secretary's Expenses		10 6 8
Treasurer's Expenses		3 16 4
Secretary's Typist		10 0 0
Editor's Expenses		4 0 2
Insurance		4 0
		£395 10 10

We report to the Members of the Society for British Entomology that we have audited the foregoing Receipts and Payments Account for the year ended 31st December, 1954, and we have received all the information and explanations we have required. In our opinion the foregoing Account is correct and properly sets forth the result of the Society's activities for this year.

Ellerslie Chambers, Bournemouth.
10th March, 1955.

DONALD & CO.,
Chartered Accountants.

(*Continued from inside front cover*)

HYMENOPTERA

A Consideration of Cephalic Structures and Spiracles of the Final Instar Larvae of the Ichneumonidae. By B. P. Beirne, 1941. 68 pp., 31 figs., 5*s.* 6*d.*

Second Review of Literature concerning British Ichneumonidae. By G. J. Kerrich, 1942. 35 pp., 7 figs., 3*s.* 0*d.*

The Hymenoptera Aculeata of Bedfordshire. By V. H. Chambers, 1949. 56 pp., 3 maps, 10*s.* 0*d.*

An Introduction to the Natural History of British Sawflies. By R. B. Benson, 1950. 98 pp., 9 pls., 10*s.* 0*d.*

Notes on Some British Mymaridae. By W. D. Hincks, 1950. 42 pp., 5 figs., 1 pl., 5*s.* 0*d.*

The British Species of the Genus *Ooctonus* Haliday, with a Note on some Recent Work on the Fairy Flies (Hym., Mymaridae). By W. D. Hincks, 1952. 12 pp., 8 figs., 4*s.* 0*d.*

The Natural History of some *Pamphilius* Species (Hym., Pamphiliidae). By V. H. Chambers, 1952. 16 pp., 4 pls., 5*s.* 0*d.*

A Study of some British species of *Synergus*. By J. Ross, 1951. 16 pp., 4*s.* 0*d.*

A Revision of Section I (Mayr, 1872) of the Genus *Synergus* (Hym., Cynipidae) in Britain, with a Species new to Science. By R. D. Eady, 1952. 12 pp., 4 pls., 4*s.* 0*d.*

The British Ants allied to *Formica fusca* L. (Hym., Formicidae). By I. H. H. Yarrow, 1954. 16 pp., 8 figs., 3 maps, 5*s.* 0*d.*

The British Ants allied to *Formica rufa* L. (Hym., Formicidae). By I. H. H. Yarrow, 1955. 48 pp., 58 figs., 1 map, 10*s.* 6*d.*

LEPIDOPTERA

The Morphology of *Luffia ferchaultella* and a Comparison with *L. lapidella* (Psychidae). By R. S. McDonogh, 1941. 19 pp., 9 pls., 4*s.* 0*d.*

List of the Lepidoptera of Dorset. Part 2. By W. Parkinson Curtis, 1947. 138 pp., 4 pls., 11*s.* 0*d.*

Postural Habits and Colour-Pattern Evolution in Lepidoptera. By M. W. R. de V. Graham, 1950. 16 pp., 4 pls., 4 figs., 4*s.* 0*d.*

ENTOMOLOGICAL FAUNA OF THE NEW FOREST SERIES

Introduction by J. Cowley, and Part 1, Odonata, by Lt.-Col. F. C. Fraser, 1950. 12 pp., 1*s.* 6*d.* Part 2. Neuroptera, by Lt.-Col. F. C. Fraser, 1951. 12 pp., 1*s.* 6*d.*

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JOURNAL OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 5 | 25TH MAY, 1956 | PART 5

EDITORIAL

The publication of this issue of the *Journal* marks the beginning of a new phase in the history of the Society for British Entomology. The founders have seen the society grow from a small local body in Hampshire into an organisation of national and international repute. In recent years the work of the society has been carried out mainly by Mr. S. C. S. Brown, as Secretary, and Mr. and Mrs. Murgatroyd, who have acted respectively as Editor and Treasurer. To these and many others the society owes a deep debt of gratitude.

At the beginning of this year the headquarters of the Society moved from Bournemouth to Manchester. For many years there has been a keen and active interest in entomology in both Yorkshire and Lancashire. The Manchester Entomological Society, the Lancashire and Cheshire Entomological Society (centred on Liverpool), the Raven Entomological Society of Southport and the Entomological Section of the Yorkshire Naturalists Union, have built up a tradition for good work. It is, in part, due to these societies, that today the Manchester Museum contains one of the finest collections of British insects. The moving of the society's headquarters to Manchester has been a great stimulus to northern entomologists.

At the same time we must never forget that the society is first and foremost a *national* society. Its function is to serve the cause of entomology in all parts of the country. That is the tradition which Bournemouth has passed to Manchester. It is the aim and ambition of Council to preserve and develop that tradition.

If the society is to maintain its high standard of publication in spite of the ever-increasing costs of printing, it is essential that the society should have the maximum support of all those who are interested in British entomology. At the present moment membership is about 250 and it is most desirable that this figure should be increased. Members are asked, therefore, to do all in their power to bring the activities of the society to the notice of other entomologists. In doing so they will help the cause of British entomology.

SOCIETIES

SOCIAL INSECTS

A British section of the International Union for the study of Social Insects has now been formed. Membership is open to all those interested in any aspect of the study of gregarious or social insects. The subscription is ten shillings a year, which includes the membership fee for the International Union. Further information can be obtained from the Secretary, Dr. G. G. Butler, Bee Department, Rothamsted Lodge, Hatching Green, Harpenden, Herts., to whom applications for membership should also be made.

Notes on Hymenopterous Parasitoids bred from Eggs of Dytiscidae in Fife

By Dorothy J. Jackson

In the summer of 1954 and again in 1955 I collected the eggs of various Dytiscidae in three localities in Fife and I have bred from them several species of Chalcidoidea.

The most productive locality was at Gilston, Largoward, where four small artificial pools for water lilies always contained a varied assortment of water beetles (Jackson, 1952). A reservoir at Cairnsmill, near St. Andrews, with a strong growth of *Alisma plantago-aquatica* L. along its shores, was also a good collecting ground.

Mymaridae

Caraphractus cinctus Walker (=*Polynema natans* Lubbock).

This is by far the commonest parasite of eggs of Dytiscidae in Fife (Jackson, 1954). I have bred it from eggs taken in the two localities mentioned above, and also from a quarry pond at Kemback. It is a parasite both of eggs of *Dytiscus marginalis* L. and of the eggs of the smaller water beetles; *Agabus* and *Ilybius* spp. (fig. 1). In the eggs of *Dytiscus* many larvae develop, and up to fifty have reached the imaginal state in one egg, forty-five emerging successfully, but usually the number which emerges is smaller and there is a residue left of larvae, pupae and imagines, which die within the host egg. From the eggs of the Colymbetines from one to seven individuals may emerge and residual specimens are rare. The imagines reared from the *Dytiscus* eggs were usually of large size and macropterous, but small brachypterous specimens were obtained from the eggs of Colymbetines, when more than a certain number of individuals developed to maturity in the same egg, the critical number depending on the egg-size of the host species. Both macropterous

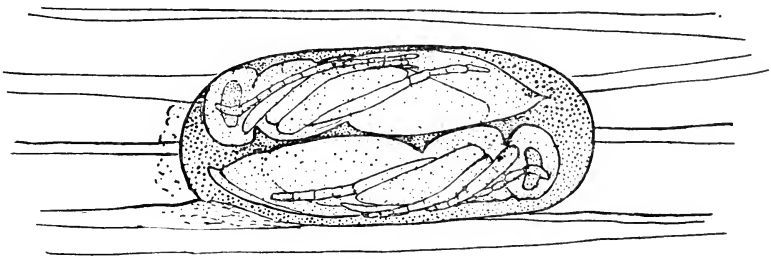

Fig. 1. Egg, probably of *Agabus sturmii* Gyll (on leaf of *Juncus articulatus*), containing two newly formed pupae of *Caraphractus cinctus* Walker. The upper pupa is a male, the lower a female. x35.

and brachypterous specimens were examined by Dr. W. D. Hincks who believed them to be of the same species. Breeding experiments which I carried out in 1955 support his view, and a note on the results so far obtained has

been recorded (Jackson, 1955). The work is still in progress and it is hoped to publish a full report of it later, together with an account of the life history and habits of this interesting Fairy Fly. There appear to be no records of the breeding of this Mymarid in Britain though various papers regarding it have been published on the continent, and the most important is that of Rimsky-Korsakov (1925).

The percentage of eggs parasitised by this species (worked out from collections of eggs made in the summer of 1955 in the Gilston lily pools) was extremely high. From 95 eggs, believed to be those of *Agabus sturmii* Gyll, and mostly laid on *Juncus articulatus* L., 69 were parasitised; while from the eggs of *Dytiscus marginalis* L. mostly laid under the sheathing leaves of the same rush, all those collected, 57, were parasitised, 51 probably by *Caraphractus cinctus* (some of the eggs were preserved in alcohol with larvae which appear to be of this species); two eggs were parasitised by the Eulophid mentioned below and four eggs still have living larvae, which I believe to be of the same species. If *Caraphractus cinctus* is equally common in other districts it must be a very important factor in reducing the number of water beetles. Since this Mymarid has at least two and possibly three generations in the year, parasitising different host eggs of Dytiscidae as they become available, I would expect it to be most common in ponds where several species, such as *Dytiscus*, *Agabus* and *Ilybius* occur together and where a succession of eggs will be found throughout the year. Thus the eggs of *Dytiscus marginalis* and some *Agabus* occur in the spring, *Ilybius* in the summer, and *Agabus bipustulatus* L. from autumn onwards, in fact Mr. J. Balfour-Browne informs me that *A. bipustulatus* is exceptional in breeding all the year round, and I am finding it to be a convenient host to use, since its eggs are laid on the surface of the leaves or stalks of water plants and not embedded in the tissues.

Patasson sp.

I have obtained this species once, on 30th July, 1955, in an egg probably that of *Ilybius fuliginosus* Fabr. embedded in a leaf stalk of *Alisma* at Cairnsmill Reservoir. The egg then contained pale pupae. During my absence from home in the beginning of August the imagines emerged—I had left the egg in a tube of water—and, when I next examined them on 12th August, I found that all five females had died and were beginning to disintegrate. As they were in a very fragile state I mounted them and sent the slide to Dr. Hincks and it is now in the Manchester Museum Collection. He regards it as as an undescribed species, which he will describe when more material is available. A species of *Patasson*, *Anaphoidea conotracheli* Girault, was recorded by Bakkendorf (1934) as a parasite of the eggs of *Agabus* (and also of a Chrysomelid), but Dr. Hincks informs me that the *Patasson* I obtained does not agree with *conotracheli*.

Mymarid sp.

Three specimens of a very small Mymarid died within an egg, probably of *Agabus sturmii*, obtained at Gilston. I extracted them after death and the specimens are too poor to allow of identification, but they are not *Caraphractus*, nor *Patasson*.

TRICHOGRAMMATIDAE

Prestwichia aquatica Lubbock.

An egg of *Ilybius fuliginosus* which I found on 25th July in an *Alisma* leaf stalk (from Cairnsmill Reservoir) contained pupae. During my absence from home the insects died within the egg. There were four, two large and two small (3 ♀♀, 1 ♂). One female (large) was macropterous, another (large) had died before the wings expanded, the other female (small) was still a pupa, and the small male, as is usual for this species, had minute rudimentary wings. Dr. Hincks has confirmed my identification of this species.

Observations on *Prestwichia aquatica* Lubbock have been published by various writers and a useful summary is given by Korschelt (1924). Lubbock described this species along with "*Polynema natans*" (i.e., *Caraphractus cinctus*) in 1864, and drew attention to the fact that while neither showed any adaptations for life under water, the Mymarid swims with its wings and *Prestwichia* with its legs. Enoch (1898) mentions as hosts of *Prestwichia* the eggs of *Dytiscus marginalis* and *Notonecta*, and he records (1899) breeding eight females and one male from a single egg and later (1913) the breeding of from 30 to 40 specimens from a single egg of "the Large Water Beetle." Henriksen (1922) found in Denmark, that the eggs of the Zygopteron, *Erythromma najas* Hansemann are very often parasitised by *Prestwichia* and he lists the eggs of various other aquatic insects which have been recorded as hosts.

Very interesting is the variation in wing length in the females of this species. Henriksen distinguished three forms: (a) fully winged (*aquatica*), (b) short winged (var. *brevipennis* Henriksen, with short wings only partly covering the abdomen) and (c) without wings* (*solitaria* Ruschka and Thienemann) and he states that they may all be found at the same time, in the end of July. Rimsky-Korsakov (1916, 1920) who has studied the development of *Prestwichia* from egg to imago, found that the macropterous females always gave rise to macropterous females and the brachypterous females to brachypterous forms. He notes (1920) that the wing varies in length in the two races according to the body length of the individual, the wings being proportionately smaller in the smaller individuals, but, according to his observations, the two forms do not intergrade. In *Caraphractus cinctus* I observed (1955) that the wing size usually varied in accordance with the size of the insect and that all intermediates occurred between the large specimens with long wings and the small specimens with short wings. Rimsky-Korsakov (1920a) states that in the males of *Prestwichia* the wings do not usually reach the length of that of the brachypterous females, and he gives the length of the forewings in the brachypterous females as 0·11 - 0·52 mm. and that of the males as 0·04 - 0·22 mm. The females of *Prestwichia*, which I obtained were certainly not of the brachypterous type, and it would be interesting to know if this form has been recorded in Britain. Henriksen bred the three forms he mentions from different hosts, but Rimsky-Korsakov obtained both winged and brachypterous forms from Dytiscid eggs.

* Henriksen evidently refers here to the form with extremely reduced wings, for Ruschka and Thienemann (1913) in describing *Prestwichia solitaria* state that the forewings are rudimentary and measure only 0·035 mm. in the female and less in the male. Of hind wings they found no certain trace.

Eulophidae

Chrysocharis sp.

I am indebted to Mr. G. J. Kerrich for examining this species, and some slide-mounted specimens are now in his possession. He informs me that it is a *Chrysocharis* species of the *punctifrons* group (sub-family Entedontinae). He states that it constitutes an entirely new host record, for the species of *Chrysocharis* as now understood (Delucchi, 1954) are known as parasites of leaf-mining larvae, mostly Diptera. One species has been bred from a leaf-mining caterpillar, *Lithocolletis* sp. According to Clausen (1940, p. 136) the species of the sub-family Entedontinae are shown by the available records to be principally internal parasites of the larvae of Diptera, Coleoptera and Lepidoptera contained in cases and leaf mines and in cells in plant stems. A considerable number of species develop as hyperparasites and a few are known to be parasitic in or predaceous upon the eggs of Coleoptera and Homoptera. One species of *Epilampsis phyllotomae* Del—is known (Delucchi, 1954) to be a parasite of *Phyllotoma nemorata* Fall., a leaf-mining saw-fly. Rimsky-Korsakov (1920b) records a Eulophid as parasitising the eggs of various dragonflies.

I found the *Chrysocharis* larvae as parasites of a few eggs of *Dytiscus marginalis* at Gilston in 1954 and again in 1955. The pools from which I obtained them dried up last summer, and it is feared that this will have destroyed the parasite (which appears to have a very short imaginal life) so that the outlook for getting more specimens next year in this locality is not hopeful. The *Dytiscus* eggs, which contained them, had been laid under the sheathing leaves of *Juncus articulatus* L., submerged in the water. The egg, lying parallel with the stem, is so completely hidden by the sheathing leaf that its situation is somewhat similar to that of a leaf-mining dipteron, and dipterous larvae were found within the stems of some of the rushes growing under water. Of the identity of the host there is no doubt whatever; I placed the *Dytiscus* eggs, with a small section of the rush containing them, in separate jars of water and examined them at intervals. The full grown larvae of *Chrysocharis* seen through the chorion of the host egg, can readily be distinguished from the larvae of *Caraphractus* by their much larger size and, on removal from the host, it will be seen that they have normally segmented bodies and distinct chitinous mandibles; while the fully grown larva of *Caraphractus* does not show segmentation nor can mandibles be distinguished in it. The pupae of *Chrysocharis* (fig. 2) are also entirely different from those of the *Caraphractus* (fig. 1) being larger and broader, with short thick antennae. Development is very slow and there appears to be only one generation in the year and the insects are difficult to rear to the imaginal state. So far, from only two of the parasitised eggs have imagines been reared. Particulars regarding them may be of interest. A dark brown *Dytiscus* egg was found on 14th June, 1955. It looked like a last year's egg, because newly laid eggs are translucent and cream coloured. I partly opened it and saw pupae inside. I replaced the egg in water in a covered jar and, on 23rd June, I noticed that one pupa had floated out from the gash I had made in the chorion, and the imago, a male, was trying to emerge, its greenish head being partly out of the pupal cuticle. Two days later the male was still struggling so I helped it out of the pupal integument. All the other

pupae (thirteen) in this egg died. From another egg, obtained on 22nd June, 1955, a successful emergence of imagines took place. The egg had been placed in a covered jar alone and the imagines had emerged from it by 17th July, 14 specimens, 10 ♂♂ and 4 ♀♀. On 21st July I opened the egg they had vacated, which was brown, and found seven last stage larvae, still living, and one pupa, and three more larvae had floated out of the emergence hole made by the imagines, giving a total of 25 individuals, more

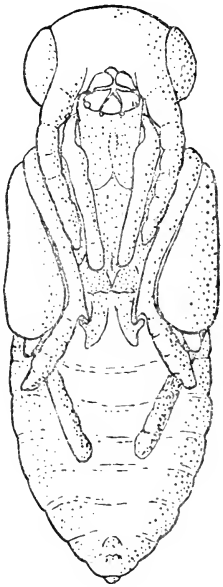

Fig. 2. Pupa, male, of *Chrysocharis* sp., ventral view, drawn from a specimen mounted in Euparal x35. Extracted from an egg of *Dytiscus marginalis* L. which contained eleven other pupae of the same species.

than I have found in the other eggs. The winter is passed as full grown larvae inside the *Dytiscus* egg; in one egg which I now have under observation full grown larvae and one pupa were visible in November. I have had one egg containing healthy parasites for more than a year. It was obtained on 9th June, 1954, and large larvae were visible in it on 1st July and throughout the winter, and by 31st March one had pupated. In June, 1955, I made a hole in the egg and saw one healthy pupa, and this still appeared healthy in August (fourteen months after collection) but in October all were dead, one pupa and several large larvae. To sum up, I believe that emergence takes place in June and July from last year's (brown) *Dytiscus* eggs, and that the larvae from summer laid eggs become full grown by the autumn and hibernate usually in this state, emerging the following summer.

In conclusion I wish to express my thanks to Dr. Hincks and to Mr. Kerrich for their examination of the species recorded. I much appreciate the help they have given me in various ways, especially with the literature and in reading over these notes.

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REVIEW.

Somersetshire Archaeological and Natural History Society: Lepidoptera of Somerset. By A. H. Turner, F.R.E.S., F.R.Met.Soc. 118 pp.+viii+map. Price 10*s.* 6*d.*

A well printed list of 1,440 species, which is an advance on most local lists in that it covers the Lepidoptera of Somerset and not merely the so-called macro-lepidoptera. It is based on records supplied by over thirty observers and on the card index of the late A. R. Hayward. Localities are given and status indicated for each species. A good point is the mention of food plants of most of the smaller moths, which should encourage further observation in the county. Mr. Turner has produced a sound and useful work which adds to the knowledge of distribution. This volume is the first of a series on the animal life of Somerset. H.N.M.

Notes on three species of micro-hymenoptera from Charterhouse Pools

By W. D. Hincks (Manchester Museum)

1. *Lymaenon alecto* Debauche (Mymaridae).

Lymaenon alecto Debauche, 1949, *Mém. Mus. R. Hist. Nat. Belg.* **108**:105, pl. xi, figs. 113-115 (♂♀, Belgium: Eegenhoven). Hincks, 1953, *The Naturalist* **1953**: 138 (Spurn Peninsula).

This species was noted briefly as an addition to the British fauna in 1953 when it was intended to describe it in more detail in a later paper on additions to the British Mymaridae. The capture of a single female at the Charterhouse Pools on July 24th, however, enables me to include it in the present notes.

L. alecto is slightly larger than most of the allied British species of the genus, being 1·1 to 1·2 mm. in length. The coloration is described by Debauche as "très vive," a combination of black with the base of the abdomen golden yellow, dark brown antennae, and golden yellow legs with dark markings. In dried specimens, however, the coloration is less striking, but the females may be distinguished easily from other British species of the genus by the characters of the unusually long and slender antennae. Only segments 9 and 10 (apart from the club, segment 11) have sensory ridges; segments 3 to 6 are long and cylindrical, being together clearly longer than the long and slender club; segment 3 is unusually long and is about equal in length to the pedicellus (segment 2); segment 1 is also long and slender. The male is best identified by being captured with the female, which it resembles in wing form and coloration; it is larger and has longer antennae than the related species.

I have not yet isolated *L. sulphuripes* (Foerster) from the mass of *Lymaenon* material now accumulated, but it is almost certain to occur in Britain. It is closely related to *L. alecto*, but may be distinguished by having the club at least equal in length to segments 3 to 6 and clearly longer than the combined length of the last four segments of the funicle.

L. alecto is a very common species of which nothing is known of its habits and biology. I have taken it abundantly at Spurn and Askham Bog, in Yorkshire, and in smaller numbers in a wide range of localities as far north as Inverness-shire. The following list includes the material so far examined; records without a collector's name are my own.

Somerset: Charterhouse Pools, 24.7.55, 1♀. Lincolnshire: Grantham, 20.9.51, 2♀♀ (*H. Britten*). Flintshire: Pantymwyn, Mold, 4-6.6.49, 1♀. Cheshire: Dunham, 24.8.48, 4♀♀; 6.9.49, 1♀; Marple, 11.9.49, 2♀♀ (*H. Britten*). Lancashire: Brathay, Blake Beck Woods, 17.7.55, 1♀. Yorkshire: Spurn Peninsula (VC 61), Kilnsea Warren, Marsh Meadows, Main Ridge, North Lane, Long Bank Dyke (for details of Spurn localities see "Entomology of Spurn Peninsula," 1955, reprinted from "The Naturalist," 1951-54). Abundant, 17.6.47, 18-23.6.51, 12-18.7.52, 23-24.7.53 (*W. D. Hincks* and *S. Shaw*). Barlow (VC 61), 17.9.49, 1♀. Allerthorpe Common (VC 61) 12.9.50, 2♀♀. Lastingham (VC 62) 14.6.49, 10♀♀, 1♂. Hebden Bridge (VC 63) 11.8.45, 1♀. Colden Valley (VC 63) 28.7.47, 3♀♀ (*John Wood*).

Worsboro' (VC 63) 21.5.49, 1♀. Askham Bog (VC 64), common, 27.7.46, 7.9.46, 5.10.46, 27.5.47, 11.7.54. Leeds, Rigton (VC 64) 24.5.47, 1♀. Masham (VC 65) 14.8.49, 1♀ (*W. A. Thwaites*). Cumberland: Skirwith 4.9.53, 1♂, 1♀ (*H. Britten*). Inverness: Inshriach Forest, Rothiemurchus 23.6.54, 2♂♂, 2♀♀.

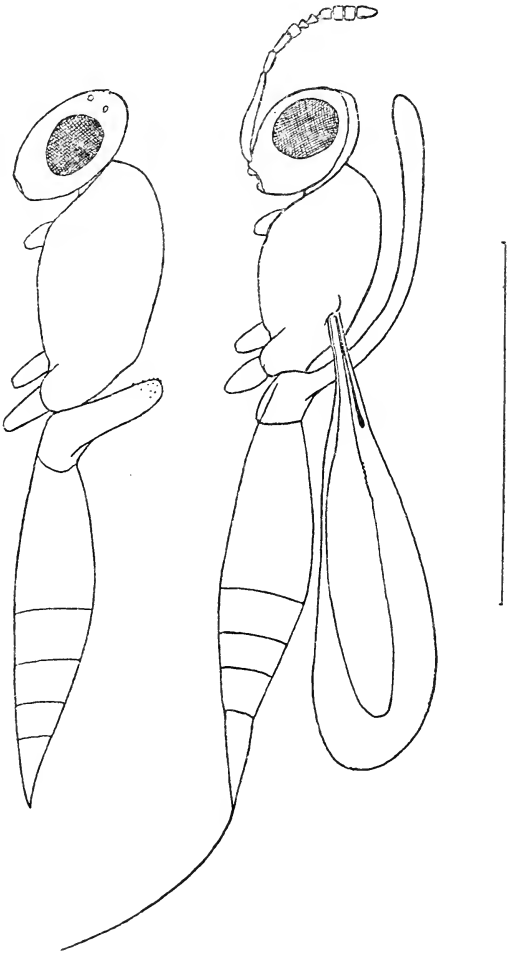


Fig. 1. *Inostemma spinulosum* Kieffer, female, lateral view (wings, legs and antennae omitted).

Fig. 2. *I. boscii* (Jurine) female with ovipositor partly exserted; lateral view (legs omitted). Scale = 1 mm.

2. *Inostemma boscii* (Jurine) (Platygastridae) (fig. 2).

I first captured a female of this species as a schoolboy in the early 1920's at Harewood, near Leeds, and was able to identify it by Curtis' illustration (1830, *British Entomology:* 309) but did not discover anything for some time about its biology or the function of the extraordinary curved process present on the first abdominal tergite extending forwards over the thorax and head. Since then, besides finding a few specimens at Charterhouse Pools, I have seen specimens from Warwickshire, Northamptonshire, Cheshire, North and South Lancashire, Yorkshire (East, South-west, Mid-west and North-west), Cumberland, Westmorland, Dumfries-shire, and from Ankaveen (Holland) (21.8.51).

The hosts of *I. boscii*, and indeed of many other Platygastrids, are Gall Midges (Cecidomyiidae). In Britain and on the continent it has been reared from *Contarinia pisi* (Winnertz), the Pea Midge, *C. lolii* Metcalfe, *Dasyneura brassicae* (Winnertz), the Cabbage Midge, and *D. pyri* (Bouché), the Pear Leaf-curling Midge. Doubtless it has other Cecidomyiid hosts but three at least of the above quoted midges are widespread and often common pests. Like many Platygastrids the species of *Inostemma* are egg-parasites, requiring special conditions. The host egg must be in an advanced stage of development so that the parasite egg may be laid in well differentiated embryonic tissues. In the case of such species of *Inostemma* as are known biologically the egg is laid in the brain of the late embryo forming a cerebral cyst. The process of oviposition is a delicate operation and requires a long slender but well controlled ovipositor since the host eggs are often embedded in plant tissues or in the centre of a developing blossom. The "slack" of the ovipositor, when it is not in use, is accommodated in the long curved tubular receptacle extending from the dorsum of the first abdominal segment over the thorax. A brief but interesting account of the biology of *I. boscii* was published by Myers in 1927 (*Bull. ent. Res.* **18**: 131-133).

The several British species of *Inostemma* are said to be distinguished by various slight characters including differences in the length of the dorsal process but in all the species the latter appears to extend at least for a considerable distance over the pronotum. In the large series of specimens examined there is slight variation in the length of the process but hitherto I have seen nothing which I could regard as belonging to any species other than *I. boscii*. A single specimen from Charterhouse Pools however, with a very short process, appears to be a quite distinct species, unrecorded from Britain.

