

HYDROBIOLOGIA

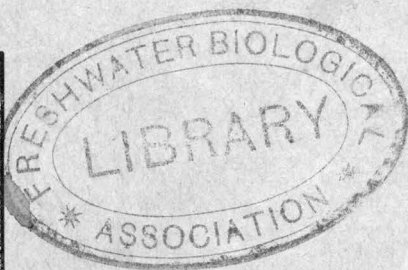
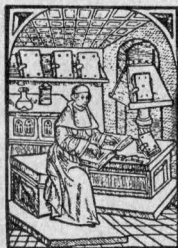
ACTA HYDROBIOLOGICA, LIMNOLOGICA ET
PROTISTOLOGICA

Taxonomy of the nymphs of the British species of Leptophlebiidae (Ephem.)

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(Freshwater Biological Association, Ferry House, Ambleside,
Westmorland, England).

(with 4 figures)



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Taxonomy of the nymphs of the British species of *Leptophlebiidae* (Ephem.)

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As in previous studies (see Macan 1951 for references), specific distinction has been established on cast skins identified from the adults that emerged from them. Points of difference having been found in this way, it has been possible to base the descriptions on both cast skins and whole nymphs.

There are six British species in this family: two in the genus *Leptophlebia*, three in the genus *Paraleptophlebia*, and one in the genus *Habrophlebia*.

The nymphs of all have been described before, but critical comparison of the species has revealed differences not noticed previously and shown that some of the distinctions used hitherto are less reliable than has been thought.

Separation of the genera

Habrophlebia is distinguished at once by its gills, each of which has several filaments (fig. 3F), and there are other points of difference, which have been mentioned in the description of *H. fusca*. *Leptophlebia* and *Paraleptophlebia* are also distinguished by the gills, though otherwise they resemble each other closely. The gills of *Leptophlebia* are swollen at the base (fig. 3M, V), those of *Paraleptophlebia* are more or less straight-sided (fig. 3S, T). In small specimens of *Leptophlebia*, however, the basal swelling of the gill is very slight and in specimens 3 mm. long (the smallest I have seen)

