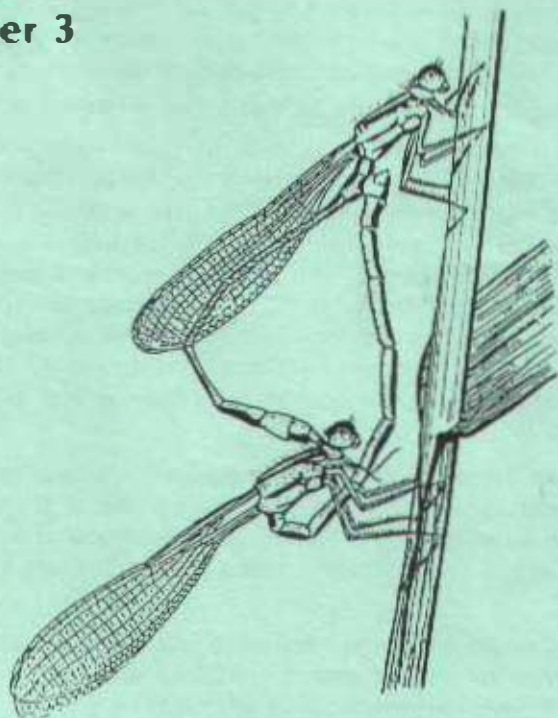


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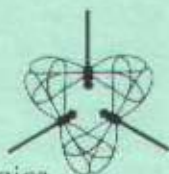
April  
1984



Edited  
by  
S. Brooks



affiliated to the Societas Internationalis Odonatologica



## Survey of adult and nymph dragonfly populations on Holme Fen NNR — R. N. Boston

Dragonfly populations and species diversity have declined in many parts of Britain. This is particularly apparent in the Huntingdonshire fens where the last major waterbody, Whittlesea Mere, was drained in the 1850's. Holme Fen NNR is a silver birch woodland of 640 acres with a dyke system and two freshly excavated meres. Casual knowledge of the dragonfly population on this reserve suggested that a survey and monitoring scheme to see whether dragonfly populations were profiting from new reserve management would be a worthwhile project.

As the reserve is too large to cover in its entirety collecting sites were chosen to represent the range of major habitats within the reserve. The project was started in May 1979 with the following objectives: a) to conduct a census of adult dragonflies on all open waters; b) to survey sites on meres and dykes within the reserve to identify nymphs and their habitat requirements; c) to conduct a survey of vegetation in the dykes and meres; d) to formulate management recommendations to improve conservation opportunities within the reserve. A great deal of information has been gathered over the four years of the study and a brief account of some aspects are reported here.

### Methods

The eight areas selected for the survey of adult dragonflies were: a) dry silted dykes, b) free flowing dykes, and c) meres. For the study of nymphs, sixteen collecting points were chosen to represent the two habitats, dykes and meres, with eight points for each habitat. The transects and collecting points are shown in Fig. 10.

Twenty-four surveys of adult dragonflies were made between May and October in each of the years 1979 to 1982. All eight transects were surveyed on the same day between midday and four o'clock. The transects were walked at a uniform pace, and all dragonflies seen approximately ten metres either side of the transect line were recorded. On occasions it was necessary to stop and collect for identification. The temperature was recorded at the end of each day's recording.

Between June and October in each of the four years nymphs were counted weekly at the sixteen collecting points. Three sweeps were made with a fine mesh net at each point and those nymphs that were sufficiently mature to identify were collected.

### Results and Discussion

Table 4 lists the species recorded during the course of the survey. Because of the high probability that a proportion of the dragonflies seen were not breeding on the transects it was not thought worthwhile to attempt to calculate numbers in terms of breeding territories, as can be done with breeding birds, for instance. Instead the annual sum of the numbers seen have been used to calculate a seasonal index of abundance for each species, a method which is used successfully for the butterfly recording scheme.