3. *Inostemma spinulosum* Kieffer, new to Britain (fig. 1).

Inostemma spinulosum Kieffer, 1916, *Centralbl. Bakter.* **46**: 550 (♀, Alsace); 1926, *Das Tierreich* **48**: 581, f. 227 a-c.

This species is easily distinguished from any of the recorded British species of the genus by the very short dorsal process, which, in lateral view (fig. 1) hardly exceeds the level of the dorsum of the pronotum. The distal portion is also minutely spinulose. Kieffer reared this species from the common *Rubus* gall midge, *Lasioptera rubi* Heeger.

I captured a single female by sweeping at Charterhouse Pools, Somerset, on July 24th.

The British species of *Sigara* (*Sigara*) Fabricius (Hem., Corixidae)

By Dennis Leston, F.R.E.S.

Introduction

The common British waterbug hitherto known as *Sigara striata* (L.) has been shown to be distinct from continental *S. striata* and must be known as *S. dorsalis* (Leach) (Macan, 1954A, 1954B; Leston 1955A). Recently, the true *S. striata* has also been found in Britain (Leston, 1955A; Waterston, *in litt.*). The present paper is concerned with the synonymy, separation characters, British distribution and status of these two species.

The British List

As first demonstrated by Kirkaldy (1906), the Linnaean type series agrees neither with the original description of *Notonecta striata* Linnaeus, 1758, nor with the species accepted by modern authors—e.g., Jaczewski (1924), Poisson (1935), China (1938A, 1938B, 1943B), Hungerford (1948), Macan (1954A) and Leston (1955A)—as *Sigara* (or *Corixa*) *striata* (L.). At one time much discussion went on over this and the related taxonomic-nomenclatural problems of the identity of the species generally taken to be the types of *Corixa* and *Sigara* (see for example China, 1938A, 1943A; Walton, 1943). In the interest of stability and because so much Corixid morphological, cytological, ecological and behaviour literature are based upon *S. striata* (L.) *auctt.*, the present writer proposes, shortly, to make an application to the International Commission on Zoological Nomenclature, to ask them to legalise this generally held concept.

Accepting *S. striata* (L.) in the above sense, the British members of *Sigara* (*Sigara*) may be listed—with the principal British synonymy—as follows:

Sigara (*Sigara*) F.
subgenerotype: *Notonecta striata* L.

1. *striata* L., 1758 (*Notonecta*)
   striata Macan, 1954A (*Corixa*)
   striata Leston, 1955A (*Sigara*)

2. *dorsalis* Leach, 1817 (*Corixa*)
   striata Douglas & Scott, 1865 (*Corixa*)
   striata Saunders, 1892 (*Corixa*)
   undulata Kirkaldy, 1906 (*Arctocorisa*)
   striata Butler, 1923 (*Corixa*)
   striata China, 1938 (*Sigara*)
   striata Macan, 1939 (*Sigara*)
   striata Walton, 1943 (*Corixa*)
   striata China, 1943B (*Corixa*)
   striata Kloet & Hincks, 1945 (*Corixa*)
   lacustris Macan, 1954A (*Corixa*)
   dorsalis Macan, 1954B (*Corixa*)
   dorsalis Leston, 1955A (*Sigara*)

Leach's species is variously assigned to 1817 or 1818; although the complete volume of the *Transactions* is dated 1818 the relevant part was issued in 1817.

SEPARATION CHARACTERS

The characters mentioned or utilised by Macan for the separation of the two species are now considered.

(a) Palae

Wagner (in Macan, 1954A) notes that in continental *S. striata* the outer row of palar teeth is strongly curved proximally (*cf.* Macan *op. cit.* fig. 3); this curvature is less marked in Poisson's figure (1935, fig. LXVI) of French material. In British *S. striata*, this curvature is clearly present and its limits, to some extent, defined by smaller pegs (fig. 13); however, there is some variation within *S. dorsalis* (figs. 1, 4, 7, 10) and the example figured by Macan, from the Lake District, showing the first five pegs in an almost straight line, may be taken as an extreme type. The smaller size of the palae of *S. striata* may prove to be significant, when detailed biometric study is made.

(b) Left harpagone.

The left harpagone, as with all Heteroptera, is supported by two apodemes. One of these is situated on the inner surface adjacent to the well marked angle and it projects mesally, thus preventing the dissected clasper from being laid flat on its inner surface for viewing the outer surface. The illustrations (figs. 2, 5, 8, 11, 14) show the inner surface, whereas Macan (*op. cit.* fig. 5) apparently shows the obverse. Whereas in *S. dorsalis* the inner margin of the ramus is sharply angled, in *S. striata* it is gently curved or almost straight; Macan illustrates a Danish specimen with a straight margin, but this may be due to the aspect from which viewed.

Comparison of the Llanelly example with that from Shoreham, Kent, on the one hand and those from Hampstead Heath and Titchfield on the other, demonstrates the type and degree of variation found in the shape of the left harpagone. The seeming variation in the size of the inner apodeme is an artefact because part of this thin lamina is lost in dissection. At its widest, the ramus of *S. dorsalis* is bigger than that of *S. striata* but, on the present evidence, it appears that the presence or absence of an angle on the inner margin is diagnostic.

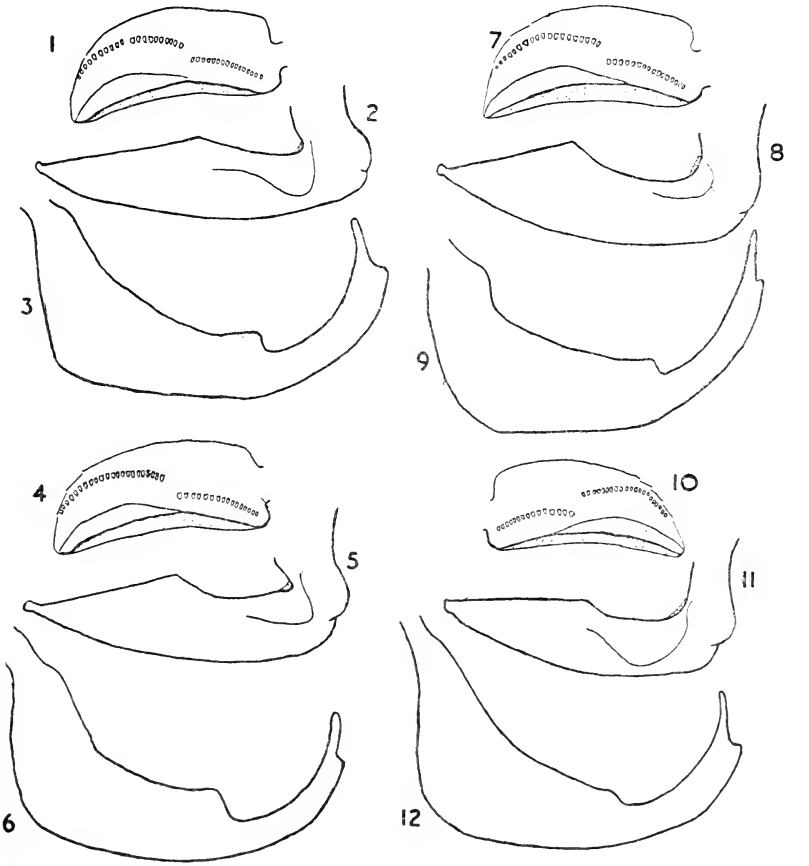
(c) Right harpagone.

Macan (*op. cit.* fig. 6) figures the right harpagone and concludes that, as between British and Swedish *S. dorsalis* and continental *S. striata*, there is a constant difference in the presence of a subapical "ledge" in the former, which is absent in *S. striata*. British *S. striata* agree with continental examples in this (figs. 15, 16) and, despite the variation noted by Macan and confirmed here (figs. 3, 6, 9, 12), the "ledge" is a reasonably diagnostic feature. However, it is worth noting that Macan (personal communication) has seen a Kent specimen otherwise attributable to *S. striata* which has "a very slight shelf below the tip, not nearly as broad as in typical *dorsalis*, but none the less a shelf . . ."

(d) Pronotal markings.

S. dorsalis has a tendency towards fewer pale transverse stripes on the pronotum than *S. striata* (Macan *op. cit.*). Using Macan's data and scoring his class 6+ (six lines, one or more of them forked) as 6·5, a frequency polygon can be constructed (fig. 17).

The data of fig. 17 have been treated statistically and also plotted on probability paper: because of the arbitrary selection of classes neither method seemingly has any validity. Thus class 7·5 includes individuals with 7 pronotal lines, one of which is slightly forked, together with individuals that may have two of the seven lines considerably forked and thus approaching class 9. However, it is concluded that there is a strong tendency to have six well marked pronotal lines in *S. dorsalis* and that in *S. striata* there are usually six or seven lines of which some are, more often than not, bifid.



Figs. 1-12. *Sigara dorsalis* (Leach). 1-3, ex Shoreham, Kent; 4-6, ex Titchfield, Hants; 7-9, ex Llanelly, Glam.; 10-12, ex Hampstead Heath, Middx. 1, 4, 7, 10, palae; 2, 5, 8, 11, left harpagone; 3, 6, 9, 12, right harpagone

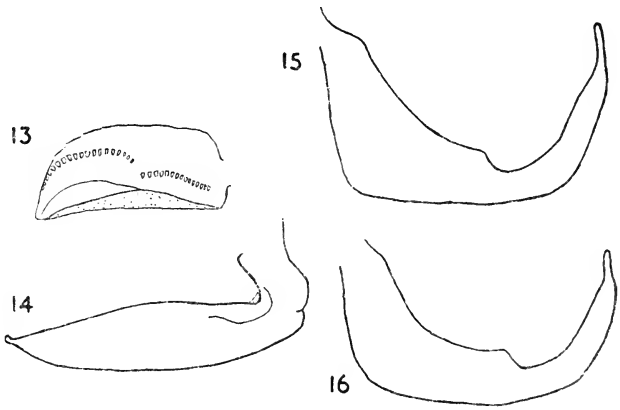
(e) Body shape.

Macan (*op. cit.*) notes that continental *S. striata* is somewhat narrower and more pointed posteriorly than is *S. dorsalis*. This distinction is borne out by British material of *S. striata*, but the present absence of a long series of this species precludes biometrical analyses.

British distribution

S. dorsalis is common throughout Great Britain (Massee, 1955). It is found in over 20 Irish vice-counties (Leston & Lansbury, in prep.). Although a species of rivers and lakes, *S. dorsalis* also occurs in ponds and ditches in southern England.

S. striata occurs in the R. Rother and in the larger, non-brackish, dykes in the neighbourhood of Rye, E. Sussex. Waterston (unpublished) has identified it amongst material collected some years ago at Dover and Folkestone, Kent, and now deposited in the Royal Scottish Museum. Ecologically the two species have much in common (Macan, 1954A, 1954C, 1955).



Figs. 13-16 *Sigara striata* (L.) 13-15, ex Rye, Sussex; 16, ex Folkestone, Kent. 13, pala; 14, left harpagone; 15, 16, right harpagone.

Taxonomic status of *S. dorsalis*

Macan (1954A, 1954B, 1954C, 1955) and Leston (1955A, 1955B) rank *S. dorsalis* as a good species. *S. striata* is widespread throughout Europe but occurs only, so far as present information goes, in the extreme south-east of Britain. *S. dorsalis* occurs throughout Britain; in Normandy, Brittany, central France and northern Italy (Poisson, in Macan, 1954A); sparingly in Sweden (Macan, 1954A): it is apparently absent from Denmark, Germany and Poland. Thus it would appear that *S. dorsalis* is mainly confined to north-western Europe but the area of overlap makes the two forms sympatric over a wide territory.

The claspers of Britsh specimens do not show as strong a differentiation between the two species as does continental material, but, in view of the wide sympatrism, it is thought best to retain *S. dorsalis* as a distinct species

for the present. Undoubtedly the two form a closely knit species pair, but the possibility of biological differences existing (e.g., in male song) require investigation.

Conclusions

Sigara striata occurs, contrary to previous findings, in Britain, where it is confined to the extreme south-east. It can be distinguished from the allied *S. dorsalis* on the sum total of characters presented by the harpagones, palae and pronotal markings. The two species form a close pair, but are sympatric over a wide territory as far as present information goes.

Acknowledgments

Dr. T. T. Macan has encouraged the present study and given invaluable assistance; fig. 16 is based upon his drawing.

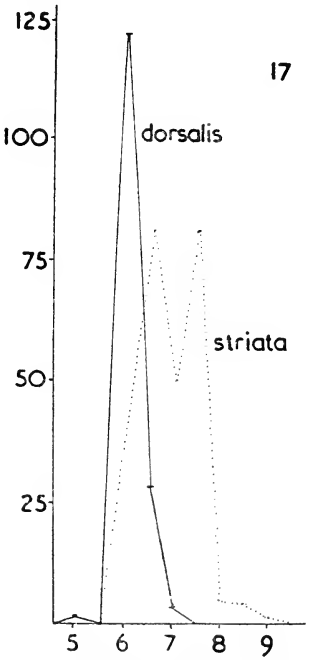


Fig. 17. Frequency polygons of number of pale lines on the pronotum. See text for method of scoring.

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REVIEW

A STUDY OF THE INSECTS LIVING ON THE WAYFARING TREE

By K. C. SIDE

Amateur Entomological Society. Leaflet No. 27. Price 1/6

This small pamphlet contains much useful information on the life cycles and feeding habits of the insects and arachnids which feed directly upon the Wayfaring Tree as well as of the predators and parasites which hold these herbivorous arthropods in check. Mr. Side has been particularly skilful in showing the wide range of insects associated with a single host plant and of their feeding methods. His chart of the main food chains is most informative, but by no means exhaustive, and shows that there are many ecological problems which still await solution. One cannot read this interesting pamphlet without sensing something of the author's zeal and enthusiasm. All who are interested in terrestrial ecology should not be without a copy of this publication.

The Ants of the South Lake District

By C. A. Collingwood and J. E. Satchell

The distribution of ants in the South Lake District was investigated during June and August, 1954. Despite the varied topography and vegetation of the area the ant fauna is relatively poor, only 17 species having been recorded —less than half the total number known to occur in the British Isles. This is probably partly due to the high rainfall, which ranges from an average of 40 in. p.a. at Arnside to over 60 in. p.a. at Windermere. The number of species is, however, greater than that recorded for any comparable area in North Britain. The fauna is of interest in that such common South Britain species as *Formica rufa* L. and *Lasius fuliginosus* (Latreille) reach here their furthest extension northward, while *F. fusca* L. overlaps with its northern and upland congener *F. lemani* Bond., often competing at the same nest sites.

The characteristic woodland of the Carboniferous limestone areas of the S. Lake District is mixed ash wood, containing ash, birch, oak, hazel and sycamore in varying proportions, with yew on the rock outcrops; patches of bare insolated rock are plentiful. This contrasts with the sessile oak woods of the Bannisdale slates, which characteristically comprise virtually pure stands of oak with occasional birch or rowans; where the canopy is open the woodland floor is frequently heavily shaded by bracken.

Most of the lowland pasture consists of *Festuca—Agrostis* grassland with heather and *Deschampsia flexuosa* (L.) invading the higher leached areas. On the higher limestone fells *Sesleria caerulea* Ard. and *Briza media* L. are abundant with heather moor occupying the more heavily leached situations. *Molinia* grassland occurs on the coastal peat mosses with heather on the better drained areas.

Table 1 shows the numbers of colonies of each species recorded by two collectors in half an hour at each of a number of representative sites. Details of the geological strata are included because, as previously shown by Satchell and Collingwood (1955), the thermal properties and drainage of the different formations have an ecological bearing quite apart from their associated vegetation.

The woodland sites were somewhat poorer in species and distinctly poorer in numbers of colonies than the grassland and coastal sites. Brian and Brian (1951) found only the 4 species *F. fusca* L. (*lemani* Bond), *M. rubra* L., v. *macrogyna*, *M. scabrinodis* Nyl. and *Leptothorax acervorum* (Fabr.) common at a variety of sites in the West of Scotland. In the grasslands of the S. Lake District additional species were invariably present. *Festuca-Agrostis* grassland on Newton Fell, Lindale, with hawthorn scrub and heather among outcropping slate, for example, yielded 9 species of ants. *M. rubra* L. was the most widespread species and occurred at over 75% of the sites. *L. flavus* (Fabr.) was the most abundant ant exceeding in numbers of colonies those of any other species. Although very abundant on the lowland pastures it was absent from the *Molinia* mosses except for occasional colonies by the sides of tracks. The mosses presented two main types of site: the drier peat between heather clumps, colonised mainly by *L. acervorum* and *F. lemani*, and the tops of *Molinia* tussocks colonised by *Lasius niger* and *M. rubra*

TABLE I

NUMBERS OF ANT COLONIES RECORDED IN 30 MINUTES

	Woodland														
	Closed Canopy						Open Canopy								
Geology:	L	L	B	B	B	P	B	S	L	L	L	L	L	L	B
Site No.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
L. niger	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
L. flavus	–	–	–	–	–	–	2	–	–	–	–	5	25	16	8
F. rufa	–	–	–	–	–	–	–	1	2	3	3	3	1	1	1
F. fusca	–	–	–	–	–	–	–	–	1	3	5	–	5	8	–
F. lemani	4	5	1	1	12	5	3	3	–	–	–	6	–	6	6
M. rubra macrogyna ..	–	1	9	1	9	2	3	2	–	3	3	4	1	1	–
M. rubra microgyna ..	4	–	–	2	3	–	–	–	1	1	–	–	–	1	–
M. laevinodis ..	–	–	–	1	2	–	1	–	–	–	2	–	–	–	–
M. scabrinodis	–	–	–	–	–	2	2	–	2	–	–	–	2	1	2
M. sabuleti	1	1	–	1	–	–	1	3	–	2	–	3	–	25	–
L. acervorum	–	1	1	–	5	1	2	–	–	–	2	–	–	1	2
Total No. of Colonies	9	8	12	6	31	10	14	9	6	12	15	21	34	60	19

Geology:

B=Bannisdale Slate.

C=Permian Conglomerate.

D=Glacial Drift.

L=Carboniferous Limestone.

P=Peat.

S=Permian Sandstone.

Vegetation: Sites

1, 2, 9-14	Mixed Ashwood.
3, 4, 5, 7, 15	Sessile Oakwood.
6	Pine plantation.
8	Birch scrub.

Sites

1 Cunswick Scar, Kendal.
2 Yewbarrow, Witherslack.
3 Low Wood, Witherslack.
4 Humphrey Head, Grange-over-Sands.
5 Roudsea, nr. Haverthwaite.
6 Cliburn Moss, nr. Penrith.
7 Low Wood, Haverthwaite.
8 Hoff Lunn, nr. Appleby.
9 High Park Wood, Witherslack.
10 Old Park Wood, Holker.
11 Whitbarrow, Witherslack.
12 Middlebarrow, Arnside.
13 Arnside Park.
14 Whitescar, Witherslack.
15 Bigland Hill, Haverthwaite.

TABLE 1 (*continued*)

NUMBERS OF ANT COLONIES RECORDED IN 30 MINUTES

Grassland															
Sheep Pastures								Sea Coasts					*Molinia* Mosses		
B	L	L	L	B	L	L	D	L	L	L	C	B	P	P	P
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
–	–	–	–	6	9	9	10	26	18	6	–	14	7	5	10
13	15	44	40	47	3	29	50	32	22	20	3	16	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	–	–	8	6	1	–	–	–	–	–	2	20	–	–	6
12	2	–	–	6	–	–	–	–	–	–	–	–	8	9	15
2	1	3	1	1	1	–	–	–	–	–	–	2	4	–	–
–	–	–	–	4	–	2	–	3	1	–	–	4	7	2	9
–	–	–	1	–	12	9	–	2	–	–	5	7	1	2	–
1	–	–	5	2	–	–	–	1	–	2	–	2	2	–	4
–	2	8	15	2	3	9	8	–	4	6	–	1	–	3	1
1	–	–	–	2	–	–	–	1	–	–	–	–	3	1	13
31	20	55	70	76	29	58	68	65	45	34	10	66	32	22	58

Also: Site 17, 1 colony *L. mixtus*; Site 24, 1 colony *M. lobicornis*; Site 25, 1 colony, *L. umbratus*.

Sites

16 Blawith Fell, Coniston.
17 Whitbarrow, Witherslack.
18 Kendal Fell.
19 Winster Valley, Witherslack.
20 Newton Fell, Lindale.
21 Witherslack Hall.
22 Kendal Golf Course.
23 Humphrey Head, Grange-over-Sands.
24 Roudsea, nr. Haverthwaite.
25 Whitbarrow, Witherslack.
26 Jenny Brown's Point, Silverdale.
27 Rougholme Point, Grange-over-Sands.
28 Roudsea, nr. Haverthwaite.
29 Ireland Moss, Haverthwaite.
30 Foulshaw Moss, Meathop.
31 Ellerside Moss, Holker.

microgyna. Both *F. lemani* and *L. acervorum* were significantly less abundant on limestone sites than on the other formations sampled at the 2% and 5% significance levels respectively.

	Mean No. of Colonies		
	16 Limestone sites	15 other sites	Value of *t* (29 d.f.)
L. lemani	1·44	5·40	2·5995
L. acervorum	0·31	2·07	2·0714

The range of altitude of the sites studied—from sea level to about 600 ft. —was too small for the effects of height to be substantial. *L. niger* and *M. laevinodis* did not appear to nest in such high or exposed situations as *L. flavus* and other *Myrmica* spp. respectively. *F. fusca* abundant in some coastal areas was replaced by *F. lemani* on the coastal fells at about 400 ft

Discussion of Species

Formicoxenus nitidulus (Nyl.) has been recorded by Day at Keswick and by Bagnall at Grange, in wood ants' nests (Donisthorpe, 1927), but was not seen during the present survey.

Myrmica laevinodis Nyl. was plentiful in the warmer limestone pastures and on the coast.

M. rubra (L.) (=*ruginodis* Nyl.) was abundant in the two varieties *macrogyna* and *microgyna* Brian and Brian (1949). The form *macrogyna* was most characteristic of woodland and upland sites while *microgyna* was noticeably abundant on the mosses. In some woodlands both forms were present with *macrogyna* the commoner of the two.

M. scabrinodis Nyl. occurred over a wide range of habitats.

M. sabuleti Mein. was abundant and widely distributed in the S. Lake District and was also taken near Ullswater, Cumberland (new County record).

M. lobicornis Nyl., a local species, has been recorded for Cumberland by Britten (Donisthorpe, 1927) and was found at Roudsea and in the Winster Valley, Westmorland (new County record).

Leptothorax acervorum (Fab.) was widely distributed.

Lasius fuliginosus (Latr.) has been recorded by J. D. Ward (Neave, 1921) from Yewbarrow, near Grange-over-Sands, its most northerly station in Britain. It was not found during the present survey.

L. niger (L.) was common on pastures, peat mosses and coastal areas but was much less widely distributed than *L. flavus*.

L. flavus (Fab.). This pacific species, although often preyed upon by *M. laevinodis* and *M. scabrinodis* is generally abundant, due perhaps to its habit of constructing earth mounds removing it from competition for stones and tree stumps as nest sites. Brian (1952) has shown that in the West of Scotland *F. fusca* (*lemani*) tends to displace *Myrmica* spp. from favourable nest sites. In this area the local dominance of *Formica* and *Lasius* species which outnumbered *Myrmica* in numbers of colonies on most open sites may have resulted largely from direct aggressiveness.

L. umbratus (Nyl.). A new county record was obtained for this species which was taken on the N. Lancashire coast near Silverdale.

L. mixtus (Nyl.). A new county record was also obtained for this form of which several colonies were found on Whitbarrow, Westmorland, at about 500 ft. on rocky limestone pasture. One colony had runways extending over several square yards, the territory of the colony apparently undermining three *L. flavus* nests. Another colony had a large earth mound through which the grass *Sesleria coerulea* was growing. A large number of males but no females were present in it on 18th August, 1954. *L. mixtus* and *L. umbratus* are doubtfully distinct species as intermediate forms are of frequent occurrence. However, the Whitbarrow specimens were of typical *mixtus* conformation contrasting with the *umbratus* from Arnside, which were large and clear yellow with characteristic pubescence.

Formica rufa L. reaches its most northern distribution in Britain to the north of the Lake District at Caldbeck, in Cumberland. The species was abundant in the open limestone woodlands about Grange, Holker and Arnside where frequently the workers were large, unusually red and less hairy than specimens from other areas. Nest materials were coarse, in ash woods consisting largely of entire ash leaf petioles.

A small mixed *F. fusca* - *F. rufa* colony was discovered on a scree slope on the S.E. face of Whitbarrow. The colony consisted of about a dozen large *fusca* workers, some 30 small *rufa* workers and one dealate *rufa* female. The workers had clear bright colouration compared with normal minor workers from established *rufa* colonies. The nest was among stones with a few bits of leaf litter and was over a mile away from the nearest known established *rufa* colony. Although recorded by various workers in Europe such a mixed colony has only once previously been recorded in Britain (Donisthorpe, 1927).

F. lugubris Zett. has been shown by Yarrow (1955) to be the common wood ant of N. Britain. Formerly referred to by Donisthorpe and others variously as *F. rufa* and *F. pratensis*, this species is readily distinguished in the worker caste from the generally accepted *F. rufa* by the presence of abundant long hairs fringing the back of the head. It occurs in the Lake District only in the Duddon Valley on the Cumberland-Lancashire border and in Ashness Woods, near Keswick, but is very numerous in both places. The distribution of these two species of wood ant in the Lake District is discussed elsewhere (Satchell and Collingwood, 1955).

F. sanguinea Latr. was recorded for Grange-over-Sands by Whitaker (Donisthorpe, 1927) but was not found during the present survey.

F. fusca L. This ant has recently been shown by Yarrow (1954) to be replaced in Central and N. Britain by *F. lemani* Bond., a distinct species occurring generally in N. Europe and on upland areas in mid-Europe. The true *F. fusca* occurs in the Lake District in a restricted area near the coast near Grange-over-Sands and Arnside, penetrating the Winster and Lythe valleys up to Whitbarrow.

F. lemani Bond. is abundant throughout the Lake District. This species overlaps with *F. fusca* in the N. Lancashire coastal areas at Roudsea, Ellerside, Lindale and Arnside, replacing it in woodland and on high ground in those localities. A good example of this was observed near Witherslack where the ground rises from the open pastures of the Winster Valley through wooded slopes and then open scree to the top of Whitbarrow, a limestone fell, at 500-600 ft. In the valley pastures only *F. fusca* was found, while

F. lemani occurred throughout the wooded slopes from 50 ft. to about 250 ft. On the steep well insolated scree above the woodland both species were present often side by side, while on the top of Whitbarrow only *F. lemani* was to be found.

Summary. The distribution in the South Lake District of 17 species of ants is discussed. The relative abundance of the common species in various habitats is compared.

This investigation was conducted from the Merlewood Research Station (Grange-over-Sands) of the Nature Conservancy, to which acknowledgment is due for facilities extended to one of us (C.A.C.).

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HELOCERA DELECTA MG. AND OTHER UNCOMMON DIPTERA IN THE ISLE OF WIGHT

By C. H. ANDREWES, M.D., F.R.S.