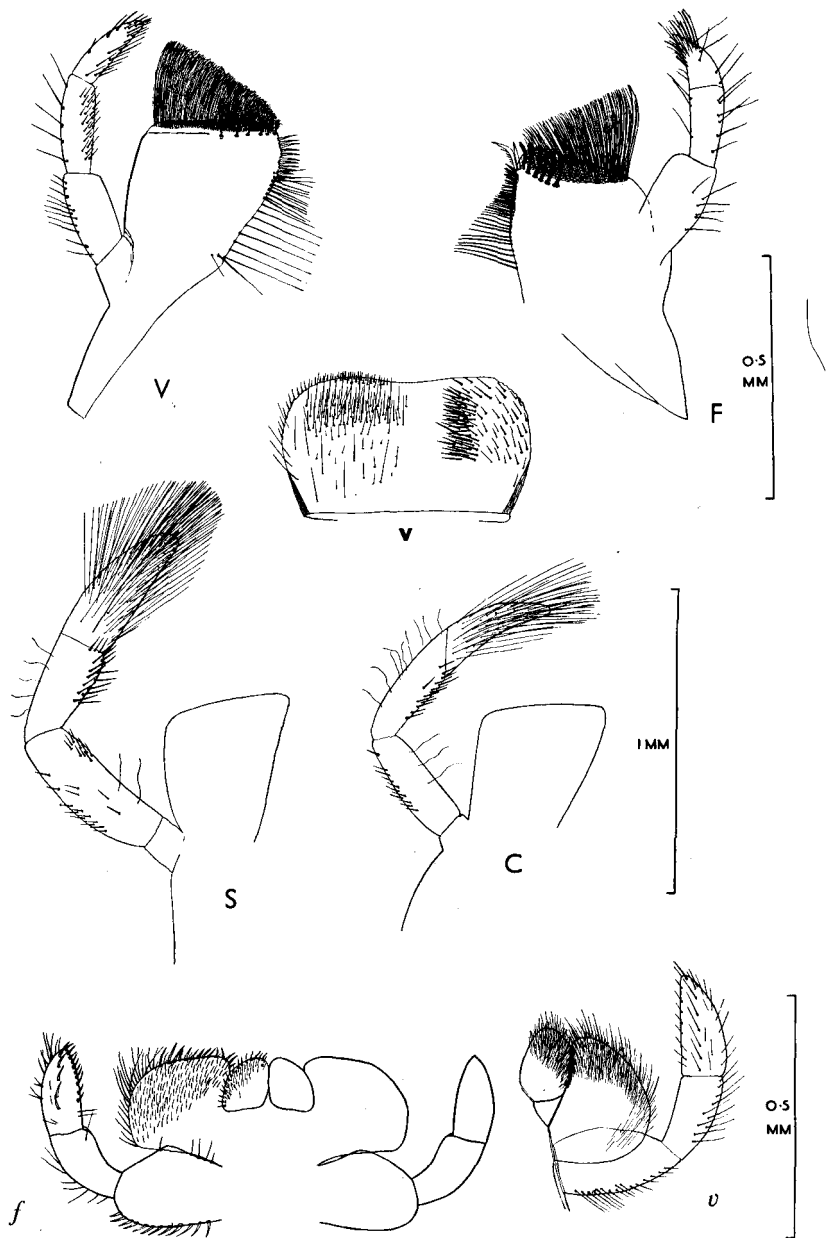


Fig. 1

V, F maxilla of *Leptophlebia vespertina* and *Habrophlebia fusca*. V labrum of *L. vespertina*. S, C maxillary palp and outline of maxilla of *Paraleptophlebia submarginata* and *P. cincta*. f, v labium of *H. fusca* and *L. vespertina*.

it is easily overlooked unless the gill is examined carefully. The maxillary palps of *Paraleptophlebia* (fig. 1S, C) are longer than those of *Leptophlebia* (fig. 1V). Specimens of *Paraleptophlebia submarginata* 3 mm. long (small specimens of the other two species in this genus were not available) are more easily distinguished from specimens of *Leptophlebia* of the same size by the maxillary palps than by the gills.

Descriptions and comparisons of the species

Leptophlebia vespertina (Linnaeus)

Previously described by Lestage 1917 (p. 330) and 1919 (p. 120 and fig. 7).

Material: Blelham Beck, WL, 2 cast skins; Cunsey Beck, WL, 1 cast skin; Nor Moss Beck, WL, 6 cast skins; Waterston Moss, WL, 4 cast skins; Windermere, WL, 1 cast skin; Wise Een Tarn, WL, 2 cast skins; Wray Mires Tarn, WL, 3 cast skins; Buttermere, CU, 2 cast skins; Wicken Fen, CB, 6 whole nymphs; Ditchend Brook, SH, 6 whole nymphs; Dockens Water, SH, 1 cast skin.

Markings: The nymph is brown. On each abdominal tergite there is a pair of triangular light dots near the proximal margin, and larger less distinct light areas near the sides. This pattern is rather constant, though the degree of contrast between the light and dark parts varies considerably.

Lengths: 7.0—10.0 mm.

Mouthparts, legs, and gills are illustrated in figs. 1, 2, 3 and 4. It will be more convenient to discuss them under the next species.

Ecology: In the Lake District (WL and CU) this species abounds in the more sheltered parts of lakes (Moon 1936) and in tarns (Macan 1949) and occurs also in slowly flowing streams where there is vegetation. In southern Hampshire (SH), nymphs were found in streams draining the sandy base-deficient soils of the New Forest, but not in the calcareous waters of the River Avon and its tributaries (Macan, T.T. and Z. 1939). The species was found in ditches among the sedge at Wicken Fen, a region of calcareous peat.

Leptophlebia marginata (Linnaeus)

Previously described by Lestage (1917, p. 328 and fig. 25).

Material: Nor Moss Beck, WL, 1 cast skin; Rather Heath 6, WL, 3 cast skins; Three Dubs Tarn, WL, 1 cast skin; Cooper's Bottom, SH, 4 whole nymphs; Loch of Lauriston, 2 whole nymphs. (The last place is presumably in Scotland, but there is no other data on the label and I cannot remember who was kind enough to send these specimens).

Markings: The pattern on the abdominal tergites is basically the same as that of *L. vespertina*, but more variable. The lateral pale marks are commonly smaller, and there is often a distal median light dot, line, or triangular mark.

Lengths: 10.5—11.5 mm.