The indices offer an interesting comparison between the four years with a noticeable drop in overall numbers in 1980, followed by an increase in 1981 and a further increase in 1982 to a total that exceeded that of 1979. The numbers of most species showed this trend, however, counts of *Aeshna grandis*, *Anax imperator*, *Erythromma najas* and *Sympetrum sanguineum* increase progressively over the four years. The increase in numbers of *Sympetrum sanguineum* is particularly pleasing in view of its uncommon status nationally. Conversely, the decline of *Coenagrion pulchellum* gives cause for concern.

The information gathered on nymph numbers and species diversity over the whole range of collecting sites (Table 5) was encouraging. Ten species were identified in the first year, twelve in the second and thirteen in the fourth. The commonest species was *Ischnura elegans* followed by *Aeshna cyanea*, with both species increasing in number throughout the study period. Other interesting points shown are the colonisation of the meres by *Erythromma najas*, which was absent at the beginning of the survey, and *Sympetrum sanguineum* which was found as a nymph for the first time in 1982.

Table 6 indicates that after a huge increase in nymph numbers from 1979 to 1980, the populations in the meres have remained fairly stable. By comparison, the numbers caught in the dykes in 1979 were considerably more than those caught in the meres, a situation that was reversed in 1980 and 1981, but by 1982 the numbers caught were very similar for both habitats. Despite these fluctuations in habitat totals, there has been a distinct and steady overall increase in the numbers caught over the four years.

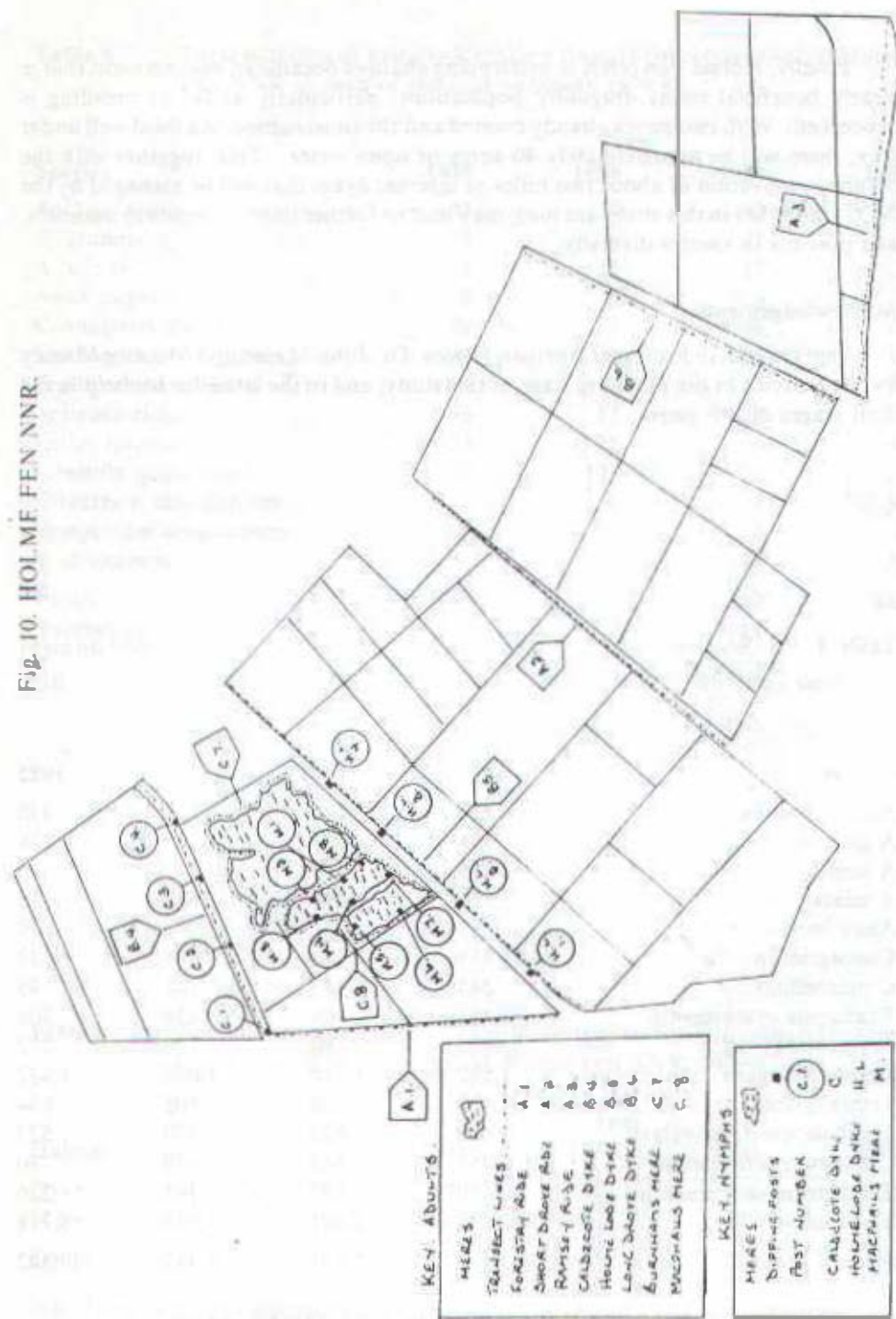
As an example of the information obtained from an individual collecting point, Table 7 shows the results over the four years for point M4. This is a rich site in comparison with