I spent three weeks' holiday in the Isle of Wight in June and July, 1954, and took a number of uncommon flies. Probably the most interesting was the Tachinid *Helocera delecta* (Mg.), for which van Emden (1954) gives only two records, Cambridge and Dorset. I took 3 ♂, 1 ♀, on flowers of *Heracleum* near St. Catherine's Point, one of them just alongside the lighthouse. The dates were between June 19th and July 2nd. Other Tachinids were *Linnaemyia comta* (Fall.), on the Dover at St. Helen's, 22.6.54; and *Ocyptera interrupta* (Mg.) in Firestone Copse, Ryde, 30.6.54. The host of this Phasiine fly is unknown but is presumably a Pentatomid; it is therefore worth recording that *Eurygaster testudinarius* (Geoff.) and *Neottiglossa pusilla* (Gmel.) were swept from herbage in the same clearing at the same time.

Among Muscids, *Phaonia fusca* Mde. is of especial interest; my record (Yarmouth, I.O.W., 5.7.54) represents a considerable westward extension of its known range. Another Muscid taken was *Lispocephala verna* (F.), Shalfleet, 27.6.54 and St. Helens, 22.6.54.

The island yielded many interesting *Dolichopodidae*, especially on the salt-marshes between Yarmouth and Cowes. *Dolichopus strigipes* Verr., recorded by Verrall only from Fawley, on Southampton water, was abundant

on salterns at Yarmouth, Ningwood and Shalfleet between June 23rd and July 5th. *D. virgultorum* Walk. also occurred in numbers at Shalfleet on July 10th: Verrall records this from Sussex. Other Dolichopodids were *Macrodolichopus diadema* (Hal.), Yarmouth, and Shalfleet, 1 - 5.7.54; *Hercostomus gracilis* (Stann.), 1 ♂, Niton 8.7.54; *H. nigriplantis* (Stann.), Ryde 30.6.54; *Tachytrechus consobrinus* (Walk.), Niton 19.6.54, on wet clay cliffs; *T. notatus* (Stann.), Brook 8.7.54, in a similar place; *Thinophilus flavipalpis* (Zett.), Yarmouth 28.6.54; *Aphrosylus celtiber* Hal., Niton 21.6.54; *A. ferox* Walk., Niton 21.6.54, and Shalfleet 3.7.54; *Thrypticus pollinosus* Verr., Shalfleet, 3.7.54; *Xiphandrium brevicorne* (Curt.), Niton 10.7.54.

Dr. F. van Emden kindly confirmed my determination of the *Helocera* and *Linnaemyia comta*; Mr. E. C. M. d'A. Fonseca did the same for the *Phaonia fusca*.

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TELENOMUS PUNCTATISSIMUS (RATZEBURG) (HYMEN. SCELIONIDAE) NEW TO BRITAIN

By S. SHAW, F.R.E.S. (Manchester Museum)

In late August, 1954, Dr. R. Warwick, of Manchester University, collected an egg mass of the Buff-tip moth *Phalera bucephala* (L.) from a willow at Wythenshawe, Cheshire. The eggs were found to be parasitised by a scelionid, which I identified as *Telenomus punctatissimus* (Ratz.) a species not previously recorded from the British Isles. Twenty-eight specimens of the parasite, all of which were males, emerged from the batch of 33 eggs of *P. bucephala*, and out of the remaining 5 eggs 4 had emergence holes of the parasite.

The identity of this species was kindly confirmed by Mr. G. E. J. Nixon of the British Museum, who had previously seen examples of *T. punctatissimus* from the same host species.

Further specimens of *T. punctatissimus* were found in the collections of the Manchester Museum with the following data: Witherslack, Westmorland, 20.7.1918, 8♀♀, together with a batch of *P. bucephala* ova (*W. Buckley*) (det. H. Britten); New Forest, Hants, 1♂, 1♀, from ova of *P. bucephala*, 2.8.1926 (*A. Swift*) (det. H. Britten); Ranworth, Norfolk, 1♀, together with a batch of *P. bucephala* ova, em. 21.8.1933 (*H. L. Burrows*) (det. H. Britten); Bala and Festiniog, Merioneth, 2♂♂, 2♀♀, from ova of *P. bucephala*, em. July, 1936 (*S. Gordon Smith*).

Kieffer (1926) gives the distribution of this species as being Germany, Austria and France, and cites *P. bucephala* and *Malacosoma neustria* (L.), the Lackey moth, as its hosts.

The following characters will enable this species to be distinguished from its allies in the genus. Female: colour, antennae and body black, legs varying from dark brown to black with the joints lighter, the anterior legs usually lighter than the others. Antennae with a 5-segmented club, 2nd and

3rd basal segments equal in length. Head more than twice as broad as long, vertex coriaceous, behind the ocelli a short transverse ridge which extends behind the eyes forms a furrow between it and the eye margin; there is no deep depression behind the antennae. Abdomen short, second tergite quadrate with longer fine striations in addition to the short basal striae. Male: similar to the female, except that the antennae are filiform, the 3rd segment being twice as long as broad. Length: 1·1 - 1·8 mm.

Kieffer (1926) in his description of this species describes the male antennae as having the distal portion of the scape and the pedicel a dirty yellow with the apical 3 or 4 segments brown. In all the males which I have examined, the antennae are entirely black. Kieffer also states that the legs of the male are lighter than those of the female, a character, which does not apply to the present specimens.

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PHORID FLIES DAMAGING CULTIVATED MUSHROOMS; *MEGASELIA* (*MEGASELIA*) *PLURISPINOSA* (LUNDBECK, 1920) (DIPTERA, PHORIDAE) A SYNONYM OF *MEGASELIA* (*M.*) *HALTERATA* (WOOD, 1910)

By CHARLES N. COLYER, F.R.E.S.

In September, 1953, I had the opportunity of seeing several batches of Phoridae reported to be causing damage to cultivated mushrooms in Kent, Sussex, Norfolk and Shropshire. Two species were involved. One of these, *Megaselia* (*M.*) *bovista* (Gimmerthal), occurred in only one instance (Salop), as I have already recorded (Colyer, 1954), and the other more or less abundantly from the remaining localities. This second species I provisionally named for Mr. B. D. Moreton, of the National Agricultural Advisory Service, Ministry of Agriculture and Fisheries, at Wye, *Megaselia* (*M.*) *plurispinosa* (Lundbeck). At the same time I drew attention to remarks by Schmitz (1948, 1952) which suggested that this name might well be a synonym of *Megaselia* (*M.*) *halterata* (Wood). A little later (Colyer, 1954, *op. cit.*), I added some further observations on the question of the identity of *plurispinosa*, leaving it for future investigation. Moreton (1954, 1955) duly used the name, noting the possible synonymy, in accounts of the infestations and discussions of the efficacy of various methods of control which had been utilised.

Since then, at intervals, I have had the opportunity of seeing more material from the Ministry from the original localities, also from a further locality in Norfolk and a new locality in Lancashire. My friend, Mr. J. F. Shillito, who has been interested in some of the biological aspects of the infestations, has also kindly furnished me with prepared material and very helpful notes. Additionally, I have had, through the good offices of my friend, Father H. Schmitz, the opportunity of studying a large and representative material, previously determined as *plurispinosa* and *halterata* respectively, from widely distributed localities in the Palaearctic Region, which, together with the

specimens in my own collection, has enabled me to reach a firm conclusion. This conclusion, which confirms the tentative opinion of Schmitz, is that only one variable species is actually involved and that the name *plurispinosa* (Lundbeck) must therefore sink as a synonym of *halterata* (Wood).

In order to account adequately for this conclusion, it is necessary to go right back to the origin of both names. Wood (1910) described his *halterata* as having two forms; a larger, darker one with dusky halteres which he stated to occur almost exclusively in woods, and a smaller, paler form with yellow halteres which, he said, frequented as exclusively the house or garden. Now Lundbeck (1922) described his *plurispinosa* on three males only, all taken on windows, in separate localities, in June, August and October of three successive years. He drew attention to its similarity to *halterata* as regards the costal division and course of the fourth vein, but indicated that *plurispinosa* had a rather longer costa (0·40) than *halterata* (0·37), four bristles on each side of the male hypopygium instead of two, and was a much more black species. He had evidently decided that his *plurispinosa* was not Wood's dark form of *halterata* because it had yellow halteres, and thought that the dark form mentioned by Wood was probably a different species, namely the *fuscohalterata* of Schmitz (a synonym of *sulphuripes* (Mg.), *teste* Schmitz, 1929). Moreover, he had taken all his specimens of *halterata* (all with yellow halteres) both indoors and in woods. Schmitz (1937) settled this question, after an examination of Wood's material, by stating that Wood's dark form was not *fuscohalterata* but Lundbeck's own species *coacta* which Lundbeck had (1922, *op. cit.*) differentiated from *halterata*, *plurispinosa* and *fuscohalterata*.

There, in the literature, the matter rested until Schmitz, as already mentioned, suggested that *plurispinosa* might indeed be a synonym of *halterata*, and drew attention to the striking resemblances in the descriptions apart from the character of the hypopygial bristles.

It was therefore necessary to review critically once again the "species" so far involved in the question, together with any closely similar species, according to their descriptions, in the *halterata* complex, and to eliminate them progressively so that the investigation could be narrowed down with conviction to establishment of the identities of *halterata* and *plurispinosa* respectively. Since *plurispinosa* had been described only from males, and there were, therefore, no distinguishing characters recorded for the females, the discussion is restricted to males. In the use of Lundbeck's work, one was able to derive much more assurance from the results of Schmitz' critical examination (1952 *op. cit.*) of Lundbeck's material.

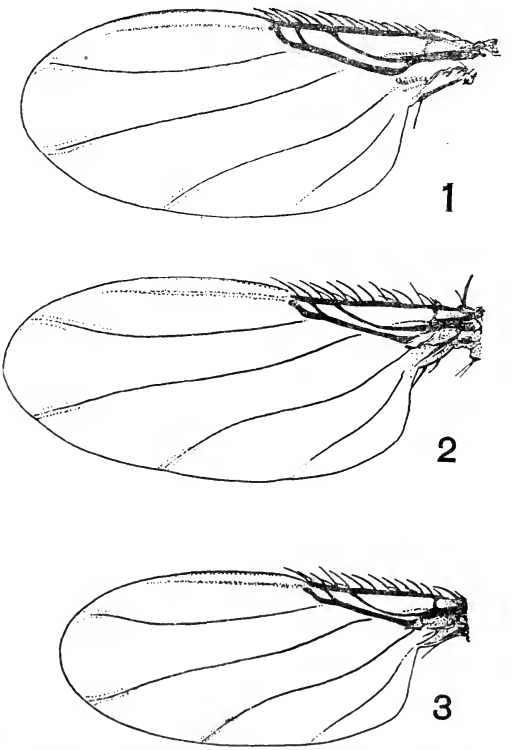
Now Schmitz (1937) had, as already stated, deleted the "dark haltere" element from the Wood conception of *halterata* by establishing this form as *coacta* (Lundbeck), and in so doing had definitely established *halterata* (Wood) as a species with yellow halteres. It is worth a few moments' digression to consider the very close similarity in general appearance apart from the halteres and to note the distinguishing characters. As regards the wings (figs. 1 - 3), there is a general similarity but closer scrutiny reveals that in *coacta* (fig. 1) the wing is slightly broader in relation to its length than in *halterata-plurispinosa* (figs. 2 and 3) and the costal index is larger (about 0·42 against 0·38 - 0·39). The outline of the fourth vein is clearly

more concave anteriorly. Moreover, the first costal segment, i.e., between the proximal edge of the humeral cross-vein and the proximal edge of the apex of the first vein, is clearly less than double the length of the second and third segments together, whereas in the other two "species" 1 would appear to be about double 2+3. In this connection it is interesting to recall that Wood, in describing his dark form (*coacta*) had stated "1 *more* than double 2+3." His fixed points for judging relative values of costal segments (1908, p. 167) were apparently the same as those later adopted by Schmitz (1917, pp. 133-4) and Lundbeck (1922 *op. cit.*, p. 212). There is evidence for thinking however (Colyer, 1955) that Wood never used a micrometer for actually taking his measurements and the unaided eye can, on occasions, be quite misleading as the student of the genus *Megaselia* soon comes to realise. It is also worth while noting that, whereas Schmitz and Lundbeck both stated that their "first segment" was measured "*from* the humeral cross-vein" to the point of junction of the *inner* or proximal contour of the first vein and the costa, in fact Father Schmitz has confirmed (*in. litt*) that the proximal contour of the humeral cross-vein has also, logically, been used by him (and probably also by Lundbeck, since Lundbeck indicated that he used "microscopical measurements"). Continuing with the comparison between the species, it is evident that the configuration of the fork of Veins 2 and 3 in *coacta* is different, the lumen of the latter being larger. More striking, however, is the presence of greatly developed abdominal stigmata in *coacta* (fig. 4) which can often actually be seen in dried pinned specimens, whilst the arrangement of the hypopygial bristles is different (*cf.* figs 7. and 8).

Of the remaining "dark haltere" species, *sulphuripes* (Mg.) (=*fuscohalterata* Schmitz) and its close allies, *subfuscipes* Schmitz and *compacta* Schmitz, with brown or brownish halteres, could likewise be eliminated additionally by virtue of the fact that 1 is much less than double 2+3; and one could cross off those with dark palpi, *fuscinula* Schmitz and *tibiella* (Lundbeck) having the hypopygium without bristles, as distinct from hairs, and *mortenseni* (Lundbeck) with an extremely short costa (0·34) and 1 more than double 2+3. Some doubts were left by the descriptions of *apozona* Schmitz and *devia* Schmitz and the fact that in the progressive elimination several specimens otherwise indistinguishable from what was being taken for *halterata-plurispinosa* had darkened halteres (some, it is true, only distally). It was observed, however, that in each case these specimens with dark or darkened halteres occurred in the same populations as normal *halterata-plurispinosa*, and that these populations were from indoor habitats. Various notes and wing-photographs kindly furnished by Father Schmitz cleared these doubts up satisfactorily. Of the two species, *apozona*, only recorded from the Canary Islands, is linked in its description with *pallidizona* (Lundbeck), *parumlevata* Schmitz, to which further reference will be made, and *coacta*; it clearly differs from *halterata-plurispinosa* in its narrower wing-outline (ratio of length to maximum width, 2·4 as against 2·2), and in the course of the fourth vein which is practically straight for the first two thirds and thereafter less outwardly curved. In the case of *devia*, of which no wing-photo has been published with the description, it can definitely be stated that the costal cilia are very much shorter, the fork is more like that of *coacta* and the anal cell is differently delimited.

The list of species with yellow halteres was a short one, only three being involved, namely, *ultrabrevis* Schmitz, *palaestinensis* Enderlein (=*mediterranea* Schmitz), and *parumlevata* Schmitz, the first two of which are at once distinguished by the very short costa (0·26 - 0·27 and 0·29 - 0·30 respectively). The third, *parumlevata*, like *apozona*, is only recorded from the Canary Islands, and has a similarly-shaped fourth vein. Comparison of the wing-photographs accompanying the descriptions (Schmitz, 1936, figs. 20 and 22) requires to be very close to bring out these distinctions. In the case of *parumlevata*, which, it will be seen, is the nearest of all to *halterata*, the first half or two-thirds of the fourth vein will need to be very carefully studied in both species. Unlike *apozona*, the ratio of length of wing to maximum width, is 2·2, i.e., exactly the same as in *halterata*.

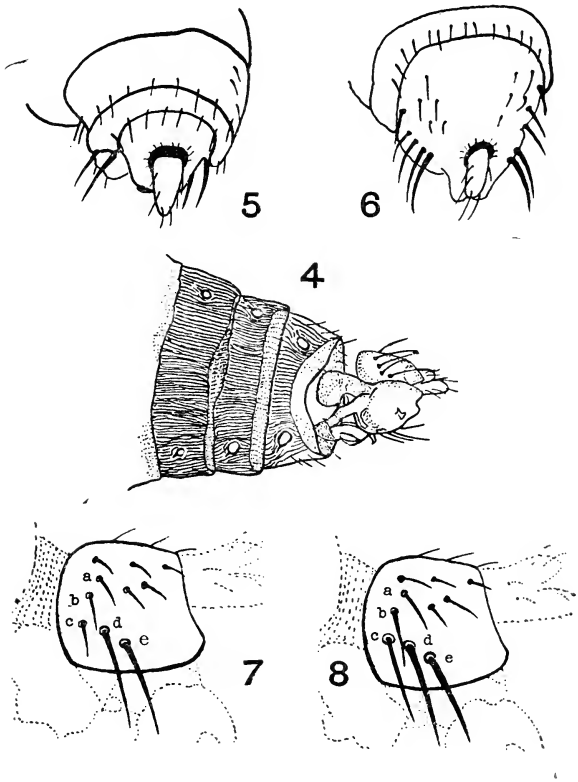
There now remained *halterata* and *plurispinosa* mainly to be differentiated, according to the descriptions, by means of the male hypopygial bristles, of which the former species was stated to have two strong ones and the latter four (or five). Typical examples of each, as hitherto conceived by Father Schmitz and myself, are shown in figs. 5 and 6, the sketches having been prepared from photographs of dried specimens. In addition, *plurispinosa* was said to be a much more dark species and to have a longer costa.



Figs. 1-3. Wings. 1, *Megaselia* (*M.*) *coacta* (Lundbeck). 2, *Megaselia* (*M.*) *halterata* (Wood), form "*halterata*." 3, *Id.*, form "*plurispinosa*."

The present study was based on 125 specimens from 33 quite distinct populations in the Palaearctic Region. "Dark" forms (dark all over) and "light" (dorsum of thorax and abdomen of varying degrees of reddish-brown to yellowish) were found to occur quite often in the same population; the females preponderantly light and the males of either form. A distinct tendency was noticed for the "indoor" forms, e.g., those from mushroom cultivation, to be dark, the extreme forms even having, as already mentioned, the halteres darkened, at least distally. In practically every case these dark forms exhibited three to five strong or strongish hypopygial bristles, but some light specimens were found to occur with a similar arrangement.

It can be seen that there is no significant difference in the wings from figs. 2 and 3, which were prepared from photographs of two representative specimens from the series. A study of the relative density of the bristles of the venter and other characters showed no significant factor.



Figs. 4-8. 4. *Megaselia* (*M.*) *coacta* (Lundbeck), ♂, abdominal stigmata, from macerated specimen. 5. *Megaselia* (*M.*) *halterata* (Wood), ♂, hypopygium (rear) of form "*halterata*," from dried specimen, 6, *Id.*, form "*plurispinosa*." 7, *Id.* (left side), form "*halterata*," from macerated specimen. 8, *Id.*, form "*plurispinosa*."

There remained only Lundbeck's character of the hypopygial bristles. A study of the arrangement of these in the long series, a good number of which were treated in lactic acid to distend the hypopygia and thus facilitate critical examination, revealed a precisely similar arrangement of the *bristle insertions* in the two "species" (figs. 7 and 8), the left and right sides being asymmetrical but homologous. But, on both sides, the degree of development of the bristles *a* - *e*, which, on the right side (not figured) form an almost vertical, nearly straight, basal row is extremely variable. In both *halterata* and *plurispinosa* bristles *d* and *e* seem almost invariably to be robustly developed. In *halterata a*, *b* and *c* are more or less short and concealed but, when visible, are only differentiated from the remaining bristles of the hypopygium with close attention. On the other hand, in *plurispinosa*, bristle *c* is almost always nearly as robust as *d* and *e* (thus giving a three-bristled appearance when the rest of the hypopygium is concealed, as in certain specimens mentioned by Mr. J. E. Collin and myself (Colyer, 1954)) and *a* and *b* may be sufficiently differentiated from the remainder of the hypopygial bristles to give a four-bristled appearance as in Lundbeck's conception (*a* not developed), or five-bristled as in the lectotype selected by Schmitz.

Comparison between the long series of dried and macerated specimens also made it clear that the real misleading factor throughout has been the tendency in many dried specimens for bristles *a*, *b* and *c* to be concealed by the preceding tergite, i.e., the hypopygium being considerably withdrawn (fig. 5). When this occurred, only the two strong bristles *d* and *e* were visible, thus constituting "*halterata*." When the hypopygium was exposed fully, the specimen would be "*halterata*" or "*plurispinosa*" according to the relative development of the bristles. Either state could occur in both "dark" and "light" forms.

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On the Occurrence oe *Hylecoetus dermestoides* (L.) and *Lymexylon navale* (L.) (Col. Lymexylidae) in Lancashire and Cheshire

By S. Shaw, F.R.E.S. (Manchester Museum)

Hylecoetus dermestoides (L.) is an uncommon beetle in Britain and seems to be mainly recorded from the northern parts of the country. Fowler (1890, The Coleoptera of the British Islands, **4**: 177) quotes Sherwood Forest and Cannock Chase, Staffs, as the most southerly localities.

In Lancashire there are only two old records for *Hylecoetus*, one for Stretford, (*Reston*) (W. E. Sharp, *Lancs. and Ches. Ent. Soc.*, 1908:56) and one for Pendleton, where several specimens were taken from Russian oak in June, 1886. Its distribution in Cheshire is much wider and confirmed by recent records, which indicate that it probably occurs all along the valleys of the Goyt and Bollin, where the adults are to be found during May and June, associated with beech or coniferous plantations. The Cheshire records are as follows: Goyt valley, 25.5.1933 (*H. Britten, Jnr.*), 18.6.1932, 4.6.1933 (*H. R. P. Collett*): Bowden: Bollin valley, 14.10.1947, emergence holes found in old beech stumps (*H. Britten*): Dunham Park, 5.1953, 5.1954, common in recently felled beech trunks (*W. D. Hincks*): Cotterill Clough, near the Bollin, 23.5.1950, 1♀ flying (*H. Britten*), 5.1952, 1♀ flying (*S. Shaw*): Lyme Park, 5.1952, several flying near beeches (*G. W. R. Bartindale, W. D. Hincks, S. Shaw*): Birtles Wood: Godrell Hall, Knutsford, May (*R. Kaufman*): Delamere, 19.5.1951, 1♀ flying in coniferous plantations (*S. Shaw*).

The other rare British representative of this family, *Lymexylon navale* (L.) has not been recorded in Lancashire or Cheshire during the present century, although it was apparently common in Dunham Park, Cheshire, in July and August, 1872-4, when it was taken by J. Sidebotham. This record is confirmed by specimens which are in the Sidebotham Coll. at the Manchester Museum. All the other localised specimens in the Manchester Museum collections are from the southern localities of Windsor and the New Forest. Dunham Park has previously been noted as a locality for *Lymexylon* by J. Chappell (1873, *Ent. mon. Mag.* **9**: 158) who first discovered specimens on a fallen oak tree in July, 1872. The only other records for this species are from Bowden, Cheshire (*Reston*) and Stretford, Lancashire (*Reston*) (W. E. Sharp, *Lancs. and Ches. Ent. Soc.*, 1908:56).

Some new British Borboridae (Diptera)

By J. E. Collin, F.R.E.S.

The following species of the restricted genus *Limosina*, and of the groups known under the names of *Paracollinella* Duda, *Trachyopella* Duda and *Coproica* Rdi. (=*Heteroptera* of Richards and *Coprophila* of our List), are new to the British fauna. Before enumerating these species and calling attention to their distinctive characters, it appears advisable to refer to the fact that the head bristles of the Borboridae have been often misinterpreted,

especially the inner and outer "vertical bristles." For instance, in Richards' interpretation of the head bristles of *Limosina silvatica*, the true "inner vertical" is called the "superior orbital," and the true "outer vertical" is called the "inner vertical." A comparison with the vertical bristles in other Acalyptrate Muscids will prove the truth of this assertion. In certain genera (always I believe in the old genus *Limosina*) other bristles are developed behind these "vertical bristles" in a transverse row on the posterior margin of vertex. They include Richards' "outer vertical" and "outer and inner postverticals," and Hendel's "outer and inner occipitals" and "postverticals." They might all, with reason, be called "postverticals," and because there is often some doubt in regard to the inner pair as to whether the same pair of bristles has been developed, I propose to identify them by numbers (beginning with the outer pair), as postverticals 1, 2 and 3 (or pv. 1, pv. 2 and pv. 3). The inner pair (pv. 3) are often absent, and when present the bristles may be parallel, whereas in the other two pairs they are convergent. The comparative development of these postvertical bristles is often of considerable value in the identification of species.

Limosina verticella Stenhammar (1855)

A single male captured at Barton Mills (Suffolk) on 8th June, 1931, is assuredly the same as that described by Duda under the above name from specimens in Strobl's collection but, as in the case of the next species (*nitens* Stnh.), the types will have to be examined before the names can be used with any certainty.

L. verticella belongs to the *silvatica-claviventris* group, resembling the latter more than the former, but without the sexual peculiarities of either, the middle tibiae however have the numerous dorsal bristles (no median ventral) of *silvatica*, and not the few of *claviventris*. Face dusted greyish on interantennal keel and a middle line only, front of frons distinctly, and jowls below eyes obscurely, reddish. Only postverticals 1 and 2 present but both strong as in *silvatica*. Abdomen with third and fourth tergites equal in length and both slightly shorter than second, fifth about two-thirds length of fourth, the prehypopygial tergite visible on left side only and devoid of hairs, third to fifth tergites with a distinct hindmarginal bristle each side. Hypopygium large, subterminal, with a large ovate depression which is yellow, and has a truncate lower margin; below this depression lie the two genital side lamellae clothed with numerous curved hairs and apparently with 2-3 small black terminal spines. Legs strong, trochanters and both ends of tibiae yellowish, and at least four posterior tarsi obscurely yellow. Last section of third vein convex above on basal half, and more distinctly concave on apical half than in *silvatica*. Halteres yellow.

Limosina nitens Stenhammar (1855)

A small shining black species unknown to Duda, and apparently running down in his Tables to *nana* Rdi., having very similar wing venation, but certainly not that species.

Face and jowls shining black, only the interantennal keel dusted greyish. Only postverticals 1 and 2 present and these quite small. Two pairs of dorsocentrals, anterior pair small, discal setulae very short. Second abdominal tergite very large and long, longer than next three together, prehypopygial

tergite visible on left side only, devoid of hairs. No long hindmarginal bristles, and the small black setulae far more numerous on sternites than elsewhere. Hypopygium small, without the pair of longer bristles of *nana* and allied species. Genital side lamellae shining black, broad, scale-like, curled inwards at tip, and clothed on outer side with short black slightly curved hairs. Legs comparatively short-haired; trochanters, tibiae narrowly at both ends, four anterior tarsi, and hind tarsi towards tip, yellow. Middle tibiae very inconspicuously bristled, one small posterodorsal at about basal third, and a somewhat longer one not far from tip, with a small anterodorsal one slightly above it, a small apical spur, but no median ventral bristle. Basal joint of middle tarsi long and slender, quite half length of tibia, most insignificantly bristled even at tip. All costal hairs quite short. Knobs of halteres black, contrasting strongly with the pale yellow stems.

Of this species one male was obtained by sweeping at Chippenham Fen (Cambs.) on 9th June, 1951. It is certainly different from any previously recorded British species, and is somewhat doubtfully identified as *nitens* Stenh.

Limosina brevicostata Duda (1918)

A small species with front of frons distinctly red, and venation rather like that of *moesta* Vill. (*antennata* Duda), but costa scarcely (if at all) continued beyond end of third vein, and this vein more evenly upcurved and ending further from wing tip.