The mouthparts are identical with those of *L. vespertina* apart from some small details of trichiation: the hairs on the front margin of the

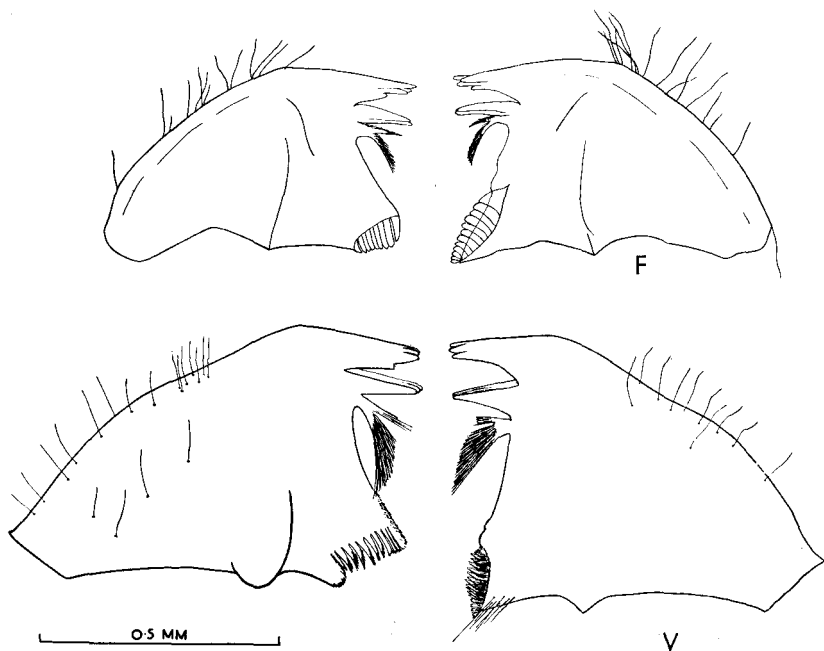


Fig. 2.

Mandibles of *Habrophlebia fusca* (F) and *Leptophlebia vespertina* (V).

labrum and at the tip of the labial palp are somewhat longer, and more of the paraglossae is covered with hairs.

Gills: The blade of each gill, except the first, is broad and ovate, sweeping round to meet the filament somewhat abruptly (fig. 3M), whereas that of *L. vespertina* tapers gradually into the filament (fig. 3V). The filament of *L. marginata* is shorter than that of *L. vespertina*. This difference in gill-shape has hitherto been deemed sufficient to distinguish the species (eg. Schoenemund 1930, Ulmer 1943). The shape of the gill, however, depends on its size, and the typical ovate shape of *L. marginata* is found only on full-grown nymphs; moreover, the length of the filament is variable. A specimen of *L. marginata* 8 mm. long has gills very like those of *L. vespertina* of the same size, and the two cannot be separated on this character.

Legs: The underside of the fore femora of *L. vespertina* (fig. 4V) is beset with spines most of which are complex and of the type shown in fig. 4v. They are fairly obvious under the low power of the compound microscope (x 165). Some of them have more lateral branches than those illustrated, and a few have numerous tiny lateral branches that are no more than hairs.

The corresponding spines of *L. marginata* appear simple under low power magnification, but under high power (x 750) are seen to be fringed with tiny hairs (fig. 4m). This is the most certain distinction between the species.

On a specimen of *L. vespertina* 3 mm. long, most of the spines had more lateral branches than those of bigger specimens, and there were more spines bordered with hairs, but it was just possible to make out with low power magnification that some of the spines were complex. The smallest specimen of *L. marginata* seen was 5.2 mm. long. The lateral hairs on the spines were rather more conspicuous than those of larger specimens, but they were still detectable only under high power magnification.

The middle legs of the two species do not differ significantly. The upper surface of the tibia of *L. vespertina* usually has a few spines on it, that of *L. marginata* is usually bare except for some long hairs. The tibiae of the hind legs of the two are similar, with fairly numerous spines along the upper surface, but the tarsi differ. Those of *L. marginata* usually have a number of spines along the upper surface (fig. 4M), those of *L. vespertina* none or only a few. Unfortunately this is not invariable, and *L. vespertina* may bear many spines.

The teeth approach nearer the tip of the claw in *L. vespertina* (fig. 4V) than in *L. marginata* (fig. 4M). This difference is constant on the specimens that have been examined and, with a little practice, affords a satisfactory means of distinguishing the two species.

Ecology: This species has generally been found with *L. vespertina*, though in smaller numbers.