1980 and 1981 was a welcome indication of an improvement of dragonfly breeding in a relatively new waterbody, the drop in numbers in 1982 is disappointing. The figures for future years will confirm whether this is the start of a trend. The richness of a site may be correlated with the quantity of submerged and emergent vegetation.

One further point arising from the first four years of this ongoing study is worthy of mention here. It is probably significant that the decline in the overall seasonal indices for adults in 1980 (Table 4) was mostly confined to three transects adjacent to two drainage dykes that were thoroughly dredged by the internal drainage board in October/November 1979. It is assumed that this resulted in fewer adults emerging in 1980 but that as the dyke ecosystems recovered from the dredging in the next two years numbers of dragonflies built up again. The total indices given in Table 8 for transect B4 (one of the three transects referred to above) and the numbers of nymphs caught in the dredged dykes (Table 6) are considered to support this view. If this interpretation is correct it clearly shows that the dredging of waterways must be on at least a three-year cyclical basis so as not to seriously depress the number of dragonflies present.



Fig. 10. HOLME FEN NNR.



Finally, Holme Fen NNR is undergoing changes because of management that is clearly beneficial to its dragonfly populations, particularly as far as breeding is concerned. With two meres already created and the construction of a third well under way, there will be approximately 40 acres of open water. This, together with the planned renovation of about two miles of internal dykes that will be managed by the NCC (the dykes in this study are not), may lead to further improvements in numbers, and possibly in species diversity.

#### Acknowledgements

I am grateful to Professor Norman Moore, Dr. John Mison and Maurice Massey for their advice in the planning stage of this study, and to the latter for his help in the draft stages of this paper.

**Table 4** Seasonal indices of abundance of adult Dragonflies recorded on eight transects at Holme Fen NNR, May to October 1979-1982.

Species	Year			
	1979	1980	1981	1982
<i>Aeshna cyanea</i>	419	402	406	420
<i>A. grandis</i>	104	136	196	236
<i>A. juncea</i>	5	4	13	16
<i>A. mixta</i>	726	694	644	716
<i>Anax imperator</i>	13	31	67	89
<i>Coenagrion puella</i>	955	744	668	927
<i>C. pulchellum</i>	245	143	146	95
<i>Enallagma cyathigerum</i>	402	309	326	308
<i>Erythromma najas</i>	22	80	146	212
<i>Isebruna elegans</i>	1,502	1,240	1,065	1,422
<i>Lestes sponsa</i>	422	378	505	654
<i>Libellula quadrimaculata</i>	628	520	470	523
<i>Orthetrum cancellatum</i>	753	542	679	780
<i>Sympetrum sanguineum</i>	70	107	165	226
<i>S. striolatum</i>	2,834	2,601	2,986	3,718
Overall Indices	9,100	7,931	8,482	10,342

NB: The index of abundance is the sum of the eight transect indices.