♀. Eyes comparatively small, jowls even at narrowest part quite half vertical diameter of eye. Third pair of postverticals present, short and straight, pointing more rearwards than other pairs. Only one pair of dorsocentrals. Abdominal cerci short, each with one long end-hair and other short ones, the small shield-shaped tergite which stands almost vertically above base of cerci with an isolated pair of short small spines at middle. Legs mainly greyish-black, coxae only partly yellow, knees narrowly and indistinctly, and four posterior tarsi indistinctly, yellowish. Middle coxae with a distinct bristle in front, almost as large as the main upper dorsal bristle on middle tibiae, this tibial bristle with a smaller one immediately above it, also on lower dorsal part of tibia a pair (both large) with a third one close above the front one, further a small median ventral, an apical ventral and a shorter apical in front. Front tarsi somewhat dilated (as in *crassimana*). First joint of middle tarsi with a double row of minute black spines beneath ending in a longer pair, and one of the spines of posteroventral row not far from base slightly longer than others. Halteres brownish-black.

A single female was obtained by sweeping over a garden compost heap at Kirtling (Cambs.) on 12th May, 1951, and another on 1st July, 1953.

L. fungicola Hal. (1836), *vitripennis* Zett. (1847) and *exigua* Rnd. (1880)

The fact that Haliday included more than one species under the name *fungicola* (as noted by me in 1914, *Proc. Roy. Dublin Soc.* p. 243) is obvious both from his description and the specimens in his Collection. I have recently re-examined these specimens, described as taken in "Holywood, N. Devon, and near London, Mr. Walker," and find that three labelled "Holywood," one labelled "Ireland," and one "British" are *fungicola* as

recognised by Richards (1930), while four labelled "Ireland" are *vitripennis* Zett., and one (also labelled "Ireland") is a female *guestphalica* Duda.

Actually the application of the name *fungicola* was definitely restricted to a species which was *not vitripennis* by Stenhammar in 1855 when having examined a type specimen of *vitripennis* received from Zetterstedt, he quoted the characters given in Walker's copy of Haliday's description of *fungicola* which indicated a species different from *vitripennis*. I have therefore placed a "lectotype" label on a pin holding a pair of this species *fungicola* (both gummed to the same card) in Haliday's Collection, and labelled as taken at "Holywood."

Rondani in 1880 ignored this restriction published by Stenhammar, and sank the name *vitripennis* as a synonym of *fungicola*, at the same time giving a new name (*exigua*) to the species which had already been accepted, because of Stenhammar's action, as *fungicola* Hal. Rondani further considered that *vitripennis* of Stenhammar was not the same species as *vitripennis* Zett., entirely overlooking Stenhammar's statement concerning the type specimen of *vitripennis* sent to him by Zetterstedt compared with a specimen in his own Collection, of: "Hujus caput cinereo-caesium et abdomen ferrugineum, omnino ut in meis."

Duda followed Rondani in the use of the name *fungicola*, but the synonymy of our two British species must be that adopted by Richards, viz.: (1) *L. fungicola* Hal., with synonym *exigua* Rnd., and (2) *L. vitripennis* Zett., with synonym *fungicola* Rnd. *nec* Hal.

Paracollinella finalis sp. n. ♂ ♀

Resembling a small *P. fontinalis* Fln. but legs always darker, the two apical bristles behind tip of middle tibiae longer, and other small differences.

♂. Compared with *fontinalis:* Frons seldom reddish in front, arista shorter. The two to three pairs of developed acrostichals among microchaetae on middle of thorax not so strong. Prehypopygial sternite with a *much smaller, narrower, excision in hindmargin*, and this with less extensive clothing of soft fine hairs. Genital processes of similar general type, but recognizably distinct. Legs everywhere darker, especially *front tarsi dull black* and gradually somewhat dilated from base onwards, *both posterior apical bristles to middle tibiae longer*, extending rather beyond base of strong ventral spine near base of metatarsus (fig. 1A). Wings somewhat brownish on costal area, the end of upcurved cubital vein rather nearer actual wing-tip than is the end of faint continuation of discal vein.

♀. With similar differences from *fontinalis* ♀. Ovipositor darker and with *dark* setae on lower terminal edge of lateral plates.

Length about 2 - 2·25 mm.

A long series of this species was taken by me at Barton Mills (Suffolk) about a shallow damp ditch on 25th March, 1953, and 9th April, 1953, in company with a few *P. Oldenbergi*, and an odd specimen or two of other species, but including only one *fontinalis*. It was also found at Horning Ferry (Norfolk) on 7th July, 1953, and will probably prove to be not uncommon.

Trachyopella minuscula sp.n. ♂ ♀

A very small black species resembling *leucoptera* Hal., but third vein much

less upcurved to costa, while this and the veins below it are much more distinct, the wings not whitish, and hind femora without the short, upcurved, apical anteroventral bristle of that species.

♂. Frons very broad, somewhat shining black except for two narrow, parallel, very dull black stripes close to, but on outer side of, each row of interfrontal setae. On the outer side of each dull stripe two (at least) of the row of small outcurved setae (in front of inner vertical bristle) peculiar to this group of species are well developed, being almost as long as the orbital bristles, but the latter and all the normally longer bristles on frons are shorter than usual. Third pair of postverticals well developed (almost as long as ocellar pair), parallel, slightly reclinate, and somewhat in front of a line connecting the other pairs which are much smaller, especially the second pair. Antennae placed wide apart and pointing laterally, arista not very long, obviously pubescent, the hairs pale. Eyes small, bare. Thorax rather dull black with only one pair of dorsocentrals. Abdomen dull greyish-black except when viewed from behind, second tergite longest, others subequal, pubescence everywhere short, including hindmarginal bristles at sides. Hypopygium small, not visible from above. Legs black, four posterior tarsi sometimes brownish, middle tibiae with one upper and three lower bristles on outer side, the middle one of the three the longest, the postero-dorsal one (slightly above it) the shortest, only a quite small median ventral bristle. Basal joint of middle tarsi only slightly longer than the next, and with only the usual small bristles, of which one posteroventral near base is very slightly longer than others. Preapical bristle on hind tibiae longer than in *leucoptera*, decidedly longer than tibia is thick. Wing venation resembling that of *coprina* Duda, but postical vein more bowed therefore the cell above it rather broader, second section of costa thickened and equal or almost equal in length to third, alula not so short or narrow. Halteres black with brownish stem.

♀. Resembling male. Cerci short and broad, dorsoventrally flattened, quite different in form and chaetotaxy from those of *coprina*, each ending in a long fine pale hair with a much shorter one near it, and a slightly upcurved hair of medium length above it.

Length not quite 1 mm.

Described from five pairs taken on a garden compost-heap at Kirtling (Cambs.) in May, 1951, and 1952, and again in July, 1951. Mr. B. R. Laurence has a female specimen found on a 7 - 8 day old cow-pat at Rothamsted (Herts.) on 3.iv.51.

This species must also be very much like that described by Duda as *T. Kuntzei*, but in that species the second section of the costa would appear to be much shorter.

Trachyopella melania Hal., and *coprina* Duda

Trachyopella coprina was described by Duda in 1918 when he also gave a description of *melania* Hal., with which *coprina* was compared. Later (1923), having been informed by Villeneuve (who had seen some of Duda's specimens), that while his *melania* was the same as *melania* (Hal.) of Rondani (type), his *coprina* was "*melania* Hal. teste Collin," Duda proceeded to transfer the name *melania* to his species *coprina*, and give the new name of *Villeneuvei* to his *melania* (Hal.) of Rondani. Actually Duda was misled by

Villeneuve's statement, and this changing of names was quite unnecessary. The two species are very much alike, and Duda's species *coprina* had not been described when I examined Haliday's Collection in 1913. It was in fact mixed up with *melania* in my Collection at that time, so Villeneuve's "*melania* Hal. teste Collin" must have referred to some specimens of *coprina* Duda sent by me to Villeneuve as *melania* Hal. (It should be noted that in Lindner's "Die Fliegen. Sphaeroceridae" Duda incorrectly referred to his *L. coprina* as "*coprophila*").

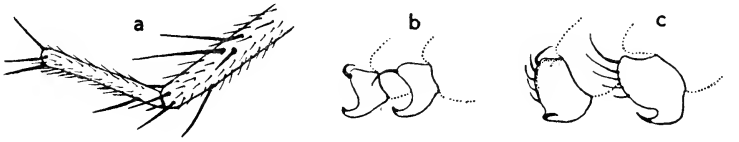

Fig. 1. *a*, Part of left middle tibia and tarsus of *Paracollinella finalis* n.sp. *b*, Paralobes of male genitalia of *Trachyopella melania* Hal. *c*, Paralobes of male genitalia of *Trachyopella coprina* Duda

A recent re-examination of Haliday's specimens of *melania* has established their identity with *melania* Hal. of Rondani, and of Duda, 1918, *nec* 1923. One of Haliday's three specimens (all gummed to cards) has disappeared leaving only one wing and the tips of some tarsi, but this wing very clearly shows the faint continuation to wingmargin of upper vein from discal cell. In the other two specimens (both of which appear to be males) this is not so evident, but the obviously hairy eyes and arrangement of bristles on middle tibiae distinguishes them from *coprina*. In *melania* the eyes are normally more obviously hairy than in *coprina*, hence Haliday's "oculi hispiduli," while on the middle tibiae the anterodorsal of the three exterior bristles on lower half (the posterodorsal of these three being very minute) is almost as far above the longer dorsal one as that is from end of tibia (an arrangement similar to that in *atoma*), while in *coprina* these two bristles are nearer together. There is also an additional venational distinction from *coprina* in the somewhat shorter length of second costal segment compared with third, as indicated by Haliday in his description. The male hypopygium of *melania* is smaller than that of *coprina* with different paralobes (figs. 1B and 1C), and the female cerci are less prominent and their bristles very much shorter and finer than in *coprina*.

In describing *T. coprina* Duda stated that he had taken in all 36 specimens on manure at Ilfeld and Eickel. I understand however from Prof. Dr. Peus of the Berlin Museum that there are now no specimens in Duda's Collection with such locality labels, but many labelled as captured in 1916 at "Herten." I have seen some of these specimens and they are the same as our British *coprina*, and not T. *melania* Hal.

The next species belongs to a group for which Richards used the name of *Heteroptera* Mcq. (1835), and Duda that of *Coprophila* Duda (1918), but if *Heteroptera* Mcq. is preoccupied by *Heteroptera* Raf. (1814), the name to be used must be *Coproica* Rdi. (1861), proposed as a new name in the place of *Heteroptera* Mcq.

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HEMIPTERA-HETEROPTERA ASSOCIATED WITH FRUITS AND HOPS

By A. M. MASSEE, O.B.E., D.Sc.

The British Hemiptera-Heteroptera have been studied by numerous hemipterists during recent years, and the publications relating to the plant bugs have been considerable. However, very few entomologists are afforded the opportunity to study the plant bugs associated with fruit in detail in the field, and in consequence very little is known concerning the life cycles and habits of these species.

Fifty-seven species of Hemiptera-Heteroptera have been recorded on top and small fruits and hops, but only a few of these species are confined to specific host plants such as apple, pear, plum, etc., the majority being more catholic in habit occur on several kinds of fruits, and these may be found also on other wild host plants, sometimes remote from fruit orchards.

A number of fruit species are mainly confined to derelict and neglected plantations; indeed many more species are found in these environments than in well-cared-for plantations. Occasionally species not noted previously in commercial orchards become established in their new environment, while some of the once familiar species tend to disappear without any apparent reason.

The fact that fewer species occur in commercial orchards today than formerly is doubtless due to the routine spray programme practised by all progressive fruit growers. The use of synthetic chemicals toxic to most species of Hemiptera largely accounts for this reduction.

Probably one of the most interesting examples of an insect changing its habits and becoming a major apple pest is provided by the Mirid *Plesiocoris rugicollis* (Fall.), popularly known as the Apple Capsid Bug. This Mirid was first recorded on apple in a nursery at Wisbech, Cambridgeshire, in 1911. Previously to this date this Mirid was associated with various species of willow and Bog Myrtle.

The Apple Capsid Bug spread very rapidly from the nursery at Wisbech, and in a relatively short time became established in most fruit growing districts of the British Isles. Notable exceptions being the greater part of Essex and a small area around the Tenterden district of Kent. The apparent absence of the bug from fruit in these areas has not been explained.

Coproica hirticula sp.n. ♂ ♀

Allied to *pseudolugubris* Duda, but differing as follows. Eyes rather smaller and consequently jowls rather wider, especially towards front. Scutellum with fewer and slightly longer setae on disc. Abdomen much less bristly on last sternite which has a narrow median apical projection, rounded at end, and each tergite with a more distinct hindmarginal bristle at each hind corner. Hypopygium smaller, and not so densely haired, but with a pair of rather longer hairs near base and another shorter pair near tip. Genital side lamellae not slender and curved, but broad at base and sharp-pointed at tip, its front margin strongly convex and bearing a row of short hairs, and rear margin (nearest anus) concave. Legs differing in arrangement of spines beneath basal joint of middle tarsi (apparently distinctive in each species of this group), there being a pair of fairly large spines near base, a distinctly smaller pair just beyond middle, and the usual apical spines, in *pseudolugubris* there is only one (anteroventral) spine at base which is *equally small* as *two* other pairs on middle half. Wings slightly whitish, and with no indication of third vein being slightly recurved at tip. Halteres somewhat dusky yellow.

♀. Resembling male. Abdominal cerci each with two long terminal hairs similar to those in *pseudolugubris*, but sternites less bristly, and hind corners of each tergite with a more distinct bristle.

Length scarcely 1 mm.

This species is still more like *hirtula*, but among other differences the middle tibiae are always without the two small additional posterodorsal bristles of *hirtula*. It was not uncommon about a garden compost heap at Kirtling (Cambs.) from May to July (and again in October), 1951. Specimens taken on 14.x.51 may be taken as typical.

Stenhammaria nivalis Hal. and *fenestralis* Fln.

I am personally convinced that the former is only a mutant form of the latter. In my experience *nivalis* is only found in company with *fenestralis*, which exhibits a distinct tendency to vary in the direction of wing abbreviation. When Duda in 1918 placed these species in distinct subgenera he had seen only one pair of *nivalis*, and Richards with a better knowledge of the species did not accept this division. The chaetotaxy of the middle legs is identical in both forms, and the supposed larger head in *nivalis* is an illusion due to a natural reduction in the size of the thorax as a consequence of abbreviated wings, while the loss of the outer crossvein is also due to this abbreviation.

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THE HYMENOPTERA ACULEATA OF BEDFORDSHIRE. By V. H. Chambers, 1949. 56 pp., 3 maps, 10*s*. 0*d*.

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THE NATURAL HISTORY OF SOME *Pamphilius* SPECIES (HYM., PAMPHILIIDAE). By V. H. Chambers, 1952. 16 pp., 4 pls., 5*s*. 0*d*.

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A REVISION OF SECTION I (MAYR, 1872) OF THE GENUS *Synergus* (HYM., CYNIPIDAE) IN BRITAIN, WITH A SPECIES NEW TO SCIENCE. By R. D. Eady, 1952. 12 pp., 4 pls., 4*s*. 0*d*.

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ORTHOPTERA, Etc.

A SUMMARY OF THE RECORDED DISTRIBUTION OF BRITISH ORTHOPTEROIDS. By D. K. McE. Kevan, 1952. 16 pp., 5*s*. 0*d*.

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On apple, the Apple Capsid Bug hibernates as an egg, which is laid in the tissue of the new growth, in the latter part of June and early July. On hatching, early in April, the immature bugs feed on the unfolding foliage, but by the time the young fruitlets start to form at petal-fall the immature bugs feed on the fruitlets in preference to the foliage, causing much distortion and roughening of the fruitlets, rendering them unsuitable for market.

By 1931, the Apple Capsid Bug became so abundant in most commercial orchards that fruit growers regarded it as one of the most serious apple pests. The economic status of the Apple Capsid Bug resulted in a detailed study of its life-cycle and habits (Petherbridge, 1918) and measures for its control have been worked out in this country and on the Continent.

In fact, the Apple Capsid Bug disappeared from the commercial apple orchard almost as quickly as it arrived some thirty-five years earlier. The reason for its departure is a simple one. In 1946 the synthetic chemical DDT was introduced into the spray programme as a pre-blossom insecticide, and it was found to be so effective against the bug that it was completely eradicated by only one application in a single season. This bug is rarely found in commercial apple orchards today, but it may still be found in a few neglected orchards of the West Midlands.

It is significant that thirty of the fifty-seven species of plant bugs associated with fruits and hops are regarded as beneficial species known to be wholly or partly predacious on some of the more harmful insects resident in the orchards.

Eleven species are mainly confined to the floor of orchards, where they inhabit grasses and wild flowers and only visit the trees from time to time. Some of the species hide in the sack bands, which are placed around the trunks of the trees to prevent the tree stakes rubbing the bark. These insects may be regarded as neutral species, since they are neither harmful nor beneficial. Only five species of those recorded may be described as pests of fruits and hops, and even these are not regarded as being very serious today. They are as follows: the Apple Capsid Bug, the Common Green Capsid, the Hop Capsid or Shy Bug, the Hop Lygus and the Hazel Capsid.

All the species of Hemiptera-Heteroptera recorded on fruit, with two exceptions, are very common British insects, and the life-cycles and habits of most of them are well known.

The two exceptions are as follows: *Xylocoridea brevipennis* Reuter is a very uncommon species of Anthocorid bug, which is found occasionally under the loose bark of apple and pear. The second species is *Lygus visicola* Puton, a rare species, which inhabits mistletoe growing on apple trees, and this Mirid feeds on the parasitic plant.

Cydnidae

Sehirus bicolor (L.)

This shield-bug is normally associated with dead-nettle, stinging nettle, etc., but sometimes occurs on fruits, and it has been observed feeding on the leaves of plum. An egg batch consisting of twenty-eight eggs, was found on the undersurface of a plum leaf. The eggs hatched on 1st August. This is most unusual since the ova are usually laid in the soil.

A number of adults were found on Bramley's Seedling apple. Egg batches were deposited on the upper surface of the leaves in June. The eggs hatched on 18th June.

Several adult shield bugs were found on raspberry foliage in June, 1951, but they were not observed feeding on the leaves (Massee, 1936, 1951).

Pentatomidae

Podops inuncta (Fabr.)
Dolycoris baccarum (L.)
Pentatoma rufipes (L.)

Three species of Pentatomid bugs are associated with fruit, but none of them is very important. *Podops inuncta* (Fabr.) is frequently plentiful on the floor of orchards which have been covered with straw litter, provided as a form of humus. It occurs most commonly in the autumn months and hibernates in the litter during the winter.

Dolycoris baccarum (L.), popularly known as the Sloe Bug, is frequently common on plum and damson trees in August and September, where it preys upon the various species of aphids which infest these fruits (Massee, 1954).

The Forest Bug (*Pentatoma rufipes* (L.)) sometimes occurs in considerable numbers in commercial orchards—more especially old cherry orchards—during the winter months. It hibernates in the immature stages. The Forest Bug is predacious upon the larvae of the winter moth group during the spring months (Massee, 1946, 1954).

Aradidae

Aradus depressus (Fabr.)
Aradus aterrimus (Fieb.)

Brachyrhynchidae

Aneurus laevis (Fabr.)

Three species of Aradid bugs are found under the loose bark of old apple and pear trees, and may be present in considerable numbers. All stages of the bugs and eggs occur, especially in orchards which do not receive winter or spring washes, but they never occur in well-cared-for orchards (Massee, 1935, 1949).

Lygaeidae

Kleidocerys resedae (Panz.)
Aphanus rolandri (L.)
Rhyparochromus alboacuminatus (Goeze)
Scolopostethus thomsoni Reut.
Scolopostethus decoratus (Hahn..)
Scolopostethus affinis (Sch.)
Taphropeltus contractus (H.-S.)

The seven species of Lygaeids found in orchards may be described as casual visitors, since none of them is directly associated with the fruit trees of the orchards concerned.

Kleidocerys resedae (Panz.) frequently occurs on apple foliage in April and May, but there is no evidence that it feeds on the leaves (Massee, 1949).

Aphanus rolandri (L.) is commonly seen running on floors of cultivated orchards in August and September, but this species does not harm the trees. After picking, the apples are frequently left in the apple boxes under the trees to colour for several days. The bug is attracted to the boxes, and several specimens may be seen running amongst the fruits, and the bugs congregate in numbers under the paper at the bottom of the boxes.

Rhyparochromus alboacuminatus (Goeze). This Lygaeid is an extremely active species which runs about on the floor of the orchards in the spring months. It does not occur on the trees, but more frequently lives in the hedge bottoms which surround the orchards.

The species of *Scolopostethus* which have been recorded in fruit orchards hibernate in the sack bands placed around the trunks of the trees to prevent the support stakes rubbing the bark. *Taphropeltus contractus* (H.-S.) also seeks hibernation in the bands (Massee, 1935).

Tingitidae

Physatocheila smreczynskii China

This beautiful lace bug has been recorded from eight English counties, including Kent, and normally occurs on lichen-covered crab apple trees. Occasionally it establishes itself in old, neglected plantations where lichen abounds. It is never present in the well-cared-for orchard.

Nabidae

Nabis mirmicoides Cost.
Nabis ferus (L.)
Nabis apterus (Fabr.)

Nabis mirmicoides Cost. and *Nabis ferus* (L.) are found commonly in hop gardens in July, August and September. Both species also occur on fruit trees and are predacious on the Fruit Tree Red Spider Mite and the Hop-Damson Aphid (Paine, 1951).

Nabis apterus (Fabr.) inhabits deciduous trees, and it is found commonly in orchards, where it is predacious upon the Fruit Tree Red Spider Mite and fruit aphids. It is also plentiful in hop gardens, where it feeds upon the Hop-Damson Aphid and the immature bugs also devour the Red Spider Mite. This species overwinters in the egg state, the ova being laid deep in the one-year wood (Massee, 1954).

Anthocoridae

Anthocoris confusus Reut.
Anthocoris nemoralis (Fabr.)
Anthocoris gallarum-ulmi (Deg.)
Anthocoris nemorum (L.)
Orius niger (Wolff)
Orius majusculus (Reut.)
Orius minutus (L.)
Orius laevigatus (Fieb.)
Lyctocoris campestris (Fabr.)
Xylocoridea brevipennis Reut.
Dufouriellus ater (Dufour)

No less than eleven species of *Anthocorid* bugs are recorded on top and small fruits and hop. All the species are predacious, and many of them are very important beneficial species.

Anthocoris nemorum (L.) is regarded as the most important beneficial species of the genus, and it frequently occurs in very large numbers on all kinds of fruits and hop. It feeds on the Fruit Tree Red Spider Mite, the fruit aphids and other species of harmful insects. There are two generations each year, and the bug hibernates in the adult state. The ova are inserted into the tissue of the underside of leaves of top and soft fruits and hops (Massee and Steer, 1929).

Orius majusculus (Reut.) is another very important species which inhabits all kinds of top and soft fruits and hop. It is predacious on all stages of the Fruit Tree Red Spider Mite, fruit aphids and other pests. There are two generations each year, and the ova are laid in the tissue of the leaf under-surface (Massee, 1935, 1939, 1947).

The other species contained in the genera *Anthocoris* and *Orius* also inhabit fruit trees from time to time, but not as frequently as the species referred to above (Dicker, 1951).

Lyctocoris campestris (Fabr.) is commonly found in the sack bands around the tree trunks. It has not been observed feeding on harmful fruit insects, and merely shelters in the bands for hibernation purposes.

Xylocoridea brevipennis Reut. is a rare species of *Anthocorid* bug which sometimes occurs under the loose bark of old apple trees. It is sometimes found in company with *Dufouriellus ater* (Duf.), another subcortical species (Massee, 1935).

Loriculidae

Loricula elegantula (Baer.)

This minute bug is found on the trunks of many kinds of trees, including fruit trees, and sometimes it is very common in old, neglected orchards. It is predacious on mites, thrips and other small insects (Massee, 1944).

Miridae

Pantilius tunicatus (Fabr.)
Phytocoris tiliae (Fabr.)
Phytocoris reuteri Saund.
Phytocoris ulmi (L.)
Calocoris fulvomaculatus (Deg.)
Calocoris norvegicus (Gmel.)
Lygus pabulinus (L.)
Lygus spinolae (M.-D.)
Lygus rugulipennis Popp.
Lygus viscicola Puton.
Plesiocoris rugicollis (Fall.)
Liocoris tripustulatus (Fabr.)
Camptobrochis lutescens (Sch.)
Deraeocoris ruber (L.)
Camptoneura virgula (H.-S.)
Pilophorus perplexus D. and S.

Blepharidopterus angulatus (Fall.)
Orthotylus marginalis Reut.
Orthotylus ochrotrichus Fieb.
Capsus meriopterus (Scop.)
Malacocoris chlorizans (Panz.)
Phylus coryli (L.)
Psallus ambiguus (Fall.)
Psallus variabilis (Fall.)*
Atractotomus mali (M.-D.)
Plagiognathus arbustorum (Fabr.)
Campylomma verbasci (M.-D.)

Twenty-seven species of Mirid bugs are found on top and small fruits and hop, which represents about half the total number recognized on these trees and bushes. Of these five are considered harmful, three may be regarded as neutral species, and nineteen are beneficial since they feed partly at least on harmful insects and mites associated with fruits and hop.

The harmful species consist of the Apple Capsid Bug (*Plesiocoris rugicollis* (Fall.)), the Common Green Capsid (*Lygus pabulinus* (L.)), the Hop Capsid (*Calocoris fulvomaculatus* (Deg.)), the Hop Lygus (*Lygus spinolae* (M.-D.)) and the Hazel Capsid (*Pantilius tunicatus* (Fabr.)).

The Apple Capsid Bug has already been noted. It is no longer an important pest, but it occurs in a few orchards which do not receive a routine pre-blossom spray containing DDT. The immature bugs feed on fruitlets of apple, frequently distorting them to render them unfit for market. The bug less frequently occurs on pear, causing a shortening of the new growths, thus causing forking of the tips. It rarely attacks pear fruits, but feeds on the tender foliage around the area of the mid-rib. A detailed account of the life-cycle, habits and injury caused by the Apple Capsid Bug has been published (Petherbridge, 1918).

The Common Green Capsid Bug is much more catholic in its habits since it infests and damages most kinds of top, small fruits and hop. It does not feed on the apple fruitlets, however, but attacks the leaves and young growths, causing the latter to fork and produce stunted growth. It is particularly harmful to cultivated *Rubi*, black currant and gooseberry. It stunts the growth and distorts the foliage of the plants. On pear it attacks the fruitlets (and not the foliage), causing severely malformed fruits and also forked growths. The second generation sometimes feeds on the hop bine, causing bleeding and stunting of the growth.

The Common Green Capsid has two generations a year. It hibernates in the egg state, the ova being laid in the new growths of woody plants and trees. The eggs hatch early in May, some weeks later than those of the Apple Capsid Bug, and the immature bugs feed on the foliage (Petherbridge and Thorpe, 1928).

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* The Mirid bug *Psallus salicellus* (M.D.) has been found in numbers recently in a commercial apple orchard, where it was noted to be predacious upon the phytophagus mite *Bryobia praetiosa* Koch.