Paraleptophlebia submarginata (Stephens)

Material: Nor Moss Beck, WL, 3 cast skins and 2 whole nymphs; R. Rawthey, MY, 4 cast skins and 1 whole nymph; R. Ribble, MY, 1 cast skin; Teal Burn, KF, 3 whole nymphs; Daggons Brook, SH, 2 whole nymphs.

I am indebted to Mr D. Scott of the Scottish Brown Trout Research Laboratory for the specimens from Teal Burn.

Markings: Some specimens have abdominal markings similar to those of *L. vespertina*; others are uniformly brown. Some have a pale transverse line and a U-shaped mark at the distal end of the segments.

Lengths: 8.0—11.5 mm.

The mouthparts are like those of *L. vespertina*, except that the last segment of both sets of palps bears long fine hairs, those on the maxillary palp being particularly long and dense. The whole palp is of unusual length (fig. 1S).

Gills: There is a progressive but slight diminution in the size of the gills from the middle to the ends of the series, except that the first is distinctly smaller than the rest, usually about half the size (fig. 3S).

Legs: Spines are absent from the upper surface of all the tarsi and from the fore and mid-tibiae.

The spines on the femora occur in three irregular rows, along the top, along the middle, and along the bottom (the leg being in the position shown in fig. 4). On the fore femora most of the spines are fairly long, those in the middle are finer than the others, and all are tapering and pointed except a few at the distal end of the upper row. These taper but are blunt at the tip. The mid femur is similar but there are more blunt spines, most of those in the middle row being blunt. The hind femur has characteristic spines. All those of the middle and bottom rows are blunt and parallel-sided, and some are short (fig. 4s).

The teeth extend a little more than half-way along the claws.

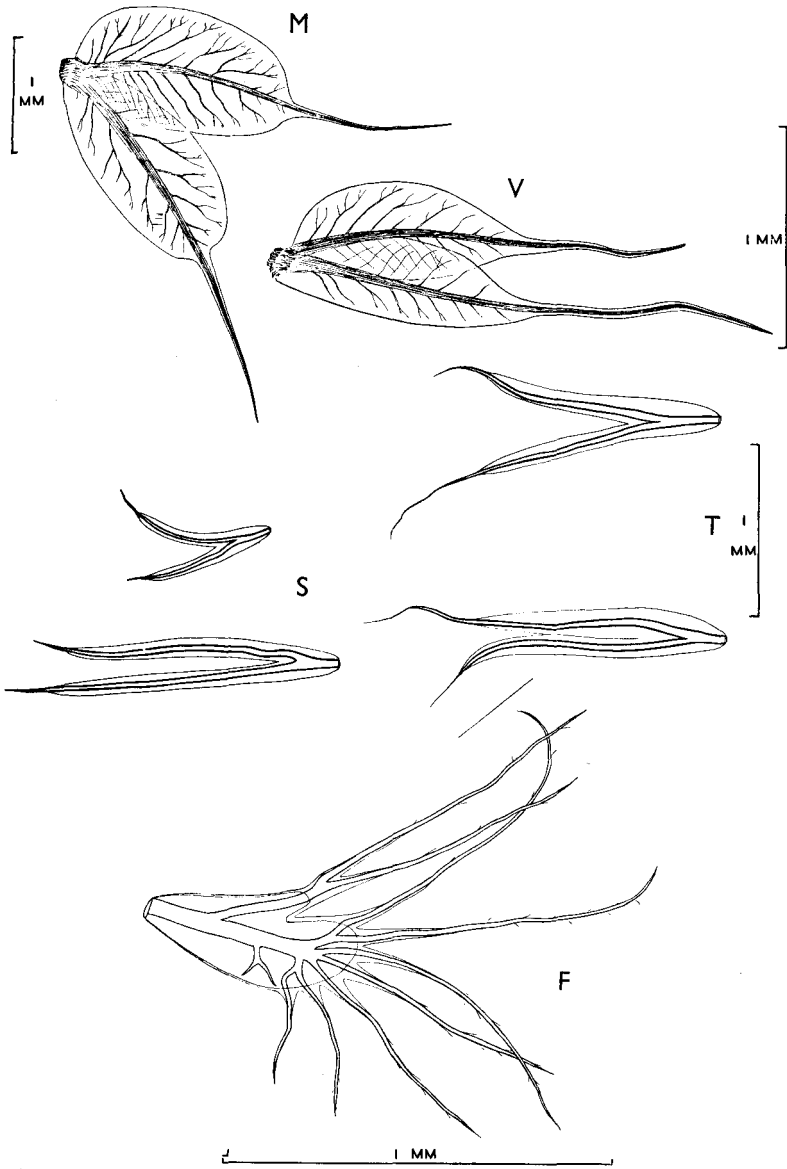


Fig. 3.