**Table 5** Total numbers of nymphs identified from 16 collecting points at Holme Fen NNR in each of the four summers 1979-82

Species	Year			
	1979	1980	1981	1982
<i>Aeshna cyanea</i>	41	38	52	57
<i>A. grandis</i>	3	6	11	16
<i>A. mixta</i>	18	22	17	21
<i>Anax imperator</i>	0	4	5	9
<i>Coenagrion puella</i>	39	40	48	51
<i>Enallagma cyathigerum</i>	36	26	34	37
<i>Erythronma najas</i>	0	10	17	18
<i>Ischnura elegans</i>	79	77	82	89
<i>Leuctes xponxi</i>	33	28	36	41
<i>Libellula quadrimaculata</i>	10	25	29	27
<i>Orthetrum cancellatum</i>	17	31	33	37
<i>Sympetrum sanguineum</i>	0	0	0	6
<i>S. striolatum</i>	16	32	28	33
Totals	292	339	392	442
Number of Species	10	12	12	13

NB: There were 19 collections at each point in 1979 and 24 in all other years.

**Table 6** Total seasonal numbers of nymphs by habitat from 16 collecting points (eight in each habitat type) at Holme Fen NNR, 1979-82

Habitat	Year			
	1979	1980	1981	1982
Dyke	196	113	115	226
Mere	96	226	277	216
Totals	292	339	392	442

NB: There were 19 collections at each point in 1979 and 24 in all other years.

**Table 7** Seasonal totals of nymphs collected from point M4 at Holme Fen NNR, 1979-82

Species	Year			
	1979	1980	1981	1982
<i>Aeshna cyanea</i>	0	4	7	6
<i>A grandis</i>	0	2	3	2
<i>A mixta</i>	4	4	2	3
<i>Anax imperator</i>	0	1	2	1
<i>Coenagrion puella</i>	6	9	8	7
<i>Enallagma cyathigerum</i>	4	5	6	4
<i>Erythromma najas</i>	0	2	4	5
<i>Ischnura elegans</i>	7	13	15	9
<i>Lestes sponsa</i>	6	7	5	4
<i>Libellula quadrimaculata</i>	0	6	4	2
<i>Orthetrum cancellatum</i>	5	9	7	6
<i>Symphetrum sanguineum</i>	0	0	0	1
<i>S striolatum</i>	3	7	2	4
Totals	35	69	65	54
Number of Species	7	12	12	13

NR: There were 19 collections in 1979 and 24 in all other years.

**Table 8** Seasonal indices of abundance of adult Dragonflies recorded on Transect B4 at Holme Fen NNR, 1979-82

Species	Year			
	1979	1980	1981	1982
<i>Aeshna cyanea</i>	44	39	53	46
<i>A grandis</i>	38	25	35	37
<i>A juncea</i>	0	0	2	0
<i>A mixta</i>	62	44	53	58
<i>Anax imperator</i>	8	6	6	10
<i>Coenagrion puella</i>	215	105	60	188
<i>C pulchellum</i>	63	16	11	14
<i>Enallagma cyathigerum</i>	83	33	36	51
<i>Ischnura elegans</i>	321	157	92	267
<i>Lestes sponsa</i>	138	58	45	108
<i>Libellula quadrimaculata</i>	83	51	31	64
<i>Orthetrum cancellatum</i>	65	36	32	54
<i>Sympetrum sanguineum</i>	37	20	31	40
<i>S striolatum</i>	345	186	204	318
Overall Indices	1,502	776	691	1,255
Index per 100 yards of Transect	163	84	75	136



## Some observations at breeding sites of emeralds (Corduliidae) in Scotland.

— E. M. Smith

During the summer of 1983 my husband and I had the good fortune to observe the Downy Emerald (*Cordulia aenea*), the Brilliant Emerald (*Semeretochlora metallica*) and the Northern Emerald (*Semeretochlora arctica*) ovipositing.