The Hop Capsid and the Hop Lygus both attack the hop and may cause considerable harm to the bines by feeding on the tender growths in June and July. The Hop Capsid lays its eggs in the hop poles in July, and the immature bugs hatch the following May. The Hop Lygus is less common but does occur from time to time in several Kentish hop gardens (Theobald, 1925).

The Hazel Capsid Bug frequently occurs in Kentish nut plats in August and September. The adult and immature bugs feed on the foliage, frequently causing injury to the new growths. It does not affect the crop. The Hazel Capsid hibernates in the egg state, and there is one generation each year.

The three neutral species consist of *Phylus coryli* (L.), *Lygus rugulipennis* Popp. and *Lygus visicola* Puton. *Phylus coryli* (L.) is associated with hazel and cultivated nut, but it does not cause any harm to the latter. *Lygus rugulipennis* Popp. frequently occurs on cultivated fruits and hop but is not regarded as harmful and there is no evidence that it feeds on the pest species associated with these plants. *Lygus visicola* Puton is not a common species. It is associated with mistletoe, and it is thus restricted to the areas where mistletoe grows. It is partial to fruits of the plants.

The nineteen predacious species associated with fruits and hop vary very considerably in the life-cycles, habits, and in their prevalence on these plants, and a few interesting observations concerning them follow.

The Black-kneed Capsid (*Blepharidopterus angulatus* Fall.) is at present regarded as the most important Mirid associated with top and small fruits. This species is widespread throughout the British Isles, and it occurs on many other plants in addition to cultivated fruits. The bug is predacious on the Fruit Tree Red Spider Mite, aphids, small caterpillars, etc. It lays its eggs deep in the young wood growths and water growths of apple, etc. The species overwinters in the egg state. It is fortunate that the eggs hatch in the latter part of June and July, since by this period most of the spraying of commercial orchards has been completed, thus the Mirid largely escapes the toxic effect of the spray chemicals (Collyer, 1952).

Another beneficial species, *Psallus ambiguus* (F.), may prove very valuable in commercial orchards, when the spray programme is further modified to allow it to survive. At present it is abundant in derelict and neglected orchards, where it occurs from April until the end of June. The eggs are laid in the young wood of apple, etc., from mid-May until the end of June. It hibernates in the egg state. There is one generation each year. It feeds on all stages of the Fruit Tree Red Spider Mite, aphids, and small caterpillars.

Phytocoris tiliae (Fabr.), *P. reuteri* Saund., *P. ulmi* (L.), *Camptobrochis lutescens* (Sch.), *Deraeocoris ruber* (L.), *Camptoneura virgula* (H.-S.), *Pilophorus perplexus* D. and S., *Orthotylus marginalis* Reut. (Massee, 1954), *O. ochrotrichus* Fieb., *Malacocoris chlorizans* (Panz.), *Capsus meriopterus* (Scop.) (Collyer, 1954), *Psallus variabilis* (Fall.), *Atractotomus mali* (M.-D.), *Plagiognathus arbustorum* (Fabr.) and *Campylomma verbasci* (M.-D.) have all been observed feeding on the immature stages and adults of the Fruit Tree Red Spider Mite. *P. perplexus* D. and S. and *A. mali* (M.-D.) also feed on the immature forms of the Woolly Aphid.

Calocoris norvegicus (Gmel.) and *Liocoris tripustulatus* (Fabr.) both occur on cultivated hop (Paine, 1951).

A number of other species of Mirids have been noted on top and small fruits, but since they have not been observed feeding on the foliage or preying on other insects of the fruit trees they have not been included.

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The Known Distribution of British Orthopteroids, Fourth Supplement

By D. Keith McE. Kevan

From time to time, sufficient new or hitherto unnoticed county records of British Orthopteroids (and corrections) accumulate to make desirable the publication of supplements to the original summary of distribution (Kevan, 1952); this is the fourth such supplement (*cf.* Kevan, 1953, 1953a, 1954). Since the publication of the last of these, very considerable advances in our knowledge of one family of this previously rather neglected group—namely, the Acrididae—have been made through the appearance of the important ecological study by Richards and Waloff (1954). There is, however, but a single new vice-county record (and that a quite incidental one) in the whole of this large work. It may perhaps also be mentioned that George (1955, 1955a) has now published details of the records of the Orthopteroids of Gloucestershire and certain other counties to which brief reference [as George "(1954)" or "(private communication)"] was made in the last supplement (Kevan, 1954). The following are new or otherwise interesting records, or corrections:

Blattodea

Ectobius lapponicus (L.). This has now been recorded from Buckinghamshire (v.c. 24) and Northamptonshire (v.c. 32) by Claridge (1955).

Blatta orientalis L. Even if not new, records of the Oriental Cockroach taken outdoors are always interesting. They now seem to be getting not uncommon. Mr. W. Bunting (*in litt.*, 1955) records 7 ♂♂ (adults) in the open at Portland, Dorset (v.c. 9), vii.1951 [this is not a new county record for the species].

Phasmatodea

Carausius morosus Br. v. W. In the last supplement (Kevan, 1954) it was suggested that this species might be more widely established as a glass-house "escape" than is generally known. Mr. C. F. Rivers (*in litt.*, 1955) informs me that Mr. Herbert Whitley's private plant collection at Primley, near Paignton, Devon (v.c. 3—where it is already known to have become established at Torquay), was infested. Mr. Whitley is said to be a "famous zoologist" and it is not impossible that he may have started the trouble himself.

Orthoptera-Ensifera

Tachycines asynamorus Adel. Another glass-house insect, this species has recently been recorded from Ayrshire and Midlothian (v.c. 75 and 83) by Dunn and Kevan (1955) and from Leicestershire (v.c. 55), as well as from a previously known vice-county (v.c. 21), by Thomas (1954). Mr. A. R. Waterston, of the Royal Scottish Museum, Edinburgh (private communication, 1955), also informs me that it occurs under glass in Dumfries (v.c. 72)—a new county record.

Decticus verrucivorus (L.). Some twenty-eight years have elapsed since the last authentic British record of this species, so that it is both interesting and gratifying to note that, although rare, or at least very local, it is by no means nearing extinction. One of the most significant notes in this supplement is to draw attention to the record by Payne (1955a, b) of Mr. J. A. Whellan's discovery and his own confirmation of the occurrence of the species in a previously unrecorded vice-county, East Sussex (v.c. 14). Almost simultaneously, Ragge (1955a) announced its rediscovery in Dorset (v.c. 9) and at the same time confirmed the occurrence of several other Orthopteroids in the county.

Metrioptera brachyptera (L.). Mr. R. M. Payne has kindly sent me a list of interesting vice-county records of Orthoptera compiled by Mr. J. A. Whellan. Apart from that of *Decticus* (above) none is actually new, but the northerly record of the present species from mid-Lancashire (v.c. 60) is perhaps worth mentioning: Winmarleigh Moss, 1946.

Conocephalus discolor (Thunb.). Gardner (1956) records this from near Dungeness (v.c. 15)—a new Kentish record.

Leptophyes punctatissima (Bosc). Mr. C. Moriarty (*in litt.*, 1955) has kindly informed me that this species may be recorded from Kerry S. (Ireland 1); this has not previously been noticed. Since Mr. Moriarty hopes to publish details shortly I will not anticipate his notes further. [It may be noted that the recorded Irish distribution for this species, according to Burr's (1936) distribution map, includes the whole of County Cork (v.c. 3-5), but published records actually appear to be limited to Cork East (v.c. 5); Ireland 3 and 4 thus await confirmation.] The record of a nymph of this species from Cheshire (v.c. 58), published by Ford (1956), is apparently erroneous. Mr. Ford (*in litt.*, 1954) informs me that the specimen is in Manchester and has been examined by Mr. B. C. Pickard and found to be a Decticine (? *M. brachyptera*).

Gryllus campestris L. Mr. W. Bunting (*in litt.*, 1955) records this species from between Salisbury, Wiltshire South (v.c. 8), and Blandford, Dorset (v.c. 9), vii.1951. Although the exact locality is not given, this constitutes an additional county record since the Field Cricket is so far unrecorded by me from either Wiltshire or Dorset. It is probable that the record refers to the latter county since most of the road between the two places lies within it. It may be noted, however, that a small part of the road runs through the corner of Hampshire South (v.c. 11), from which the species is recorded! Recent published records of *G. campestris* are rare, even from counties in which it has been reported as occurring:* Mr. J. A. Hardman (personal communication, 1953) records it from Frensham, Surrey (v.c. 17), 18.vii.1953; Mr. P. W. E. Currie collected specimens in East Sussex (v.c. 13) (*cf.* Parmenter, 1955).

Acheta domesticus (L.). In the original "Summary" (Kevan, 1952), the House Cricket is said to have been recorded from several Irish vice-counties.

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* See also note by B. C. Pickard (1956, *Entomologist*, **89**: 200) published subsequent to the preparation of this paper.

Mr. C. Moriarty (*in litt.*, 1955) kindly points out that, as yet, there are apparently no authentic records from Kerry N., Mayo E. or Donegal W. (Ireland 2, 26 and 35). The records should therefore be withdrawn; the reason for their inclusion was that the Irish distribution of this species was given on a county, instead of a vice-county, basis.

Mogoplistes squamiger (Fisch.). This species has again been recorded from Dorset (v.c. 9) (see Taylor, 1954; Pickard, 1956) and it seems that it may now be accepted as an established British insect, even if it is not a true native. In France this species is apparently confined to the Mediterranean seaboard, so that it may be adventive in Britain, but the Dorset fauna is known for its southern connexions.

Gryllotalpa gryllotalpa (L.). Recent notes on the occurrence of this species in Britain (*cf.* Allan, 1955; Kevan, 1955; Ragge, 1955) have brought to light an additional Welsh record (Caermarthen, v.c. 44—an old record by Edward Lloyd), quoted by the first author, and a number of interesting *recent* records, including some of crop damage, from the previously recorded vice-counties of Hampshire South and Surrey (v.c. 11 and 17) by the last writer.

Orthoptera-Caelifera

Tetrix subulata (L.). Fincher (1955) records this species from Castlemorton, near Malvern, Worcestershire (v.c. 37), a new county record. *T. subulata* was not previously known north-west of a line from the Wash to the Severn estuary, so that the record has additional interest even although the locality lies in the general area of the Severn valley.

Tetrix undulata (Swrby.) [*T. vittata* (Zett.)]. Mr. C. Moriarty (*in litt.*, 1955) kindly informs me that previously unnoticed Irish records for this species exist for Meath and Mayo West (Ireland 22 and 27), but I will not further anticipate his notes which he hopes shortly to publish. He also points out that Lucas' (1920) record from Glengarriff refers in fact to Cork West (v.c. 3), whence it has hitherto been unrecorded, and not to Kerry South (v.c.1), which still stands. [It may be noted that Irish records from Kerry North and Galway SE. and NE. (v.c. 2, 15 and 17) are based only on Burr's (1936) map which indicates the whole of each county to be concerned, although other published records seem to be confined to Kerry South and Galway North (v.c. 1 and 16). Ireland 2, 15 and 17 therefore await confirmation.]

Stethophyma grossum (L.). Mr. Moriarty (*l.c.*) queries the validity of including Galway SE. and NE. and Mayo East (Ireland 15, 17 and 26) in the known distribution of this species. So far we appear to have only Burr's (*l.c.*) map upon which to base this knowledge, so that, although there are authentic records for Galway West and Mayo West (Ireland 16 and 27), confirmation is needed for the remaining three vice-counties.

Stenobothrus lineatus (Pz.). Payne (1955) gives what is only the second record of this species for Hertfordshire (v.c. 20).

Omocestus rufipes (Zett.) [=*O. ventralis* (Zett.)]. The occurrence of this species in Essex (v.c.18, 19) is based only on the record of Harwood (1908) and I am indebted to Mr. R. M. Payne (*in litt.*, 1956) for pointing out that Harwood's list contains no mention of the abundant *O. viridulus*, from which my correspondent deduces misidentification. I am inclined to agree with this view and there thus appears to be no substantiated record of the species from the county. Mr. B. C. Pickard (*in litt.*, 1954) is of the opinion, also, that most of the northern records of this species are spurious and that a reappraisal of the position is required. With this latter point I concur.*

Omocestus viridulus (L.). I am indebted once more to Mr. Moriarty (*l.c.*) for drawing attention to the alleged records of *O. viridulus* from Kerry South and Donegal West (Ireland 1 and 35) given in my "Summary." These appear to be errors due to a *lapsus calami*. An interesting Irish record (though not a new one for the vice-county) is that given by Richards and Waloff (*l.c.*) for Achill Is. (Ireland 27). [In connexion with the Irish distribution of this species it may be noted that its occurrence in Cork Mid and East, Galway SE. and NE. and Mayo East (Ireland 4, 5, 15, 17 and 26) is based only on Burr's (*l.c.*) map and confirmation for these particular vice-counties is much needed.]

Chorthippus brunneus (Thunb.). Specimens of this common species are recorded from Balinrobe, Mayo East (Ireland 26) by Richards and Waloff (*l.c.*, p. 74), a new vice-county record. Mr. C. Moriarty (*l.c.*) also notes that *Ch. brunneus* is known from Waterford and Mayo West (Ireland 6 and 27); he hopes to publish details later.

Chorthippus parallelus (Zett.). There is no new vice-comital record of this species to add, but it is always of interest to report the macropterous f. *explicatus* Sélys. A specimen (sex not stated) was recorded by Mr. J. A. Whellan (see above under *Metrioptera*) from Westend Common, Surrey (v.c. 17), 15.viii.1945. In connexion with this species it is also of interest to record that several otherwise normal females were taken, by members (including the writer) of the Ninth Congress of British Entomologists on their excursion to Charterhouse Pools, Somerset North (v.c. 6), clinging to the upper parts of grass stems where they had died as a result of attack by an entomophagous fungus (*Empusa* sp., presumably *E. grylli*), 24.vii.1955 [*cf. antea* **5** (4): 133]. Acridophagous fungi are well known, but published British records are rare.

Myrmeleotettix maculatus (Thunb.). Mr. C. Moriarty (*l.c.*) has kindly pointed out that there is some doubt as to whether this species has been recorded from all the vice-counties of County Cork (Ireland 3, 4, 5). The whole county is indicated by Burr (*l.c.*), but other sources appear to confirm only Cork West (v.c. 3). This common species must certainly occur elsewhere in Ireland than in this and the only other two vice-counties so far known, Galway West and Wicklow (Ireland 16 and 20).

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* Since writing, Mr. Pickard (1956, *Ent. mon. Mag.*, **92**: 51-3) has investigated the position with regard to the more northerly records and produces clear evidence for the rejection of v.c. 49, 61-64, 69-70 and 88, and good reasons for not accepting 58, 59 and 80 also.

Dermaptera

Labia minor (L.). Fincher (*l.c.*) records the Lesser Earwig from Worcestershire (v.c. 37). This is not a new record, but there appears to be but one other for the county. For Ireland, Mr. Moriarty (*l.c.*) again points out that other than Burr's (*l.c.*) map, there is apparently no record of this species for Kerry North, Cork Mid and East and Donegal West (Ireland 2, 4, 5 and 35), so that these vice-counties still require confirmation although Kerry South, Cork West and Donegal East (v.c. 2, 3 and 34) are supported by other records.

Forficula auricularia L. The exact known British distribution of this most ubiquitous of species has never been given in detail. It is certainly recorded or known from the majority of the vice-counties of Great Britain, but in Ireland, authentic records appear to be limited to vice-counties 1, 16, 17, 21, 22, 27 and 35, to which, however, Mr. Moriarty will doubtless be adding when he publishes his account of the Irish Orthopteroids.

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Editorial

The Secretary has received a number of enquiries as to why the Society has, in recent years, published so few papers on Coleoptera and Lepidoptera. These two orders are of special interest to many members, and for that reason the complaints are not unreasonable. But there is another aspect of the problem.

It is the aim of the Council to publish papers on as many aspects of entomology as possible, yet at the same time keeping a balance in accordance with the interests of the Society as a whole. So far this year papers have appeared on Orthoptera, Hemiptera, Hymenoptera and Diptera. Before long members should receive, as a Transactions, a new paper on the ecology of Ephemeroptera. The Council would like to publish papers on other orders during the coming year. This cannot be done, however, unless suitable papers on the appropriate orders are forthcoming. The range of papers published is determined by the papers the Editor receives. For that reason a special appeal is made for good papers on any branch of entomology which has not been adequately represented in the Society's publications in recent years.

Aberrations in British Ants of the Genus *Formica*.

By C. A. Collingwood

Pseudogynes

Worker-queen intercastes in *Formica* species have usually taken the form of pseudogynes. These resemble miniature females but the thorax is excessively developed in relation to the head and abdomen. They are not known to lay eggs; they are sluggish but otherwise behave much as small workers in the nest. From their behaviour and sporadic occurrence, they are evidently abnormal forms having no positive value in the life of a normal ant community, On the contrary, Wasmann (1902) considered that with *F. sanguinea* Latr. pseudogynes were brought about by abnormal feeding and behaviour associated with the presence of the myrmecophilous beetle *Lomechusoides strumosa* F. Donisthorpe (1927) questioned this relationship since he did not always find the beetle in nests where pseudogynes were present. Moreover, related species such as *Lomechusa pubicollis* Bris. were thought by Wasmann to have the same effects among *F. rufa* L. and allied species. This beetle has never been found in Britain, whereas pseudogynes of *F. rufa* and allied species have been recorded, often in abundance, from several localities.

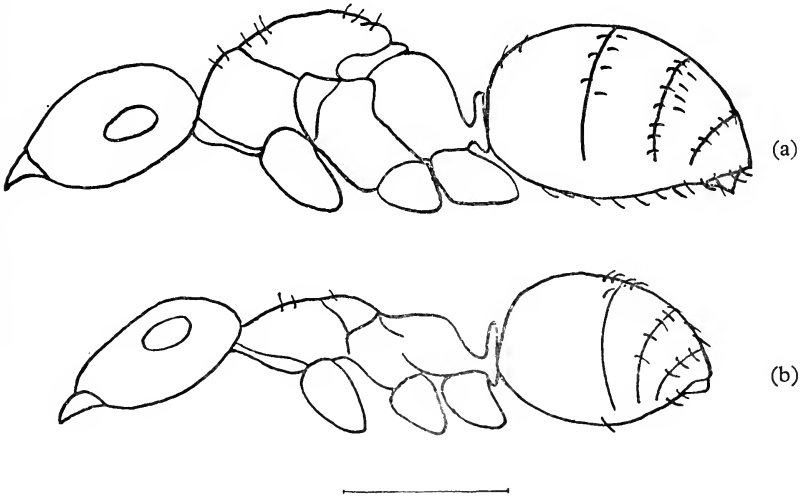

Fig. 1. A, Pseudogyne of *Formica lemani* (Bondroit), Ambergate, Derbys., iv.55, in side-view. B, Small worker of *Formica lemani* (Bondroit), Ambergate, Derbys., iv.55, in side-view.

Donisthorpe (1927) has recorded pseudogynes in colonies of *F. sanguinea* in S. England and *F. rufa* in Scotland. Yarrow (1955) has shown that *F. rufa* does not occur in Scotland and Donisthorpe's records from Rannoch and

Nethy Bridge probably refer to the two northern species *F. lugubris* Zett. and *F. aquilonia* Yarrow. In confirmation of this the writer has pseudogynes of both species from Braemar and Carrbridge respectively in the Scottish highlands and has also seen pseudogynes in nests of *F. rufa* in Surrey and Worcestershire. Yarrow (1955) has also pointed out that Donisthorpe's specimens of "*rufo-pratensis*" from the Isle of Wight are *rufa* pseudogynes. It is characteristic for pseudogynes in the *rufa* group of ants to have a clearly marked dark patch on the pronotum and mesonotum, not shining as in normal females of *F. rufa*, *lugubris* and *aquilonia* but matt as in typically coloured *F. nigricans* Em. workers. The degree of over development of the thorax is very variable.

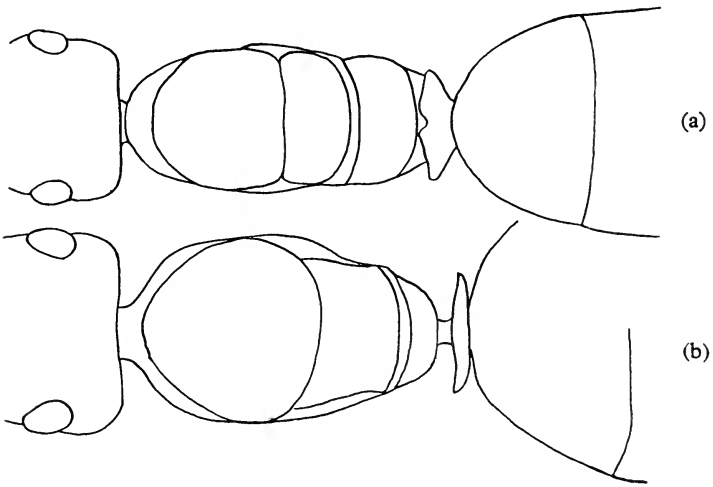

Fig. 2. A, Microgyne of *Formica lemani* (Bondroit), Dartmoor, ix.54, thorax seen from above. B, Normal queen of *Formica lemani* (Bondroit), Staffs., ix.55, thorax seen from above.

Wasmann found pseudogynes of *F. fusca* in Holland, but these have not yet been recorded in Britain for this group of ants. It is therefore of interest to record that in April, 1955, the writer dug up a colony of *F. lemani* Bond. at Ambergate, Derbyshire, in which some 50 or more pseudogynes, about 150 workers and 6 queens were present. The pseudogynes (fig. 1) were characterized by their small size and sluggish behaviour. The female-like thorax was coloured as in the worker and had no shining scutellum as in the queen. In this and other respects the pseudogynes resembled those of the *rufa* group. No myrmecophilous beetles were found, but some of the ants were quite heavily infested with a species of laelapid mite. The nest was situated round and under a stone in semi-shade and the colony was evidently

not thriving. In general it has been the writer's experience that pseudogynes have been found more commonly in colonies that seemed to be in a state of decline, but have also occurred in thriving populous colonies as was noted by Donisthorpe.

Microgynes

Microgynes have not been found among the *rufa* group of ants in Britain, but occasionally occur with *F. fusca* and its allies. Donisthorpe recorded microgynes with *F. fusca* L. from the New Forest and from Tenby in Wales. Other localities mentioned are Houth in Ireland and Rothes in Scotland and these should evidently refer to the northern species *F. lemani* Bond. (Yarrow, 1954). Female size in this group of ants is somewhat variable and in the writer's experience undersized queens are usually replicas of normal-sized queens in body proportion. Small queens found in a colony of *F. lemani* on

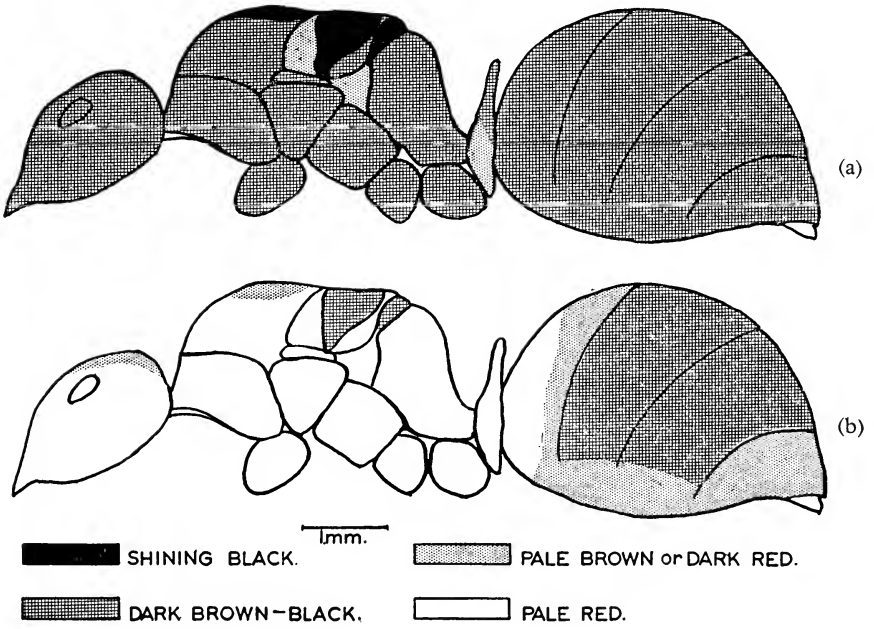

Fig. 3. A, Dark queen of *Formica rufa* L., Buddon wood, Leics., v.55, in side-view. B, Pale queen of *Formica rufa* L., Wyre Forest, Worcs., vi.51, in side-view.

Dartmoor in September, 1954, however, were not much shorter than ordinary queens, but had the thorax markedly smaller and the head correspondingly reduced (fig. 2). Queens of the *fusca* group found their colonies singly, but there is no evidence that colony proliferation as in *Myrmica ruginodis microgyna* Brian (1949) may not also occur. In the

Dartmoor colony only small queens were present, but the records of Donisthorpe and others show that normal and small queens have frequently occurred together in the same nest, and this would suggest that the microgynes in these cases, at least, resulted from some form of developmental abnormality.

Colour

Yarrow (1955) has shown that in the *rufa* group, worker body colour is variable and of little significance in distinguishing the various species. Aberrant *F. nigricans* workers from a colony discovered by Yarrow in Dorset differ little in colour from nearby *F. rufa* and in the writer's collection are specimens of *F. sanguinea*, *exsecta*, *rufa*, *aquilonia* and *lugubris* that would be indistinguishable on the basis of colour. Workers of *lugubris* and of *rufa* often show considerable variation in the same colony with bright reddish and dusky coloured individuals occurring side by side. Several interesting colour contrasts have been found in nests of *F. rufa* in Buddon wood, Leicestershire, and in one colony a remarkable colour aberration in some of the queens was observed. A small nest was dug up and among about twenty queens five were almost completely black, a colour not observed in this species before. By contrast the writer has specimens of *rufa* queens from Wyre forest, which have only part of the scutellum and abdomen other than the basal segment dark, the rest of the body colour being reddish (fig. 3).

In the *fusca* group reddish colouration is frequent and normal among workers of *F. cunicularia* Latr. and *F. rufibarbis* Fab., but has also been found by the writer occasionally in *F. lemani* as in Wigtownshire in June, 1954, and once in *F. fusca* (Arneside, Lancashire, August, 1954). These may have been young workers in which the colour had not yet fully developed, but as a rule callows in these species are greyish and not reddish. Examples of some of these workers could have been easily mistaken on superficial examination for those of *F. cunicularia*, itself a very variably coloured species.

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Notes on the Elateridae (Col.) of the "British List"

By W. D. Hincks

In the "Check List of British Insects" (Kloet and Hincks, 1945) a small number of the names there used are followed by a black square. This mark was designed to indicate names which the compilers knew to be invalid, but at the time the work was prepared they lacked the necessary information to enable them to decide on the names valid under the International Rules. Since 1945 a number of these anomalies have been corrected by subsequent workers but some yet remain to be considered. In the small family Elateridae there are no less than seven such invalid names and these are discussed in the following brief notes, together with one or two other nomenclatorial matters which have arisen.