M, V 4th gills of *Leptophlebia marginata* and *vespertina*. S, T 1st and 2nd gills of *Paraleptophlebia submarginata* and *tumida*. F 4th gill of *Habrophlebia fusca*.

Ecology: This species occurs in sluggish streams and occasionally in rapid stony ones and in rivers.

Paraleptophlebia tumida Bengtsson

Previously described and figured by Ulmer (1943, p. 336, figs. 1—10).

Material: Allen R., SH, 1 cast skin and 11 whole nymphs; R. Till, SW, 1 cast skin and 7 whole nymphs.

Lengths: 8—9 mm.

Distinction from P. submarginata: 1. The gills diminish slightly and regularly in size from the middle outwards, and the first gill is not distinctly smaller than the rest (fig. 3T).

2. The maxillary palp is not as long, and the hairs on its last segment are fewer and shorter (fig. 1C).

3. All the spines on the hind femora are pointed, and none is very short (fig. 4t).

4. There are fewer fine hairs on the palps of the labium, and the glossae are more pointed.

Ecology: Allen River and River Till are streams in chalk-down valleys. They flow with moderate speed over stony beds and are densely overgrown with vegetation. Surface water probably disappears every summer. In these two streams, *P. tumida* was abundant and no other Ephemeroptera were found (T.T. and Z. Macan 1940). The species has never been recorded anywhere else in Britain.

(There is an error in the paper referred to. Allen River was dry on 6:vi, not 6:v as shown in table 1 on p. 59).

Paraleptophlebia cincta (Retzius)

Previously described and figured by Eaton (1888, pl. 32) and Lestage (1919, p. 342 and fig. 27).

Material: R. Wharfe, MY, 1 cast skin; R. Kent, WL, 1 whole nymph.

Length: 7.5 mm.

Distinction from foregoing species: This species resembles *P. tumida* closely, and both differ from *P. submarginata* in the same way,

though, as will be seen presently, the femoral spines of the two are not identical.

P. cincta and *P. tumida* can be separated on the following characters:

1. The spines of the middle and lower rows on the hind femora of *P. cincta* are intermediate in character between those of the other two species; they taper like those of *P. tumida*, but are blunt-ended like those of *P. submarginata* (fig. 4c).

2. The teeth do not extend far beyond the middle of the claw of *P. cincta* (fig. 4C), those of *P. tumida* reach nearly three-quarters of the way to the tip (fig. 4T). The number of teeth is unexpectedly variable and not always higher on *P. tumida*, as might be expected. Six specimens of *P. tumida* had respectively 22, 22, 27, 27, 27, and 28 teeth on one of the hind claws; both specimens of *P. cincta* had 21.

3. The maxillary palp of *P. cincta* is slightly longer.

Ecology: This species appears to be fairly widespread but nowhere abundant. In addition to my own two records, I have nine kindly supplied by Mr D. E. Kimmins; all are from rivers.

Habrophlebia fusca (Curtis)

Previously described and figured by Eaton (1888, pl. 36) and Lestage (1919, p. 348 and fig. 30).

Material: Hog House Beck, WL, 1 cast skin; R. Ribble, MY, 3 cast skins; Daggons Brook, SH, 4 whole nymphs.

Markings: The abdominal tergites are uniformly pigmented.

Lengths: 6.5—8.0 mm.

The mouthparts are of the same type as those of the other two genera, but differ in detail: the front margin of the labrum is more deeply indented; the mandibles are more rounded along the outside (fig. 2F); the maxilla is shorter, and the short conical last segment of its palp is characteristic (fig. 1F); the labial palps are shorter (fig. 1f).

Gills: Each is divided into two lobes which bear between them some 5 to 12 filaments according to their position in the series, those in the middle being the most richly provided. No other British Ephemeropteran nymph has gills like this.