1. The type of *Lacon* Castelnau, 1836, is *Elater punctatus* Herbst, 1779 (Arnett, 1953). Our British species, *L. querceus* (Herbst, 1784), under its synonym *Elater varius* Olivier, was referred to *Lepidotus* (Megerle) by Stephens in 1830. *Lepidotus* Stephens, 1830, being preoccupied by *Lepidotus* Asso, 1801, Arnett (1953) has proposed the new subgenonym *Zalepia*.

2. *Elater murinus* Linnaeus, 1758, is the type of *Agrypnus* Eschscholtz, 1829, by designation of Westwood in 1838. This genonym must therefore replace *Adelocera* of the "Check List." *Adelocera* Latreille, 1829, based on *Elater ovalis* Germar, 1824, included in the genus *Lacon* together with *murinus* by Schenkling (1925), is stated by Arnett to be generically distinct from *Agrypnus*.

3. The generotype of *Elater* Linnaeus, 1758, is *E. ferrugineus* L., designated by Latreille in 1810. It consequently replaces *Ludius* of British authors (see note 11). *Elater** of British authors becomes *Ampedus* Megerle *in* Dejean, 1833, type *E. sanguineus* L.

4. *Hypnoidus* is assigned to Dillwyn, 1829, by Arnett (1955). Its type is *Elater riparius* Fabricius, designated by Westwood in 1838. *Cryptohypnus* Eschscholtz, 1830, is isogenerotypical.

5. *Elater dermestoides* Herbst, 1806, is preoccupied by *E. dermestoides* Linnaeus, 1767, now *Trixagus dermestoides* (L.). Herbst's species should now be known as *Hypnoidus minimus* (Lacordaire, 1835).

6. *Elater rufipes* Herbst, 1784, is preoccupied by *E. rufipes* Degeer, 1774, a synonym of *Agrypnus murinus* (L.). Herbst's species should now be known as *Melanotus erythropus* (Gmelin in Linnaeus, 1789).

7. *Elater vittatus* Fabricius, 1792, was designated as the type of the genus *Athous* Eschscholtz, 1829, by Westwood in 1838. Unfortunately it is preoccupied by *Elater vittatus* Gmelin *in* Linnaeus, 1789. Schenkling (1927) includes *Elater advena* Scopoli, 1763, as a synonym of *Athous vittatus* (F.), despite its earlier date. I can find no reason why *Athous advena* (Scopoli) should not be the valid name for this species.

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* A new list of British species, including some changes in nomenclature and an additional species, is given by van Emden, 1956 (*Ent. mon. Mag.*, **92**: 168).

8. Tottenham (1948) has shown that *Athous campyloides* Newman, 1833, is the valid name for the species appearing in the "Check List" as *A. difformis* Lacordaire, 1835.

9. *Ctenicera* Latreille, 1829, type *Elater pectinicornis* Linnaeus, 1758, should replace the isogenerotypical *Corymbites* Latreille, 1834. *Ctenicerus* Stephens, 1830, is a misspelling of Latreille's name, as, surely, is *Cleniocerus* Stephens, 1829 (see Arnett, 1955).

10. *Elater aeruginosus* Fabricius, 1798, is preoccupied by *E. aeruginosus* Olivier, 1790 (now *Limonius aeruginosus*). The only synonym included by Schenkling (1927), under ab. *aeruginosus* F., is *Elater chalybeus* Sowerby, 1806, which is preoccupied by *E. chalybeus* Gmelin *in* Linnaeus, 1789. As stated by Stephens (1830: 266) under *Ctenicerus cupreus* (F.) "every possible shade and proportion [of colour] occurs, so that it becomes impossible to discriminate the varieties." Therefore it would be best to allow this name to lapse without replacement.

11. *Elater* Linnaeus, 1758, should replace *Ludius* Berthold, 1827 (see note 3).

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CORRIGENDUM

In Miss D. J. Jackson's paper "Notes on Hymenopterous Parasitoids bred from eggs of Dytiscidae in Fife" which appeared in the last issue of the *Journal*, two words have been omitted. These are "of *Colymbetes*" and occur in the second paragraph, p. 146. The sentence should read: "Enock (1898) mentions as hosts of *Prestwichia* the eggs of *Dytiscus marginalis* and *Notonecta*, and he records (1899) breeding eight females and one male from a single egg of *Colymbetes*, and, later (1913), the breeding of from 30 to 40 specimens from a single egg of 'the large Water Beetle.' "

(*Continued from inside front cover*)

ORTHOPTERA, Etc.

A Summary of the Recorded Distribution of British Orthopteroids. By D. K. McE. Kevan, 1952. 16 pp., 5*s.* 0*d.*

HEMIPTERA-HETEROPTERA

The Natural Classification of British Corixidae. By G. A. Walton, 1943. 14 pp., 1*s.* 9*d.*

Contributions towards an Ecological Survey of the Aquatic and Semi-Aquatic Hemiptera-heteroptera of the British Isles.

Anglesey, Caernarvon and Merioneth. By E. S. Brown, 1943. 62 pp., 3*s.* 0*d.*

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OBSERVATIONS ON THE SIZE OF GALLS FORMED ON COUCH-GRASS BY A CHALCIDOID OF THE GENUS *HARMOLITA* MOTSCHULSKY (*ISOSOMA* WALKER) (HYM. EURYTOMIDAE)

By R. BAILEY, B.Sc., F.R.E.S.
(Biology Department, Wigan and District Mining and Technical College)

Introduction

At least two species of the genus *Harmolita* Motschulsky (*Isosoma* Walker) (Eurytomidae) induce gall formation at the stem apex of the Couch-grass, *Agropyron repens* Beauv.

By far the greatest number are caused by *Harmolita graminicola* Giraud and it is this species which is considered here. Its galls have been reported from a number of European countries and are found in great profusion throughout Great Britain.

In June or July the female insect lays a single egg in the tissue immediately below the apical meristem of the host-plant and on emergence the larva commences feeding on the tissue surrounding it. This process causes the partial destruction of the apical meristem and only rarely does the stem elongate far beyond the larvel chamber. In only one case out of the many examined was a flower head formed beyond the gall.

The damage inflicted by the larva causes the suppression of internode lengthening and inhibits leaf development so that the swollen apex becomes surrounded by a whorl of short and stunted leaves (fig. 1).

By October the galls and the contained larvae have reached their maximum size. The size of galls varies considerably and this appears to be correlated with the sex of the emerging insect.

Material

The galls were collected as random samples from areas where they were abundant, and at times when they were known to be fully formed. Four collections were made.

Collection 1 from waste ground near to Lever Bridge, Bolton, Lancashire, in April, 1955.

Collection 2 from a railway embankment in the Beech Hill area of Wigan, Lancashire, in April, 1955.

Collection 3 from a grass verge near to Castle Head, Keswick, Cumberland, in April, 1956.

Collection 4 from a grass verge in Daubhill, Bolton, Lancashire, in November, 1956.

Results

On each occasion the collected material was divided into seven groups according to the gall lengths, which ranged between 0.5 cm. and 5.0 cm. The gall length was estimated as the distance from the stem node where the

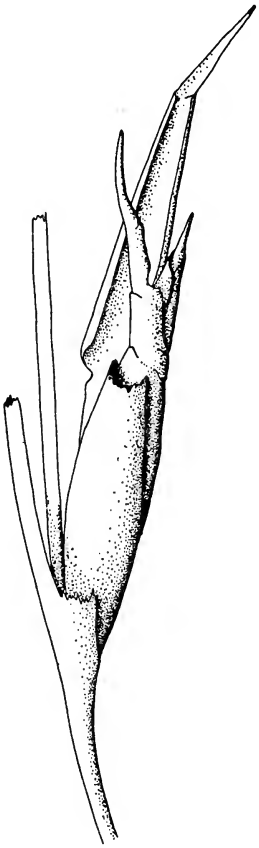

Fig. 1. Gall caused by *H. graminicola* at the stem apex of Couch grass.

swelling commenced to the stem apex, ignoring the whorl of short leaves which protrude beyond it. The gall volume would have been a more appropriate measurement but the sheathing leaves made this difficult to

assess. In general, however, an increase in length was accompanied by an increase in volume, although galls of similar length may have different diameters. This matter was investigated in Collection 4.

After the subdivision of each collection into galls of different length, those of the first three collections were placed in closed jars at room temperature

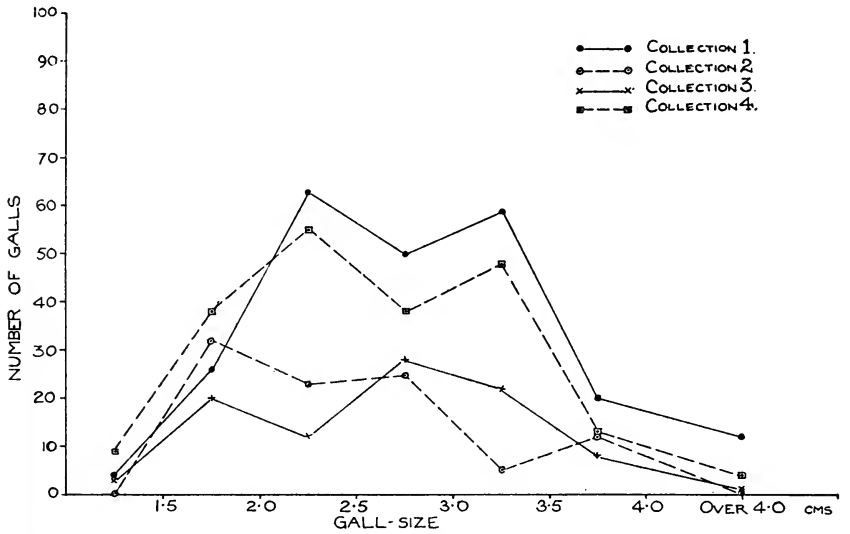

Fig. 2. To show the frequency of galls in the different size groups in the four collections made.

and the sexes of the emerging adults ascertained. In Collection 4 the sex of the larva was determined by measurement of the body and head capsule.

An analysis of the distribution of galls between 0.5 and 5.0 cm. is shown in fig. 2, whilst in table 1 the total number of galls examined and the ratio of females to males is shown.

TABLE 1

Analysis of the sex of adults emerging from galls in each size group

Size of galls (cms.)	Total Number	Number of Males	Number of Females	Ratio ♀/♂
Below 1.5	16	14	2	0.14
1.5 - 2.0	116	86	30	0.35
2.0 - 2.5	155	102	53	0.52
2.5 - 3.0	141	57	84	1.47
3.0 - 3.5	134	47	87	1.85
3.5 - 4.0	53	8	45	5.62
Above 4.0	16	0	16	16
Total	631	314	317	1

It was observed during this investigation that although the greatest number of galls had lengths between 1.5 cm. and 4.0 cm. their numbers were not distributed in a unimodal fashion around a single mean. Instead there were two lengths at which maxima occurred, and for each separate collection a bimodal curve was seen as in fig. 2.

Upon further examination of table 1 it can be seen that galls below 2.5 cm. in length are more likely to contain male than female individuals, and for galls above 3.5 cm. in length females are more often found than males. (See table 1.)

Both Giraud (1863) and James (1927) observed the sexual dimorphism in the adult individuals of *H. graminicola*.

The largeness of the female adult cannot cause the greater volume of the gall from which it emerges because only the final larval instar is reached when the gall is fully formed and the larva then undergoes diapause before metamorphosis.

The cause of the gall size difference must therefore operate during the earlier larval instars, which also show sexual dimorphism. Measurements of the final instar of both male and female larvae were made from specimens collected from Beech Hill, Wigan, Lancashire, in March, 1956. The galls were opened carefully and the larvae measured when at rest, for during movement the body shape varies considerably. These larvae were incubated at 27° C. and the sexes of the adults determined.

The eleven larvae which gave rise to female adults had an average length of 4.54 mm. (max. 4.86, min. 4.19), width 1.35 mm. (max. 1.52, min. 1.22) and head capsule width 0.466 mm. (max. 0.511, min. 0.430). In contrast the thirteen larvae which gave male individuals were noticeably smaller, showing average length of 3.57 mm. (max. 3.72, min. 3.21), width 1.00 mm. (max. 1.09, min. 0.94) and head capsule 0.394 mm. (max. 0.422, min. 0.365).

TABLE 2

To show the number of males and females in galls of the same lengths but different volumes

Size Group	Total No. of Galls.	Diameter below 0.4 cm.			Diameter above 0.4 cm.		
		No. of Galls.	No. of Males	No. of Females	No. of Galls.	No. of Males	No. of Females
1.5 - 2.0	38	25	25	0	13	6	7
2.0 - 2.5	55	33	29	4	22	6	16
2.5 - 3.0	38	17	13	4	21	5	16
3.0 - 3.5	32	10	7	3	22	3	19

Although length has been taken as the criterion of gall size, members of any one group may have different diameters and therefore different volumes. This was seen in Collection 1 where two of the galls which were less than 1.5 cm. in length were extremely globose and both contained female individuals.

In the collection from Daubhill, Bolton (Collection 4) the galls between 1.5 and 3.5 cm. in length were not only separated according to their length,

but subdivided again according to the diameter of the gall, those above 0.4 cm. in diameter being separated from those with a diameter below that figure. The result of the experiment showed (table 2) that although different galls may have the same length, those which contained a potentially female larva tended to have a greater diameter and therefore a greater volume than those which contained potentially male larvae.

Since the galls caused by male and female larvae are of the same shape but are different in size, it may well be that in each case the type of stimulus is the same but that it is greater in the case of the female larva than in the case of the male. If this were so the response of the plant tissues would be greater when a female larva was present and would thus give a larger gall. Further work is being conducted to ascertain this.

Summary

1. The size of the galls formed on *Agropyron repens* by *Harmolita graminicola* were measured and a tendency toward a bimodal distribution observed.
2. Sexual dimorphism in the larva of *H. graminicola* was noted and measurements made to show that the female larvae are larger than the males.
3. Female larvae initiate the development of larger galls than the male larvae, the size of the gall being determined during the early larval instars.

Acknowledgements

The author is deeply indebted to Dr. W. D. Hincks for his help and guidance and to Professor H. P. Moon for his helpful criticism. His thanks are also due to Dr. E. M. Adcock, of Wigan, in whose department the work was carried out.

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The Species of Ants of the Genus *Lasius* in Britain

By C. A. Collingwood
(Shardlow Hall, Shardlow, Derbyshire)

Wilson (1955) has recently published a monographic revision of the ant genus *Lasius*. The following account discusses the British species in the light of various nomenclatorial changes made by Wilson with particular reference to the synonymizing of *L. mixtus* Nylander with *L. umbratus* Nylander on the one hand and the recognition of *L. rabaudi* Bondroit as a distinct species on the other. In addition a simplified key to all castes is given together with brief notes on the distribution of the species in Britain as at present known.

During his revision Wilson has examined large collections of material from all over Europe, Asia and America with special attention to local and geographic variation over the whole range of each species. As a result several changes in species diagnoses and nomenclature have been made. Many varietal and trivial names and some species have been shown to be worthless and have been relegated to synonymy, while the really important diagnostic characters for each species have been clearly brought out. This is a definitive study of a kind badly needed to clear up the ever increasing complexity of ant nomenclature in Europe in particular and may well set the pattern for future studies in ant taxonomy.

A picture of the whole range of each species is built up by the examination of two or three individuals from each of a randomly selected nest series. A feature of great interest is the apparent development, in some cases, of convergent characters in one of a pair of similar species over parts of its range, where the other is absent. This is illustrated for example by *L. niger* L. which tends to develop fewer standing appendage hairs in those areas of Asia and America where its sibling hairless species *alienus* Foerst. is sparse or absent. The common European species *niger*, *alienus*, *flavus* and *umbratus* are apparently also widely distributed in N. America. According to Wilson, there is no basis for distinction between the Eurasian and American forms of these species, although with *alienus* at least there is a marked dissimilarity in nesting behaviour in the two hemispheres. This is in contrast to the position with members of the genera *Formica* and *Myrmica*. These are well represented in both Europe and America, but, so far as is known at present, there are no exact correspondences between the two continents with the possible exception of *Formica fusca* L. and a form of *Myrmica rubra* L. which may have been imported.

In line with many modern taxonomists Wilson regards the species as the only taxonomic unit having any objective status. The geographic race or subspecies can be defined within arbitrary limits, but these break down when the range of variation is studied over a wide area and, as with *Lasius*, genetically independent characters are found to vary discordantly in different

areas. Wilson therefore rejects the trinomen as leading to confusion and synonymizes, wherever possible, all races and varieties including the various supposed hybrids of Forel.

One of the commonest of these in the literature is *niger* var. *alieno-niger* Forel, which was erected to cover supposed hybrids between *niger* and *alienus*, but has been largely used by subsequent writers to include forms that were apparently intermediate in pilosity between the two species. In fact neither Staercke (1944), who examined Forel's specimens standing under that name, as well as much other material, nor Wilson ever found examples of nest series that could be said to be hybrid between the two species. Moreover it would probably be difficult to recognize such a hybrid did it occur, while in the whole of ant literature there are no records of natural cross-matings between like species nor any information on authentic hybrid populations even artificially contrived. In the writer's collection, ants formerly regarded as representing this variety have in most instances turned out to be *niger* with reduced appendage pilosity, rubbed, badly mounted specimens or more rarely *alienus* with one or two standing tibial hairs and he is indebted to Dr. W. L. Brown for attempting to sort out some of these specimens. Yarrow (1955) has fully discussed Forel's hybrid names in connection with ants of the *Formica rufa* group, where they have been the source of much confusion.

The case of *umbratus* var. *mixto-umbratus* Forel is very different in that a range of gradations between *umbratus* and *mixtus* do actually occur and are nearly as common as the extreme types, as was noted by many earlier writers including Donisthorpe (1927). After examining copious material Wilson has concluded ". . . there is no single character or combination of characters that can be used to separate *umbratus* and *mixtus* as species." The various characters that have been used to separate them, such as degree of pilosity, head width, or length/breadth ratio of funicular segments in both queen and worker caste, have been found to intergrade evenly and show a strong allometric trend with some degree of correlation with total body size.

It would thus appear that *umbratus* is morphologically an enormously variable species in all three castes, although Wilson does not give much attention to the similarly variable males. It will be a simplification to accept this synonymy on the evidence presented, but the matter is somewhat more controversial than with many recent nomenclatorial suggestions and should not pass without further comment. The extreme types of *umbratus* and *mixtus* are very dissimilar, at least as much so as any pair of similar but distinct species. Variability does not appear to occur in single colonies, which are usually very homogeneous even when apparently of intermediate type. Males, queens and workers from a *mixtus* colony show all the characters associated with this form consistently—reduced dentition, scarcity of eye hairs and shining body in the male, absence of standing hairs on tibiae and scapes and short funicular segments in the females. According to Wilson's study these characters are correlated with reduced body size in N. European populations. This certainly appears to be the case with males and queens, but not necessarily so with workers. The writer has examples of hairy workers from Sherwood Forest and from Surrey that are considerably smaller than *mixtus* from various sources in his possession.

Records of *mixtus* in the literature do not in general show any particular habitat preference as opposed to *umbratus*. Donisthorpe (*loc. cit.*), however, described *mixtus* colonies among Juniper in Surrey; the writer has found similar colonies associated with Juniper in Westmorland in 1954, in Glen Urquhart, Inverness-shire, in 1955, and has found this form more frequently on rough grassy hillsides than in woodland. A curious characteristic, mentioned by Donisthorpe (*loc. cit.*) but not discussed by Wilson, is that *umbratus*

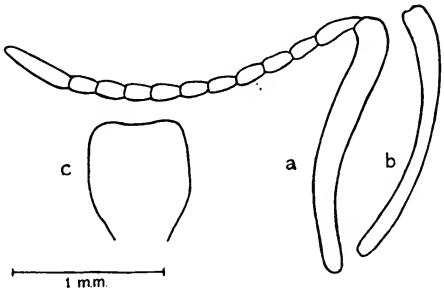


Fig. 1. *Lasius rabaudi* Bondroit, queen from Weybridge, Surrey, ex coll. Donisthorpe.
(*a*) Antennal scape and funiculus seen from above.
(*b*) Antennal scape seen from in front.
(*c*) Outline of petiole seen from in front.

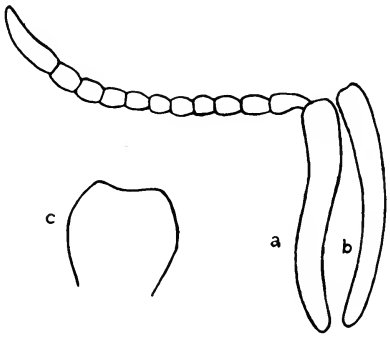


Fig. 2. *Lasius umbratus* Nylander, queen from Uffington, Lincs.
(*a*) Antennal scape and funiculus seen from above.
(*b*) Antennal scape seen from in front.
(*c*) Outline of petiole seen from in front.

workers from different localities do not fight together but are immediately aggressive towards other species such as *flavus* and, also according to Donisthorpe, to *mixtus*. The writer has himself tested out this behaviour, but not as yet with *mixtus*. It is clear that, while the synonymy proposed by Wilson is unchallengeable, there is at least a hint of ecological and behavioural differences that should be further studied before entirely abandoning any distinction between the two forms.

Wilson also synonymizes *affinis* with *umbratus* on the argument that the petiole shape in *umbratus* is too variable to warrant any distinction between them. However, *affinis* was regarded by some of the older writers, including André (1881) and Forel (1920), as a form of the distinct species *bicornis*. An important characteristic referred to by André (*loc. cit.*), Donisthorpe (*loc. cit.*(and Stitz (1939) is the greater length of the dorsal gastric hairs on the workers as compared with *umbratus*. This is also a feature shared by *bicornis*. The writer has examples of such workers from France with *affinis* petiole shape but long gastric hairs and flattened scapes as described by Wilson for *bicornis*. These characters are beyond the range diagnosed by Wilson for *umbratus* and the specimens in question cannot be keyed to either *umbratus* or *bicornis*. The variety *affino-umbratus* Donisthorpe (1927) from specimens taken in Pembrokeshire is according to Donisthorpe's own description only a form of *umbratus* and is synonymized under that species by Wilson.

Wilson distinguishes *rabaudi* Bondroit from *umbratus* on characters to be clearly seen only in the queen caste. The scape is said to be flattened so that the minimal mid-point width is less than 0.1 mm. At the same time the funicular segments of the antennae are at least 1.47 times as long as broad. The petiole outline is characteristically subquadrate. These features appear to overlap in the worker caste with the hairy form of *umbratus*, while the males are indistinguishable. According to Wilson the flattened scape in the queen caste is alone reliable but quite distinct from that of *umbratus* where the minimal mid-point width always exceeds 0.1 mm. Workers and queens of *rabaudi* have abundant standing hairs on the scapes and tibiae. In many respects *rabaudi* thus appears to form one extreme of the *umbratus* complex just as *mixtus* with its thicker semi-cylindrical hairless scape and broad funicular segments represents the other. The discontinuous variation of the scape character alone makes it possible to distinguish *rabaudi* as a separate species.

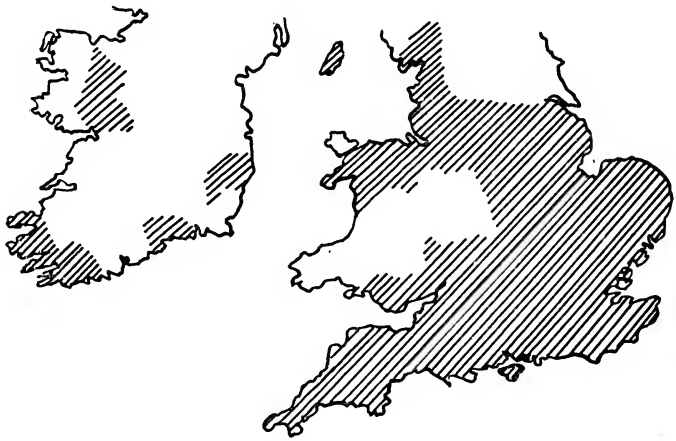
Wilson considers that *rabaudi* is probably a common palearctic species although hitherto seldom recognized and specimens have been so determined by him from Sweden, Holland, France, Austria, Switzerland, Jugoslavia and England (a queen labelled "Inghilterra Crawlei" in the Finzi collection). Mr. J. A. Pontin has located more of Crawley's specimens in the Oxford University Museum and among them are series of queens, both unaccompanied and accompanied by males and workers from Surrey, Berkshire and Hampshire, which show all the *rabaudi* characters as described by Wilson. The writer is grateful to Mr. Pontin and to Professor G. C. Varley for the opportunity of seeing some of these specimens, all of which date to forty or more years ago. No recent specimens of English *rabaudi* are known at the present and much further information is required concerning the nesting habits and distribution of this species. *Rabaudi* does not appear to occur in the Midlands or N. Britain to judge from the writer's own collection and Pontin (personal communication) suggests that the species may be restricted to the heathlands of S. England.

Because of the great variation in characters in populations of *Lasius* from Eurasia and America as a whole Wilson's keys are somewhat involved and rely to a large extent on rather precise measurements. The couplet relating to *flavus* and *umbratus* on page 30 for example reads as follows:

"14. Either the genal margins of the worker seen in full face with standing hairs prominent above the ground pubescence; or else the longest hairs of the posterior half of the first gastric tergite (exclusive of the extreme posterior strip) are distinctly less than half as long as the maximum width of the hind tibia at its midlength. In the queen the head width is about the same as the width of the thorax just anterior to the tegulae or greater..... ..... *umbratus* (Nylander) or *rabaudi* (Bondroit)

Genal margins of worker seen in full face lacking standing hairs; the longest hairs of the posterior half of the first gastric tergite (exclusive of the extreme posterior strip) at least half as long as the maximum width of the hind tibia at its midlength. In the queen the head width is much less than the width of the thorax just anterior to the tegulae..... *flavus* (Fabricius").

It will be noted that Wilson here uses an important diagnostic character, namely the relative length of the semi-erect hairs on the back of the abdomen. This appears to have been ignored by earlier writers and much facilitates the ready distinction between *umbratus* forms lacking standing appendage hairs and large workers of *flavus* which are sometimes superficially rather similar.



Distribution of *Lasius fuliginosus* Latreille

The difficulty of certain distinction between workers of the two species is alluded to by O'Rourke (1950) but can now be simply resolved by examining the worker in question in profile when the very short hairs particularly of the *mixtus* form contrast with the much longer abdominal hairs of *flavus*. For other members of the British *Lasius* the keys of Donisthorpe are adequate enough and more easily followed. As already pointed out there is unfortunately no way of keying out *rabaudi* males and workers from *umbratus* and queens are essential. Since *rabaudi* has standing appendage hairs, however, there can be no confusion between it and the *mixtus* form of *umbratus*.

The British species and their synonyms after Wilson are as follows:

1. *Lasius* (*Lasius*) *niger* Linnaeus
   Syn. *Lasius niger* var. *alieno-niger* Forel
2. *Lasius* (*Lasius*) *alienus* Foerster
3. *Lasius* (*Lasius*) *brunneus* Latreille
4. *Lasius* (*Cautolasius*) *flavus* Fabricius
5. *Lasius* (*Chthonolasius*) *umbratus* Nylander
   Syn. *Lasius mixtus* Nylander
   Lasius umbratus var. *mixto-umbratus* Forel
   Lasius umbratus var. *affino-umbratus* Donisthorpe
6. *Lasius* (*Chthonolasius*) *rabaudi* Bondroit
7. *Lasius* (*Dendrolasius*) *fuliginosus* Latreille

Keys to the British Species

Keys to the Males

1. Mandibles with five more or less distinct teeth..... *umbratus* or *rabaudi*
   Mandibles with single large apical tooth.....2
2. Head strongly emarginate, colour shining black ..... *fuliginosus*
   Head not or slightly emarginate, colour brownish-black.....3
3. Scape and tibiae with outstanding hairs..... *niger*
   Scape and tibiae hairless.....4
4. Frontal furrow indistinct..... *flavus*
   Frontal furrow distinct.....5
5. Frontal furrow strongly marked, wings smoky..... *brunneus*
   Frontal furrow less distinct, wings clear..... *alienus*

Keys to the Workers

1. Colour shining black, head cordate..... *fuliginosus*
   Colour otherwise, head rounded to emarginate.....2
2. Colour yellow, eyes small.....3
   Colour pale brown to blackish brown, eyes large.....5
3. Scape and tibiae with standing hairs..... *umbratus* or *rabaudi*
   Scape and tibiae hairless.....4
4. Hairs on upper surface of gaster long..... *flavus*
   Hairs on upper surface of gaster very short..... *umbratus*
5. Scape and tibiae with standing hairs..... *niger*
   Scape and tibiae hairless.....6
6. Frontal area distinct..... *brunneus*
   Frontal area indistinct..... *alienus*

Keys to the Queens

1. Head at least as broad as thorax at widest point.....2
   Head narrower than thorax.....4
2. Colour shining black, scale rounded ..... *fuliginosus*
   Colour brownish, scale emarginate.....3
3. Scape conspicuously flattened, funicular segments longer than broad....
   ..... *rabaudi*
   Scape otherwise, funicular segments more or less cup-shaped..*umbratos*

4. Underside of body yellowish, frontal furrow indistinct..... *flavus*
   Colour otherwise, frontal furrow more or less distinct.....5
5. Scape and tibiae with standing hairs ..... *niger*
   Scape and tibiae hairless.....6
6. Frontal area clearly defined, wings smoky..... *brunneus*
   Frontal area indistinct, wings clear ..... *alienus*

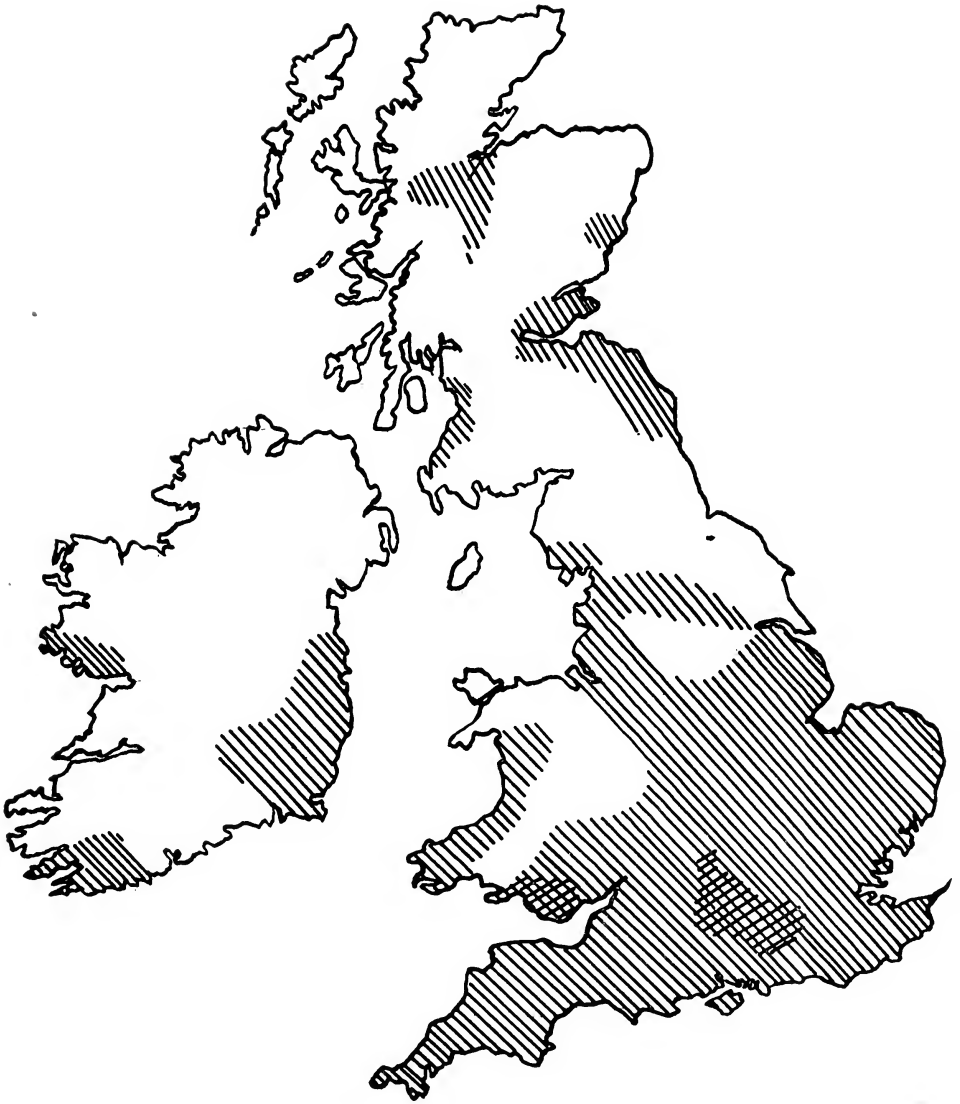
Notes on the Species

L. niger is widely distributed from Sutherlandshire southward. In the Scottish Highlands the species is restricted to river valleys and the sides of lochs such as Oykell, Sutherland, Garve Ross and Loch Ness. It becomes common on the coasts of S. Scotland and N. Ireland and is abundant and generally distributed throughout England, Wales and S. Ireland. This is one of the first species to colonize man-disturbed areas such as felled woodland and quarries. It is frequently populous in gardens, invading glasshouses, kitchens and larders during the summer months. It is an aggressive and active species nesting in the soil, under stones and in tree stumps.

L. alienus occurs sporadically as far north as SW. Scotland but is characteristic of dry uplands and heaths in S. Britain. Examples of habitats where the species is locally dominant are parts of the Malverns and Cotswolds, many areas of dry sandy heath in S. England and the coasts of S. England and S. Wales. It is recorded from a few coastal areas in Ireland and does not appear to occur inland in England further north than Northamptonshire and Warwickshire. It is less aggressive and conspicuous than *niger* and tolerates drier situations, nesting in the soil, in turfy banks but not in tree stumps.

L. brunneus has been recorded from Bedfordshire (Chambers, 1955), Oxfordshire and Buckinghamshire (Pontin, personal communication). It is not uncommon in Windsor Great Park and in parts of Worcestershire and Gloucestershire (Collingwood, 1954). It is a tree inhabiting species nesting in mature oak trees in this country but also occasionally in trees of other species and in coppices. The species appears to be restricted to the S. Midlands and the Thames valley but will probably be found to have a wider range over S. England. Although colonies are populous, it is a fugitive ant and may easily escape detection. Marriage flights occur in June at least a month or more earlier than the other species of this sub-genus.

L. flavus occurs as far north as Berriedale in Caithness and is abundant in the Loch Ness area and on the coasts of Banffshire and Aberdeenshire, but does not become widespread inland until the S. Highland belt in S. Perthshire. Further south it is extremely common and is probably the most abundant ant in Britain. The species is characteristic of old pastures and grassy hillsides where it builds the well-known earth mounds, but is also not infrequent in woodlands nesting in tree stumps and along rides. Macrergates and pterergates are not uncommon with this ant, which is the most polymorphic of the whole genus. Large dark coloured workers and smaller paler workers are usually present together in well established colonies.


Distribution of *Lasius umbratus* Nylander
Distribution of *Lasius rabaudi* Bondroit

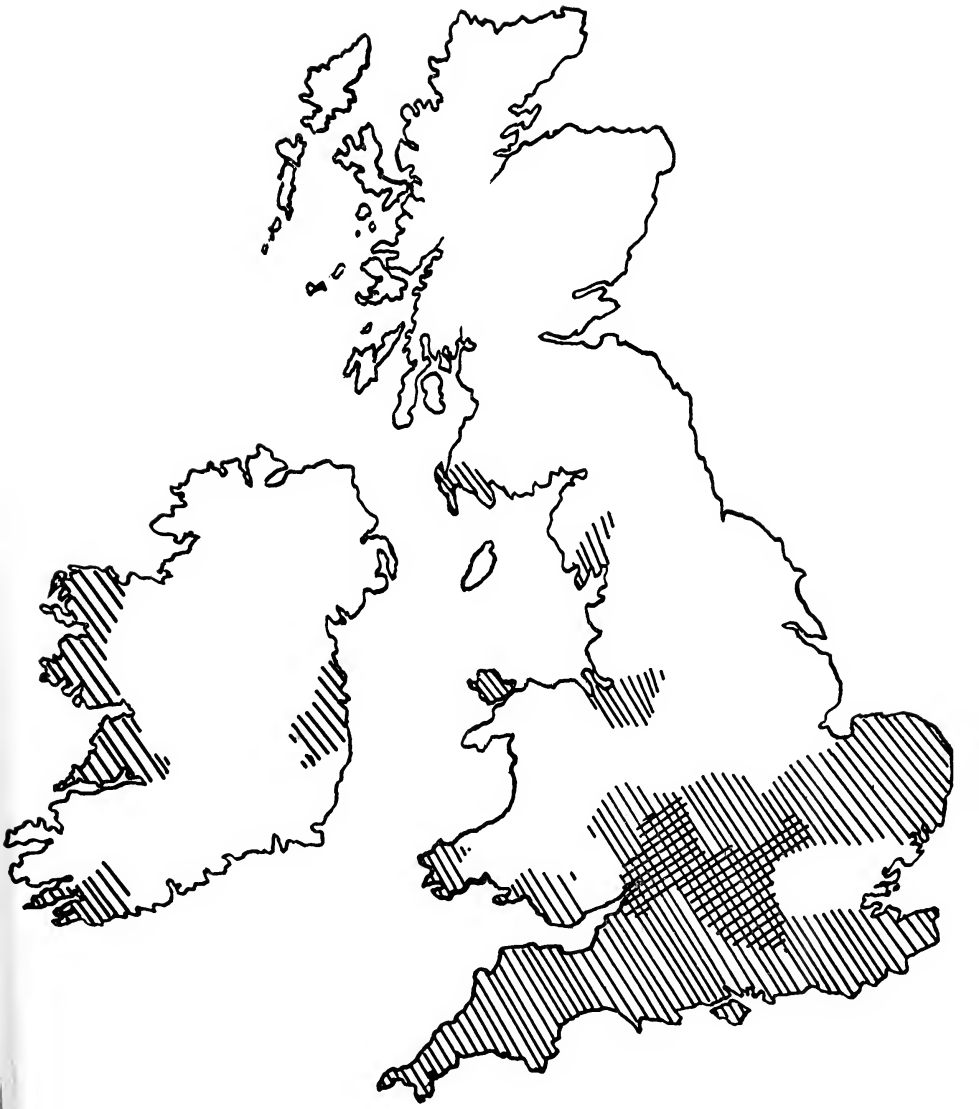
In all the above species fresh colonies are formed by single fertilized queens alone. Occasionally two or more queens are found in the same nest having probably started the colony together but single queens are the rule. At the end of the season any remaining unfertilized queens or those that have strayed back after a marriage flight are destroyed by the workers even in queenless colonies.

L. umbratus is widely distributed in England, Wales, Scotland and S. Ireland but, although taken as far north as Inverness-shire, is not common in N. Britain and nowhere abundant in this country. Nests frequently occur within the base of hollow trees or under deep stones. Occasionally earth mounds are thrown up but there is no consistency in this feature and because of its subterranean habits the species tends to escape observation. The queens have relatively massive heads and slender bodies compared with *flavus* and the *niger* group of species and there is some evidence from a few scattered observations and somewhat artificial experiments that they are unable to found fresh colonies unaided but do so by securing adoption with either *niger* or *alienus*. The writer has found freshly dead queens of *umbratus* in and about the nests of both *alienus* and *niger* on several occasions. It must be admitted, however, that the evidence for the colony founding behaviour of this group of species is scanty and further observation is desirable. In this connection it is perhaps worth mentioning that Wilson failed to secure the experimental adoption of American *umbratus* queens by various of the *niger* group of species and the writer has come across colonies of the similar hairless *mixtus* form in N. Britain in *flavus* territory where *niger* appeared to be absent. Both forms of *umbratus* have the same range in Britain.

L. rabaudi probably has similar habits to *umbratus* but little is known concerning this species as yet. As mentioned above the only known British specimens are from Surrey, Berkshire and Hampshire.

L. fuliginosus is the most conspicuous species of the genus, immediately recognizable by its large size and shining black colour. It is local but widely distributed in England from N. Lancashire, SW. Yorkshire and N. Lincolnshire southward. It also occurs in the Isle of Man, S. Wales, S. Ireland but not Scotland. It nests in trees but also occasionally in hedgerows, walls and in the ground, making large carton nests. Colonies tend to remain in possession of a site for a large number of years and frequently consist of intercommunicating nests covering a small area of woodland, each nest linked by workers moving in slow files over the ground. Such a colony has been observed by the writer intermittently for over twenty years in a Surrey woodland. The species sometimes starts fresh colonies through the adoption of fertilized queens by *umbratus* workers and mixed colonies of the two species have been reported on several occasions both in Britain and elsewhere. Once established a colony will perpetuate itself by branch nests.

Donisthorpe (1927), although somewhat anecdotal and fragmentary, gives much interesting and reliable information on the habits of the ants of this genus and his work should still be consulted for detailed observations on the British species.



Distribution of *Lasius alienus* Foerster

Distribution of *Lasius brunneus* Latreille

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Appendix

Since this paper was written examples of *L. rabaudi* from Porthcawl and Horton in Glamorganshire taken by Mr. H. M. Hallett have been found in the National Museum of Wales and in the Leicester City Museum. The writer is grateful also to Mr. K. E. J. Barrett for an example from Surrey taken as recently as 1954.

Notes on Some Species of Trichogrammatidae (Hym.: Chalcidoidea) Omitted from the "Check List of British Insects"

By W. D. Hincks

The list of Trichogrammatidae included in "A Check List of British Insects" (Kloet and Hincks, 1945: 303-4) is very incomplete due to the omission of a number of species mentioned by Blood in an overlooked paper published in the "Annual Report and Proceedings of the Bristol Naturalists' Society" in 1923 (253-8). This omission was brought to light when Mr. C. H. Ison kindly sent me some Mymarids and Trichogrammatids for identification, including *Centrobia walkeri* (Foerster) (*sensu* Kryger), a species not included in the "Check List" under that name. Reference to a manuscript catalogue of the family recently very kindly placed at my disposal by Mr. E. B. Basden showed that this and several others had been recorded as British species by Blood in the above mentioned paper. The purpose of the present notes is to draw attention to these lacunae and to make some corrections to their nomenclature which have become necessary in the light of recent work on the family. To simplify reference those names not included in the "Check List" are preceded by an asterisk (*).

Blood's paper [1] commences with a list of British Trichogrammatidae (1923: 253) including nineteen species, of which five, attributed to "Blood" in the list, are new to science although they are not specifically so indicated in the text. The brief notes relating to each species are perhaps sufficient to establish their identity and they have been accepted by Nowicki (1935) as dating from 1923. Four of the five species were described subsequently by Blood and Kryger (1928) without any mention of the 1923 paper and in one instance under a different generic name. These four species were included in the "Check List" as from Blood and Kryger, 1928, and are listed below with the emended authority and date:

Grantanna Girault, 1939 (*Neocentrobia* Blood, 1923, *nec* Girault, 1912) *hirticornis* (Blood, 1923)

Monorthochaeta Blood, 1923, *nigra* Blood, 1923

Trachocera Blood and Kryger, 1928, *longicauda* (Blood, 1923) (*Asynacta*)

Orthoneurella Blood and Kryger, 1929 (*Orthoneura* Blood, 1923, *nec* Macquart, 1829) *bimaculata* (Blood, 1923)

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[1] The numerous misspellings in this paper are here merely corrected without detailed references.

Chaetosticha Haliday *in* Walker, 1851 (*Chaetostricha* Walker, in "Check List"), **fumipennis* (Blood, 1923) (*Centrobia*)

The fifth new species introduced by Blood was *Centrobia fumipennis* which was not mentioned in the 1928 paper and consequently was omitted from the "Check List." Nowicki (1935) has now transferred it to the genus *Chaetosticha* Haliday *in* Walker, of which only the generotype is included in the "Check List." It should be noted that this genonym is usually spelt "Chaetostricha" as given in the original publication (1851: 212) but this is a misprint for "Chaetosticha" as indicated in the "Erratum" on page viii of the 1851 volume.

Six other species appear in Blood's list and notes which are not included in the "Check List" under the Trichogrammatidae, though two of them are listed under old Walkerian names in the Aphelinae. The names adopted by Blood are as follows, obvious errors of spelling being corrected: *Lathromeris scutellaris* Foerster, *Centrobia walkeri* (Foerster), *C. silvestrii* Kryger, *C. försteri* Kryger, *Chaetostricha werneri* Kryger, and *Brachista nigra* Kryger. Two of these names will stand as used by Blood, nomenclatorial changes being necessary in the other instances as indicated below.

**Lathromeris* Foerster, 1856, **scutellaris* Foerster, 1856

Blood's inclusion of this species in his list as a British species seems prophetic since he stated that he had never seen it and that it has not been recorded since its first capture in 1856 (in Germany!). It was recorded as a British insect by Waterston (1926) on a specimen taken near Bristol by Blood himself on July 1st, 1922! It was omitted from the "Check List."

Centrobia* Foerster, 1856, *doricha* (Walker, 1839) (*Pteroptrix*) (walkeri* (Foerster, 1851), **errata* Nowicki, 1935)

Nowicki (1935) has stated that Kryger's (1918) *C. walkeri*, introduced by Blood in 1923, is not the same as Foerster's species and proposed the new name *C. errata*. He does not indicate in what way the two species differ and his statement has not been accepted by Nikolskaia (1952) who places *C. errata* as a synonym of *C. walkeri* (Foerster). However, in 1951 Kryger showed that the species known to him as *C. walkeri* is in fact identical with *Pteroptrix doricha* Walker, 1839, after an examination of Walker's type in the British Museum (Nat. Hist.). Walker's name appears in the "Check List" under the genus *Pteroptrix* Westwood, 1833, in the Aphelinae, and as a result of the type examinations of Waterston and Kryger it appears that this is a composite group of small Chalcids including species with 3, 4 and 5-segmented tarsi!

**Centrobia silvestrii* Kryger, 1920

This species retains the name under which it was introduced by Blood (1923).

Ufens* Girault, 1911 (Stephanotheisa* Soyka, 1931) **försteri* (Kryger, 1918) (*Centrobia*)

Nowicki (1935) has transferred *Centrobia försteri* Kryger, to the genus *Ufens* Girault, a step which has been followed by Nikolskaia (1952). The former author also suggests that possibly *Neocentrobia* Blood, *nec* Girault,

may be a synonym of *Ufens* and *N. hirtipennis* Blood a synonym of *U. försteri*. Girault himself, however, has renamed Blood's genus *Grantanna*, as indicated earlier in this paper. Nikolskaia (1952) retains *Neocentrobia* as distinct from *Ufens* but has overlooked the necessary change of name proposed by Girault.

Oligosita Haliday *in* Walker, 1851 (**Chaetostricha* Kryger, 1918, *nec Chaetosticha* Haliday *in* Walker, 1851), *acestes* (Walker, 1839) (*Pteroptrix*) (**werneri* (Kryger, 1918, *Chaetostricha*))

Nowicki (1935) has stated that *Chaetostricha* Kryger, 1918, is not the same as *Chaetosticha* Haliday *in* Walker. This has been accepted by Kryger himself (1951) who further sinks *C. werneri* as a synonym of *Pteroptrix acestes* Walker, 1839, after an examination of Walker's type. The latter name is included in the "Check List" on p. 301.

Brachista Haliday *in* Walker, 1851, *pungens* (Mayr, 1904) (**nigra* Kryger, 1918)

Brachista **rufina* Nowicki, 1936 (**pungens* Kryger, 1918, *nec* (Mayr, 1904))

The genus *Brachista* was first described in 1851 but no species was described until Mayr's *Brachystira pungens* in 1904. It has been assumed that Haliday had *B. pungens* before him when he characterized the genus but there is no evidence to show that this species was British until Blood (1923) recorded *B. nigra* Kryger, which has been shown by Nowicki (1936) after a comparison of the types to be a synonym of the true *B. pungens*. The reddish-brown species, or form, identified by Kryger (1918) as *B. pungens* and mentioned by Blood (1923), was renamed *B. rufina* by Nowicki (1936) who expresses doubts as to its specific rank. This synonymy is overlooked by Nikolskaia (1952).

Two additional British Trichogrammatidae may be mentioned which were not included in Blood's list nor in the "Check List."

Trichogramma Westwood, 1833, **semblidis* (Aurivillius, 1897) (*Oophthora*)

In a series of interesting papers Salt (1935, 1938, 1940) has maintained that *T. semblidis*, parasitic on the eggs of the Alder fly (*Sialis lutaria* (L.)), is distinct from the polyphagous *T. evanescens* Westwood, 1833. Debauche (1942) places *T. semblidis* as a synonym of Westwood's species but does not appear to have been aware of Salt's work.

Oligosita formosa* Nowicki, 1935 (pulchra* (Kryger, 1918, *nec* Girault, 1911) (*Chaetostricha*)).

Bakkendorf (1934) states that *Chaetostricha pulchra* Kryger is a British species, on the authority of Kryger himself who often collected in this country in the company of his friend Dr. Blood.

One further matter calls for comment. The generic and specific names in the "Check List" attributed to Walker, 1851, are usually referred to (Haliday) Walker by continental authors. Reference to the paper in question shows that certain new specific names are followed by (Haliday MSS.) and that a "Synopsis of the Trichogrammini," including a key to four genera, is enclosed between quotation marks and followed by "Haliday MSS." I interpret this to mean that the specific names in question were bestowed by Haliday but that the respective descriptions, which are consistent with

others where Haliday's name is not mentioned, were the work of Walker himself. It is usual to acknowledge the use of a manuscript name in this way but after its first appearance it is the practice to quote only the name of the describer. The three new generic names in the synopsis between quotation marks (*Chaetosticha*, *Brachista* and *Oligosita*), however, are a different matter and are clearly the work of Haliday. They should be altered in the "Check List" from Walker, 1851, to Haliday *in* Walker, 1851, as indicated in the foregoing paper.

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Editorial

Early this year the Society for British Entomology was invited to enter into an agreement with the newly formed British Trust for Entomology. As a result of negotiations between the two bodies it was agreed that they might amalgamate as follows. The Society is to retain its name, identity, and will continue to publish its *Transactions* and *Journal* as at present, except that the financial costs of publication will be borne by the Trust which will therefore publish these periodicals for the Society. Wording to this effect will appear on the title page. The Trust is to make itself responsible for all the financial liabilities of the Society and in return for this the Society's assets will be taken over by the Trust. Members of the Society will automatically become members of the Trust and *vice versa*. The only exception to this being the few honorary members of the Society.

Details of the working agreement were recently circulated to the members of the Society and a postal ballot taken. One hundred and thirty-three (133) of the Society's 230 members replied. Of these 131 were in favour of the working agreement and two recorded disapproval. It is clear, then, that the Society is solidly behind the President and Council on this matter. In the near future representatives of the Society and the Trust will meet to draw up the final terms of the agreement.

As a result of this agreement it is foreseen that administrative costs will be reduced, the quality and quantity of our publications will be raised and their circulation increased.

The Society's periodicals have, hitherto, contained papers dealing with every aspect of British Entomology—those detailing with non-British insects and other terrestrial Arthropoda being excluded. In recent years great advances have been made in ecology. More and more insects are being studied in relation to other terrestrial animals. For that reason it is not always possible, nor indeed desirable, to restrict our publications to subjects which are purely entomological. Council has, therefore, given permission for a minority of papers to be published on British Arthropoda—other than insects.

During the last two years the time taken for a paper to be published has gradually been reduced. Today a period of about six months elapses from the time a paper is accepted until it appears in print. It is hoped that both members and non-members will take full advantage of the increased publication facilities the Society offers. There is every reason to expect that the Society will grow from strength to strength, but this cannot be achieved without the co-operation and support of all members—of which that of authors is, of course, paramount.

Tenth Congress of British Entomologists, Manchester
26th-29th July, 1957

The tenth Congress of the Society was held at Ashbourne Hall, Manchester, by kind permission of the Vice-Chancellor of the University and the co-operation of the Warden, Miss K. G. Gough. The Congress comprised some thirty resident members and about an equal number of day visitors. The general arrangements for the Congress being made by Dr. W. D. Hincks.

The Congress assembled on Friday, 26th July. Dinner was followed by an informal social evening at which a number of films of entomological interest were shown. These included the Danish film on Sexton Beetles, Dr. von Fritsch's film on the "Dance of the Bees" and the new Shell film on the life cycle of the Migratory Locust entitled "The Ruthless One."

Saturday, 27th July

The Congress was officially opened by Professor Mansfield Cooper, Vice-Chancellor of the University, who welcomed the members on behalf of the University and wished them learned and fruitful discussions.

The first paper was given by Professor Eastham, of Sheffield University, and entitled "**Some recent advances in our knowledge of insect feeding mechanisms.**" Professor Eastham first described the brilliant unpublished work of one of his former students, Mr. Willington, on the feeding mechanism of *Corixa*. These insects are of special interest because they are liquid feeders which have secondly become adapted to feeding upon solid material. With the aid of Willington's beautiful diagrams the lecturer described the intricate arrangement of the head muscles by which food is sucked into the oesophagus and then outlined the mechanism for crushing and triturating the food particles so obtained.

Professor Eastham then described Dr. Creighton's work on the feeding mechanism of adult Caddis Flies and explained the action of the complex labial setae. Finally the lecturer explained how the proboscis of *Pieris* coils and uncoils and is used to extract nectar from flowers. The lecture was delivered with a high standard of lucidity and clarity with which Professor Eastham's name is invariably associated.

After morning coffee Dr. Noel Hynes, of Liverpool University, discussed the distribution of "**The British Stoneflies**" and pointed out that the Plecoptera were a group which had been much neglected by British entomologists, but that their importance in freshwater biology had led to study of their ecology and young stages. As a result it was now possible, in Britain, to identify quite small nymphs, and this had enabled data to be collected on their distribution. He showed maps of the distribution of 31 of the 34 species recorded from Britain, the other three species being probably now extinct because of pollution of our large rivers. Of the 31 species three are

known only from Britain and three, or possibly four, others have distinct British races. On the basis of the known distributions and the recent geological history of these islands he discussed the possible rate of speciation in the order and the origin of the British stonefly fauna. He concluded that the distribution of a few species could be accounted for on ecological grounds, and that the others probably arrived in Britain in two main waves of immigration, the first of which had been early enough to allow 17 species to reach Ireland. He suggested that the truly British species might be survivors of an older European fauna, and that the British races of European species had either evolved here in the astonishingly short period of 7,000 years, or also represented types which had since been replaced on the continent by other races.