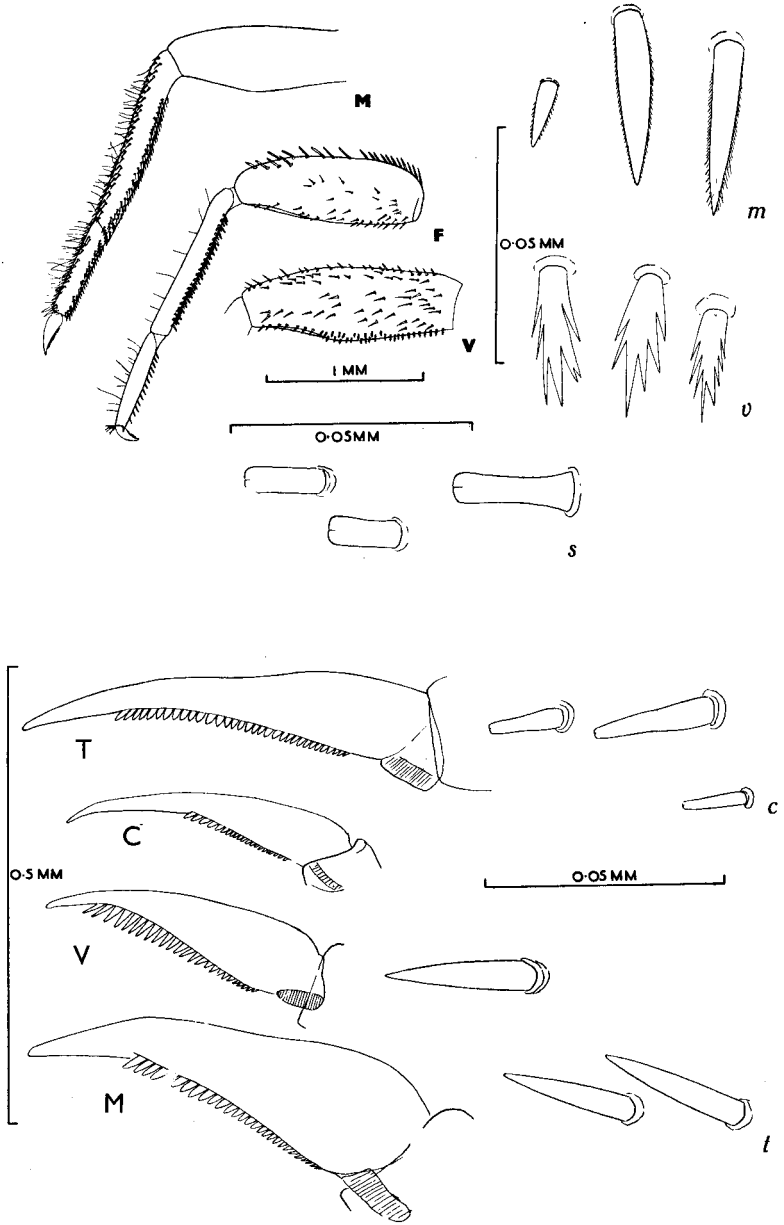


Fig. 4.

M hind-leg of *Leptophlebia marginata* showing spines on tibia and tarsus; **F** fore-leg of *Habrophlebia fusca*; **V** fore-femur of *Leptophlebia vespertina*. *m*, *v*, spines from underside of fore femur of *L. marginata* and *vespertina*; *s*, *c*, *t* spines from underside of hind femur of *Paraleptophlebia submarginata*, *cincta*, *tumida*. **T**, **C**, **V**, **M** hind claws of *P. tumida*, *P. cincta*, *L. vespertina*, *L. marginata*.

The legs are less thickly beset with spines than those of the other species and spines are absent from the upper surface of all tibiae and tarsi (fig. 4F). There are about 12 teeth on the hind claws.

Ecology: Hog House Beck, in the Lake District, is a slow stream flowing over a sandy bottom with a few stones and some tufts of vegetation. *Habrophlebia* nymphs are quite common on the stones but none have been taken by sweeping through the weeds with a net. Miss Hampshire found numbers of nymphs on stones in a similar stream in South Lancashire (SL); she did not collect in the vegetation. Daggons Brook, in the south of England, is also a small slow stream with a sandy bottom in which occasional patches of vegetation are rooted. There are no stones but packets of dead leaves occur at intervals. Nymphs were abundant in these packets of dead leaves but not in the vegetation. *H. fusca* has been taken in various other streams and some rivers, but these were the only places where it was numerous.