Dr. Owen Gilbert opened the afternoon session by describing the "**Life Histories of Four Species of Calathus (Carabidae).**" He explained how he had studied the life histories of *C. erratus*, *C. fuscipes*, *C. melanocephalus* and *C. mollis* living on the coastal sand dunes of North Wales. The larvae of these four species are to be found throughout the winter and pupate in April or May. Callow adults occur in late May and June, and adults of *C. erratus* and *C. fuscipes* are most abundant in July and August, disappearing during October and November, whereas *C. mollis* and *C. melanocephalus* adults are most abundant in September and October, though some adults are to be found at almost any time of the year. *C. erratus* and *C. fuscipes* oviposit from July to October and the species over-winters as a third instar larva. In contrast *C. mollis* and *C. melanocephalus* oviposit from July to January and all three instars are to be found during the winter. Some adults of all species survive until their second summer. Dr. Gilbert showed how these differences of life history are also correlated with changes in the condition of the gonads.

Dr. E. Broadhead, in his address on "**Taxonomic and Ecological Problems in the Psocoptera,**" gave a valuable general review of our present knowledge of this insect Order. A virtually complete bibliography comprises only about 800 papers, the majority of these being taxonomic and, to date, about 1,300 species have been described. Seven people have contributed in a major way to the development of the classification of the group—McLachlan in the last century, Banks, Enderlein and Ribaga in the first quarter of this century, and Badonnel, Roesler and Pearman during the last 30 years. The classification of the Order, proposed by Pearman in 1936, has now been widely accepted, although minor modifications will no doubt be made in the light of future work. A dozen or more excellent and extensive monographs on a regional basis, but of course with no claim to completion as far as number of species is concerned, are now available, covering Hawaii, Japan, Indo-Australian region, New Zealand, Seychelles, Java, Ceylon, Angola, Belgian Congo, U.S.A. and Peru, as well as the monograph on European psocids by Badonnel in the Faune de France, 1943. This is the only comprehensive work available for our own psocid fauna.

Little work has been done on aspects other than taxonomy. General biological information on the European psocids has been brought together by Pearman, 1928, Badonnel, 1943, and Hartmann, 1951. Most of the

anatomical and morphological work is to be found in two papers (Ribaga, 1902, and Badonnel, 1934). Four papers (Fernando, 1934, and Goss, 1952, 1953, 1954) deal in detail with embryology—oogenesis, ovarian development and early and advanced development—and one paper (Boring, 1913) records the chromosome number of a psocid species. Fossils are dealt with in several papers (by Enderlein, Hagen, Tillyard and Carpenter). The fossil material is mainly Oligocene, although interesting psocid fossils are known from the Permian, with one primitive form from the Upper Carboniferous.

Generally speaking, our knowledge of psocids in all aspects is very meagre indeed, and advances are likely to be very slow. The number of people who have published papers on psocids in the last 10 years is only 17, and at the present moment only about seven or eight are actively working on this group. **A wide field is open to anyone taking up an interest in these animals.**

Dr. Broadhead then discussed a few selected topics—the morphology of the ovipositor, comparative study of mating behaviour, the incidence of psocids in warehouses and ships' holds in Britain and ecological problems arising from a six-year study of psocid ecology in the Pennine region of Yorkshire.

Male and female genitalic structures in psocids have followed their own independent evolutionary modifications.

The remaining topics discussed have already been published and are to be found in the following papers. Broadhead, E., 1952, A comparative study of the mating behaviour of eight *Liposcelis* species. *Trans. IXth Int. Congr. Ent. Amsterdam*, 1951, 1: 380-3; ———, 1954, The infestation of warehouses and ships' holds by psocids in Britain. *Ent. mon. Mag.*, **90**: 103-5; ———, 1957, The psocid fauna of larch trees in northern England—an ecological study of mixed species populations exploiting a common resource. *J. anim. Ecol.* (in press); Broadhead, E., and Thornton, I. W. B., 1955, An ecological study of three closely related psocid species. *Oikos* **6**: 1-50.

The final paper in the afternoon session was given by Dr. M. W. Holdgate on "**Insects and the Surface Film.**" After an introductory account of the physical principles of wetting, the lecturer showed that the water contact angles of insects show a wide variation which is broadly correlated with roughness of the surface and the type of habitat.

The lecturer also showed that in *Tenebrio* the contact angle declines immediately after moulting, but rises to its former value some 10 hours later. With the aid of reflection electron micrographs of the surface, the lecturer showed these changes were associated with the secretion of the wax layer of the cuticle.

In terrestrial insects the contact angles are generally large, whereas aquatic insects frequently have low contact angles.

Finally, Dr. Holdgate discussed how the form of the Whirligig Beetle (*Gyrinus*) is adapted to living at the surface of the water.

In the evening there was an exhibition of specimens by members and visitors.

Dr. W. D. Hincks exhibited a wide range of entomological literature dating from 1744 to the present day. Amongst this collection there were some handsomely illustrated Japanese publications which created a great deal of interest. Dr. Hincks also exhibited a collection of typical insects from Millers Dale.

Mr. Alan Brindle exhibited a collection of British Cylindrotominae. This is a small group of Crane flies, which is, according to Alexander, decadent, being better represented in the early and middle Tertiary deposits than at present. In Britain there are only four species. The larvae are of special interest, because they feed on bryophytes. *Cylindrotoma* and *Diogma* have terrestrial larvae which feed on moss, whereas the larvae of *Triogma* and *Phalacrocera* are aquatic, feeding on *Hypnum* and *Sphagnum* respectively.

Mr. R. O. Brinkhurst exhibited alary polymorphism in the Gerroidea (Hemiptera Heteroptera).

It is well known that there are many polymorphic forms in the Gerroidea, ranging from macropterous to apterous. These specimens illustrate the alternative forms of some species. It has been shown in the genus *Gerris* that the short winged form is almost restricted to the first generation of bivoltine species. There is little variation in form of univoltine species such as *Gerris najas* and *Gerris costae*. This is considered to be related to the need for flight in the autumn and spring, at which times the insects are moving to and from over-wintering sights on land.

Mr. H. Britten exhibited specimens of Trypetidae mounted on celluloid and with the genitalia dissected to show the form of the male claspers. A specimen of a male *Urophora jaceana in cop.* with a female *Ceriocera cornuta* was also exhibited.

Dr. Bartindale exhibited a large collection of British Water Beetles, which had much of great interest to Congress members.

Mr. Crewdson exhibited a collection of various British Lepidoptera collected by him or bred from captured females and their progeny.

Mr. Kerrich exhibited a complete collection of British Perilampidae (Hym. Chalcidoides).

Saturday evening, by tradition, was devoted to a Conversazione and Congress Dinner, sherry kindly being provided on this occasion through the generosity of the Manchester Entomological Society.

Sunday, 28th July

Just before 10 a.m. a coach and four cars left Ashbourne Hall for an excursion to Chee Dale and Millers Dale. These two localities are situated on the Carboniferous limestone and contain a rich and varied fauna. Unfortunately the sky was overcast and the number of insects on the wing was small compared with what might have been available under better conditions.

In the evening there was an informal discussion on the day's collections.

Monday, 29th July

In a review of "**The Insect Cuticle**" Mr. Blower surveyed the work since Wigglesworth's classic paper in 1933 up to the present day. Pointing out that a subject, which had already been reviewed twice within eight years by Wigglesworth and had been treated in encyclopaedic fashion by Richards in a book, was not readily amenable to a short synthesis. He briefly treated two important aspects historically: the nature of the hardening processes and the structure and physiology of the epicuticle.

A series of important contributions to the study of insect cuticle has been made and are being made by Professor Dennell and his students at Manchester. We were therefore privileged in having one of Professor Dennell's students, Mr. J. H. Kennaugh, to give a "stop press" account of recent advances in our knowledge of the chemistry of the hardening process. Mr. Kennaugh described how the investigation by paper chromatography of cuticle extracts from *Calliphora* and *Periplaneta* had lead to a new view of the origin and nature of the phenols, which form the precursors of the tanning agents in sclerotisation.

Dr. E. J. Popham, in a paper entitled "**The Feeding Habits of Earwigs,**" showed that although there was a great similarity in the form of the mouth parts of mandibulate insects, yet a more detailed study revealed that they were used in a diversity of ways from one order to another. After describing how *Forficula auricularia* L. (the Common Earwig) feeds, he suggested that the early Dermaptera were herbivorous and that the form of the Dermapteran head was an adaptation towards carnivory in specialised habitats, such as litter or under bark. From a generalised omnivorous feeder, such as *Cranopygia* there were trends towards almost complete carnivory in several subfamilies. The Labiidae being specially adapted for subterranean carnivory, the Forficulidae showed trends towards the evolution of tunnelling mouth parts, which was associated with a secondary return to a predominately herbivorous mode of life.

The closing address was given by the President, Mr. G. S. Kloet, M.Sc., entitled "**Entomythology.**" This was a masterpiece of wit, satire and good humour, illustrated with his inimitable cartoons. From the very first slide insects lifted us from earth into flights of fantasy. Here we saw entomologists from an insect's point of view. The lecture was in every sense entomological; it was in fact mainly nonsense, but nonsense of such a high order that the Editor is unable to publish a word of it—at least for the time being.

It was upon this note of good humour that the Congress closed. Votes of thanks were given to all concerned and especially to Dr. W. D. Hincks, who was responsible for its organisation.

Reviews

Richard E. Blackwelder. Checklist of the Coleopterous Insects of Mexico, Central America, the West Indies and South America. United States National Museum, Bulletin 185 (part 6). Smithsonian Institution, Washington, D.C. 1957.

The first five parts of Dr. Blackwelder's important compilation were published from 1944 to 1947 (pp. xii+1-925) and consisted of a Check List of Neotropical Coleoptera which is beyond the scope of the present notice. After a delay of 10 years part 6 (pp. vii+926-1,492) has now appeared, consisting of the bibliography (pp. 927-1,388), corrigenda and index. The long delay has been caused, we are informed in the Introduction, by the inexplicable loss of the whole of the compiler's bibliography, and by the preparation of a new and more comprehensive one. It is the bibliographical section of the work which is of special interest to British Coleopterists. Bibliographies are very important tools in the hands of the working entomologist, providing they are carefully compiled. It is clear that the greatest care has been exercised in the present instance and we learn from the Introduction of the many errors of date and other details which were discovered and corrected, an experience which seems to be the lot of all serious cataloguers. British entomologists will find the details of many of our standard authors such as Curtis, Stephens, Westwood and others, accurately recorded, and also the major continental works which are so widely used by British Coleopterists.

The title pages of many of the older works, published in parts over several years, are frequently very misleading as to the dates of publication, and Blackwelder's careful research provides a marked advance in the bibliographical treatment of such publications. The compiler, on the other hand, would be the first to agree that there are still many anomalies awaiting clarification. For instance, the well known, beautifully illustrated work of Voet (Catalogus Systematicus Coleopterorum) is dated 1806 on the title page but would appear to have been published in parts from 1769; no copies appear to have survived in the original parts, however. An anomaly which has come under the writer's notice concerns Guérin-Méneville's "Spécies et Iconographie générique des Animaux Articules," published in nine parts, from January, 1843, to February, 1849, and comprising 36 articles. Horn and Schenkling (1928-9, Index Litteraturae Entomologicae) as well as Blackwelder, refer the whole work to Guérin-Méneville although articles 17 to 32 are clearly stated to be by M. de la Ferté-Sénectère and articles 16 and 35 by J. O. Westwood. Neither of these authors are acknowledged as contributors by the standard bibliographies, except Sherborn, as will be seen below. Both Horn and Schenkling and Blackwelder cite de la Ferté-Sénectère's "Monographie des Anthicus" as Paris, 1848. Sherborn (1922, Index Animalium; lxxvi) however, has pointed out that this work is actually a reprint, with altered headings, of the author's contributions to Guérin-Méneville's publication. In this case the title page is dated 1848 but dates from November, 1846, to May, 1847, represent the first publication.

Of course there must be many problems of this kind still outstanding, some of purely bibliographical interest, others affecting the correct date of publication of genera and species. It is true to say, however, that the labours of Dr. Blackwelder have provided Coleopterists with a bibliography which will enable them to achieve a much greater degree of accuracy in bibliographical citation. W.D.H.

Bestimmungstabellen Der Blattminen Von Europa by Erich Martin Hering.

Band I (pp. 648), Band III (pp. 221), 6″×9½″, 1957, The Hague, Dr. W. Junk

The subject of leaf-mining insects has long been associated with the name of Professor Hering and his many papers and several larger works have come to be regarded as the standard texts on the subject. His "Die Blatt-Minen Mittel- und Nord-Europas" was published in six parts from 1935 to 1937, but unfortunately had not achieved general distribution before the war when the remaining stocks were destroyed. The admirable introductory "Biology of the Leaf Miners" was published in 1951, in English, thanks to the excellent translation of Mr. K. Spencer. Owing to a lamentable lack of support by English speaking entomologists the proposed new edition of the first mentioned work has now appeared in German. Two of the three volumes are before us: volume I being the keys to leaf-miners arranged under host-plants A to L, and volume III containing 86 plates comprising about 750 line drawings of mines and details of miners. Volume II, containing host-plants M to Z, is promised for November of this year. The text so far issued includes 3,133 leaf-miners (some polyphagous species being duplicated under different food plants) out of a total of 5,551. The first thing that strikes one when the two editions are compared is the far more extensive range of included species in the second and the greatly increased biological, distributional and other data which the present volumes include. Professor Hering's work is of such a fundamental nature as to be essential to all those interested in leaf-miners—it is a vital necessity to students of micro-Lepidoptera and of the Agromyzidae and related mining Acalyptrate Muscoids. Care has been lavished on the work by its author as even a superficial examination will reveal, and the publishers have clothed it adequately. Henry Tibbats Stainton, the pioneer British student of leaf-miners, would have greatly appreciated Hering's fine volumes and one can imagine with what pleasure and laudatory comment he would have reviewed it in the Entomologist's Annual of 1870. The recent work of Mr. Kenneth Spencer and his colleagues on the British Agromyzidae has shown what can be done under the stimulation of Professor Hering. Is it too much to ask that British micro-lepidopterists should study under the same master?
W.D.H.

The Water Relations of Terrestrial Arthropods by Dr. E. B. Edney
Professor of Zoology in the University College of Rhodesia and Nyasaland
Cambridge Monographs in Experimental Biology, 5
Cambridge University Press, 1957, pp. 109, 32 text figures. 15s. nett

Just after the last war we witnessed a fascinating and spectacular step forwards in our understanding of the water-conserving properties of the insect cuticle. This had resulted from physiological studies proceeding hand-in-hand with accumulating knowledge of the histology of the cuticle. Professor Edney begins his book with a scholarly review of this subject and gives us such a careful and lucid account of the facts, the underlying physical theory and the resulting arguments and conclusions that the flaws now stand out sharply. It is a series of object lessons in scientific method and a model of enlightened review and criticism.

Ten years ago the picture of the insect cuticle in relation to water conservation seemed very complete; a superficial wax layer reduced transpiration at normal temperatures but at a certain "critical temperature" which varied from species to species the wax molecules were disorientated and a sharp rise in transpiration resulted. Waxes from several species of insects were removed and redeposited on inert membranes where they were found to show the "critical temperature" appropriate to their species. Mechanical damage to the wax layer or solution of the wax by chloroform demonstrably increased the rate of transpiration. Recently, however, it has been shown (in large part as the result of the work of Edney and his students) that the data from which curves were drawn to demonstrate the "critical temperature" do not, in fact, show a sharp rise in transpiration but an approximately exponential increase. The presence of a "critical temperature" can no longer be regarded as evidence for the presence of a wax layer and, of course, it follows that the absence of a "critical temperature" is not evidence for postulating the absence of a wax layer.

Professor Edney does not merely summarise the development of this classic edifice and then demolish it; he makes a clear appraisal of just what is left and where and how future work may throw further light on these problems. In the introduction to the book it is observed "the main stimuli for the study of water relations came from ecology"—but it is clear that some of the work reviewed has very tenuous connections with the lives of arthropods in the field; perhaps the author could have made a clearer differentiation between the data obtained from experiments with dead insects as opposed to that obtained from experiments on living animals.

The author does far more than discuss how the arthropod cuticle may or may not conserve water, however; he reviews the whole question of the water economy of excretory and osmo-regulatory processes and the various devices for obtaining water from the environment—by metabolism of solid food, by drinking or by absorbing water or water vapour. The book concludes

with a discussion of body temperature and transpiration. Here the author adds an account of what is perhaps the most fascinating aspect of his own work on woodlice to a clear exposition of the work of others in this field.

The final judgment of a monograph of this type must be made in terms of the number of lines of work it opens up in one's mind. The reviewer found himself planning far too many research projects after an evening with this book. J. GORDON BLOWER.

A Revised Key to the British Water Bugs (Hemiptera-Heteroptera) by T. T. Macan. (*Freshwater Biological Association, Scientific Publication No.* 16. *Price to non-members* 4*s.* 0*d.*).

The previous keys to Aquatic Hemiptera (Sci. Publ. Nos. 1 and 4) have done much to encourage the study of these insects by both professional and amateur entomologists. It is not surprising, therefore, that both these publications have been out of print for several years. Readers will, therefore, welcome the news that these two works have been revised and re-issued in a single volume, at a very reasonable price of only 4/-. Dr. Macan has expanded the text, added several diagrams and modernised the nomenclature. The ecological data has been expanded in the light of nearly twenty years researches on the subject. The booklet ends with a well chosen bibliography.

NOTICE

A collection of PHOTOGRAPHS of BRITISH ENTOMOLOGISTS (amateur and professional) with biographical notes is being formed to present to the HOPE DEPARTMENT OF ENTOMOLOGY, OXFORD UNIVERSITY, for custody, reference and upkeep. Each photograph is mounted on a stout, linen-jointed quarto page with biographical notes typed beneath and covered with transparent, protective sheet. The pages are assembled in loose leaf albums. British entomologists are invited to send their photographs and notes to **Dr. C. D. Day, 7 Weymouth Avenue, Dorchester, Dorset.** An unmounted, professional one of head and shoulders, about 4″ by 5″ or at least $3\frac{1}{2}$″ by $4\frac{1}{2}$″, SIGNED and DATED (the date of taking) on the **front** of the photograph itself, and stiff card protected is requested. The notes desired include: full name, home address, date and place of birth, places of education, any degrees, awards, distinctions, former occupation, occupation, any war service, chief entomological work or interests, names of any species found new to Britain, any publications, other interests, recreations, etc., married, family.

Taxonomist's Glossary of Genitalia in Insects, edited by S. L. Tuxen.

1956, Ejnar Munksgaard, Copenhagen. 284 pp., 215 ff., $6\frac{5}{8}'' \times 9\frac{7}{8}''$

The most prominent development in the field of insect taxonomy during the twentieth century has been the great increase in the use of criteria derived from the genital organs. Having developed along specialised lines, independently in different groups and orders, an astonishing and even bewildering diversity of nomenclature has resulted, with almost no attempt at homology. During a symposium on the use of genitalic characters in insect taxonomy at the Ninth International Entomological Congress at Amsterdam in 1951, Dr. S. L. Tuxen proposed that a group of specialists should be asked to contribute to a glossary which might help to remove some of the difficulties which beset the subject. It is greatly to Dr. Tuxen's credit and to his great editorial ability that this work has now appeared after so short a period as five years. The contributions of the 34 specialists, covering 29 orders which make up part I of the work, have been kept to reasonable bounds, are written in English and are well illustrated. Part II (pp. 175-284) is the major contribution of the volume and was prepared solely by Dr. Tuxen. It consists of a glossary of more than 4,000 different terms, *mirabile dictu*, which have been applied to the description of insect genitalia—surely individuality gone mad! Taxonomists owe a great debt to Dr. Tuxen for initiating this enterprise, for his able editorship and, not the least, for his spectacular lexicographical achievement of almost Johnsonian proportions. The volume is nicely turned out, handles well, and is thoroughly desirable by the working taxonomist. W.D.H.

Congratulations

The Society offers its hearty congratulations to its President, Mr. G. S. Kloet, on being awarded an honorary degree of M.Sc. by the University of Manchester, in recognition of his outstanding services to the cause of entomology both at a national and local level. His "Check List of British Insects," completed in collaboration with Dr. W. D. Hincks, is a unique masterpiece. It is gigantic both in its conception and execution. Today there are few entomologists who have not frequent recourse to it.

Mr. Kloet has, for many years, been a leading figure of the Manchester Entomological Society, which he has represented as a member of the Committee of the Manchester Museum.

The Society owes much to Mr. Kloet's prudent leadership, especially during his period of office as President. We all, therefore, rejoice that he has received the distinction he deserves and wish him every success in the future.

OBITUARY

Frederich James Killington, D.Sc.

News has been received, and was announced at this year's Congress, of the death of Dr. F. J. Killington, founder member of our Society.

Frederich James Killington was born on 1st July, 1894, at Eastleigh, Hampshire, eldest son of James Killington, a coach-builder. He won a scholarship to Peter Symonds School, Winchester. From there he went to University College, Southampton, where he won an exhibition for an extension for two years. His studies were interrupted by the war. In 1918 he took up the profession of school-teaching at Southampton, where most of his career was passed. In 1932 he was granted two years' leave to study at Jesus College, Oxford; he obtained his B.Sc. in 1932, and was awarded the degree of D.Sc. in 1939.

He was renowned for his studies on the Neuroptera, particularly the British species. These culminated in the production of his two-volume Ray Society monograph of the British Neuroptera, published in 1936-37, which was a model of what such standard work should be. In it he treated the systematics, external and internal anatomy, and bionomics very fully; in the systematic part he gave descriptions of all stages of the species. The illustrations were mainly his own, particularly noteworthy being his coloured plates of wings of Hemerobiidae.

Killington was one of the group of southern entomologists who founded our Society, as the Hampshire Entomological Society, and brought it through two further instars to emerge in 1934 of the full stature of which we know it today. He acted for many years as Editor of the Society, first with the assistance of Dr. B. M. Hobby, and later with an enlarged editorial board. Of later years, owing to failing sight, he ceased taking an active part in entomology and in the affairs of the Society.

He married at Portland in 1916 Dorothy Bartlett, who survives him, together with two married daughters and five grand-children. His collection is now in the Hope Department. G.J.K.

R.I.P.

It is with deep regret that the Society also learns of the death of

PHILIP HARWOOD

An extend notice will be published in the next issue of the *Journal*

R.I.P.

(*Continued from inside front cover*)

ORTHOPTERA, Etc.

A Summary of the Recorded Distribution of British Orthopteroids. By D. K. McE. Kevan, 1952. 16 pp., 5*s*. 0*d*.

HEMIPTERA-HETEROPTERA

The Natural Classification of British Corixidae. By G. A. Walton, 1943. 14 pp., 1*s*. 9*d*.

Contributions towards an Ecological Survey of the Aquatic and Semi-Aquatic Hemiptera-Heteroptera of the British Isles.

Anglesey, Caernarvon and Merioneth. By E. S. Brown, 1943. 62 pp., 3*s*. 0*d*.

North Somerset. By G. A. Walton, 1943. 60 pp., 26 figs., 4*s*. 0*d*.

Scottish Highlands and East and South England. By E. S. Brown, 1948. 45 pp., 7*s*. 6*d*.

The Ribble Valley (Lancashire South and Mid). By E. J. Popham, 1949. 44 pp., 1 map., 8*s*. 0*d*.

North-East Wales (Denbighshire and Merionethshire). By E. J. Popham, 1951. 12 pp., 2*s*. 6*d*.

The Hemiptera-Heteroptera of Kent. By A. M. Massee, 1954. 36 pp., 7*s*. 6*d*.

The Bionomics and Immature Stages of the Thistle Lace Bugs (*Tingis ampliata* H.S. and *T. cardui* L.; Hem., Tingidae). By T. R. E. Southwood and G. G. E. Scudder. 8*s*. 0*d*.

COLEOPTERA

The Aquatic Coleoptera of North Wales. By E. S. Brown, 1948. 15 pp., 1 fig., 1*s*. 0*d*.

The Aquatic Coleoptera of Wood Walton Fen, with some comparisons with Wicken Fen and some other East Anglian Fens. By F. Balfour-Browne, 1951. 36 pp., 4*s*. 6*d*.

LEPIDOPTERA

The Morphology of *Luffia ferchaultella* and a Comparison with *L. lapidella* (Psychidae). By R. S. McDonogh, 1941. 19 pp., 9 pls., 4*s*. 0*d*.

List of the Lepidoptera of Dorset. Part 2. By W. Parkinson Curtis, 1947. 138 pp., 4 pls., 11*s*. 0*d*.

Postural Habits and Colour-Pattern Evolution in Lepidoptera. By M. W. R. de V. Graham, 1950. 16 pp., 4 pls., 4 figs., 4*s*. 0*d*.

HYMENOPTERA

A Consideration of Cephalic Structures and Spiracles of the Final Instar Larvae of the Ichneumonidae. By B. P. Beirne, 1941. 68 pp., 31 figs., 5*s*. 6*d*.

Second Review of Literature concerning British Ichneumonidae. By G. J. Kerrich, 1942. 35 pp., 7 figs., 3*s*. 0*d*.

The Hymenoptera Aculeata of Bedfordshire. By V. H. Chambers, 1949. 56 pp., 3 maps, 10*s*. 0*d*.

An Introduction to the Natural History of British Sawflies. By R. B. Benson, 1950. 98 pp., 9 pls., 10*s*. 0*d*.

Notes on Some British Myrmaridae. By W. D. Hincks, 1950. 42 pp., 5 figs., 1 pl., 5*s*. 0*d*.

The British Species of the Genus *Ooctonus* Haliday, with a Note on some Recent Work on the Fairy Flies (Hym., Myrmaridae). By W. D. Hincks, 1952. 12 pp., 8 figs., 4*s*. 0*d*.

The Natural History of some *Pamphilius* Species (Hym., Pamphiliidae). By V. H. Chambers, 1952. 16 pp., 4 pls., 5*s*. 0*d*.

A Study of some British species of *Synergus*. By J. Ross, 1951. 16 pp., 4*s*. 0*d*.

A Revision of Section I (Mayr, 1872) of the Genus *Synergus* (Hym., Cynipidae) in Britain, with a Species new to Science. By R. D. Eady, 1952. 12 pp., 4 pls., 4*s*. 0*d*.

The British Ants allied to *Formica fusca* L. (Hym., Formicidae). By I. H. H. Yarrow, 1954. 16 pp., 8 figs.. 3 maps, 5*s*. 0*d*.

The British Ants allied to *Formica rufa* L. (Hym., Formicidae). By I. H. H. Yarrow, 1955. 48 pp., 58 figs., 1 map, 10*s*. 6*d*.

DIPTERA

Preliminary List of the Hosts of some British Tachinidae. By H. Audcent, 1942. 42 pp., 2*s*. 9*d*.

An Outline of a Revised Classification of the Syrphidae (Diptera) on Phylogenetic Lines. By E. R. Goffe, 1952. 28 pp., 3 figs., 6*s*. 0*d*.

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