CB = Cambridgeshire, CU = Cumberland, MY = Mid Yorkshire, SH = South Hampshire, WL = Westmorland (England), KF = Kinross and Fifeshire (Scotland).

Acknowledgments

It is a pleasure to acknowledge my indebtedness to Mr D. E. Kimmins who has identified many of the adults and put the records of the British Museum freely at my disposal; to my assistant, Miss Jean Hampshire, who has drawn some of the figures and helped with all aspects of the work; and to Dr J. Senez who has translated the key into French.

Key

1. Gills with several branches (fig. 3F) *Habrophlebia fusca*
Gills with two branches (fig. 3M, V, S, T) 2
2. Gills (except the first) expanded at the base (fig. 3M, V)
Leptophlebia 3
- Gills straight-sided (fig. 3S, T) *Paraleptophlebia* 4
3. Compound spines on the underside of the fore femora (fig. 4v); teeth extending about five-sixths of the way

- along the claw (fig. 4V); blade of gills tapering and merging gently into the filament (fig. 3V) *L. vespertina*
- Finely frayed spines, appearing simple except under high power magnification, on the underside of the fore femora (fig. 4m); teeth extending about three-quarters of the way along the claw (fig. 4M); blade of gills strongly rounded, meeting the filament abruptly (fig. 3M) (only in full-grown specimens) *L. marginata*
4. First gill distinctly smaller than all the rest (fig. 3S); spines on underside of hind femora parallel-sided and blunt at the tip, many of them short (fig. 4s); maxillary palps large, the last segment densely covered with long fine hairs (fig. 1S) *P. submarginata*
- First gill only slightly, if at all, smaller than the others (fig. 3T); spines on underside of hind femora tapering (fig. 4c, t); maxillary palps smaller, the last segment less densely covered with long fine hairs (fig. 1C) 5
5. Spines on underside of hind femora pointed, rather few of them short (fig. 4t); teeth extending nearly three-quarters of the way along the claw (fig. 4T) *P. tumida*
- Spines on underside of hind femora tapering but blunt at the tip (fig. 4c); teeth not extending far beyond the middle of the claw (fig. 4C) *P. cincta*

Tableau synoptique

1. Branchies multi-ramifiées (fig. 3F) *Habrophlebia fusca*
- Branchies bifides (fig. 3M, V, S, T) 2
2. Branchies renflées à la base (sauf la première) (fig. 3M, V)
Leptophlebia 3
- Branchies à bords rectilignes (fig. 3S, T) *Paraleptophlebia* 4
3. Epines très dentelées (fig. 4v) sur la face inférieure des fémurs antérieurs; la rangée de dents s'étend sur les 5/6 environ de la griffe (fig. 4V); le renflement basal de la

- branchie se rétrécit progressivement vers l'extrémité (fig. 3V) *L. vespertina*
- Epines simples (avec fines dentelures seulement visible aux forts grossissements) (fig. 4m) sur la face inférieure des fémurs antérieurs; la rangée de dents s'étend sur les 3/4 environ de la griffe (fig. 4M); le renflement basal des branchies est de forme ovale et se termine brusquement (fig. 3M) (ce caractère n'existe que sur les nymphes ayant atteint leur complet développement) *L. marginata*
 - 4. Première branchie beaucoup plus courte que les autres (fig. 3S); sur la face inférieure des fémurs postérieurs, épines à bords rectilignes et à terminaison brusque, souvent courtes (fig. 4s); palpes maxillaires longues, recouvertes, sur leur dernier segment, par un grand nombre de poils longs et fins (fig. 1S) *P. submarginata*
 - Première branchie de même longueur, ou à peine plus courte, que les autres (fig. 3T); sur la face inférieure des fémurs postérieurs épines effilées (fig. 4c, t); palpes maxillaires plus courtes, recouvertes, sur leur dernier segment, par un moins grand nombre de poils longs et fins (fig. 1C) 5
 - 5. Sur la face inférieure des fémurs postérieurs, épines effilées, à extrémités pointues, rarement courtes (fig. 4t); la rangée de dents atteint presque les 3/4 de la griffe (fig. 4T) *P. tumida*
 - Sur la face inférieure des fémurs postérieurs, épines effilées mais à extrémités tronqués (fig. 4c); la rangée de dents dépasse à peine la moitié de la griffe (fig. 4c) *P. cincta*

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