In late June, over calm water in a sheltered bay of a tree-girt Stirlingshire lochan, *C. aenea* females were flying and ovipositing at 07.50 hrs B.S.T. The emergent and floating vegetation comprised Yellow Water-lily (*Nuphar lutea*), Common Reed (*Phragmites australis*) and Water Horsetail (*Equisetum fluviatile*). Males, assumed to be *C. aenea*, mostly patrolled along the edges of the emergent vegetation. Egg-laying, which was observed at various times during the forenoon, was confined to close-inshore, often shady, calm water, about 40 cms deep in areas where the mosses *Fortuitula antipretrea* and *Sphagnum subsecundum* were abundant. The females flew unattended about 20–40 cms above the water and repeatedly dipped the tip of the abdomen beneath the surface while flying. Through 10 by 25 binoculars, at a distance of some 12 metres, *C. aenea* looked almost black except where the sun reflected metallic gold from the side of the thorax. Also present in the area were *Pyrhosoma nymphula*, *Ischnura elegans*, *Enallagma cyathigerum* (including females of the blue form) and *Libellula quadrimaculata*.

During very hot weather in early July at a loch in Inverness-shire cordulines were seen flying in characteristic manner, with abdomen held higher than thorax. A putative male would approach fast, hover briefly, then fly off quickly. This behaviour was in marked contrast to the slower flight and frequent perching of *L. quadrimaculata* in the same bay. At 10.00 B.S.T. a female *S. metallica* was discovered ovipositing while flying just clear of wet *Sphagnum* which sloped gently into the loch. She dipped the tip of her abdomen about 2–3 times per second into the moss, flew on a few centimetres and repeated the process. Through the binoculars her prominent, prong-like, valvar scale was very noticeable. Males were patrolling small bays at the loch side. One male flew at about 50 cms above the patch of *Sphagnum*, apparently scanning the area, and then perched on heather nearby. Other species present were *P. nymphula*, *I. elegans*, *E. cyathigerum*, *Cordulegaster boltonii* and *L. quadrimaculata*.

During similar weather in mid-July, in a boggy area of Wester Ross among stunted Scots Pine (*Pinus sylvestris*) a rustling of wings attracted our attention to an ovipositing *S. arctica*. She was flying just above *Sphagnum* sundew bog and ovipositing in tiny areas of open water which were about five cms deep. While flying, the tip of the abdomen was carried downwards, at right-angles. One male *S. arctica* was hovering with rapid wing-beats maintaining a steady posture at about a metre above the bog. Its hovering flight carried it very slowly about 20 metres across the bog before it changed to its usual fast flight and disappeared. Other species present were *Aeshna juncea*, *C. boltonii* and *Sinibaculum daniae*.



During early July 1982, while in Inverness-shire, we observed males of *S. arctica* in a somewhat different habitat. There they appeared to be holding territories over peaty bog-pools which were almost entirely covered with *Sphagnum*, flying at about three metres, the height of the scattered, stunted pines. In flight *S. arctica* looked slim, with a bulging thorax, which glistened emerald, while the slender abdomen looked dull black. On one occasion a male flew slowly at a height of 30-60 cms, periodically hovering, around the margin of a *Sphagnum* filled pool. Aggressive behaviour was observed when territories were invaded by conspecific males. Rivals flew to about four metres then dropped vertically, whirling round each other in descending spirals, before flying off in different directions. No females were seen in the immediate vicinity. Other species present, but using pools with deeper water, were *L. quadrimaculata* and *Leucorrhinia dubia*.

### Rapid larval development in *Brachytron pratense* (Müller)

— J. D. Holmes

During June 1982 I obtained a few eggs of *Brachytron pratense* and placed them in a small pond in my garden. This pond is full of potential food and free from fish and other large predators. By October a single larva was found approximately full grown. During the winter months it disappeared, presumably buried in mud at the bottom. At the end of March it reappeared and grew rapidly until the 30th May 1983 when the adult emerged and flew off. Thus, larval development took less than a year. This is in contrast to the larval duration of over two years considered normal by Corbet *et al.* (1960).

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Corbet, P. S., Longfield, C. & Moore, N. W. (1960). Dragonflies. Collins, London, 260 pp.

## Risley Moss: a nature reserve in the making.

— Gillian Taylor

Risley Moss is an area of 88 ha. of peat moss and woodland. It lies four miles northeast of the centre of Warrington in Cheshire. The boundaries are formed by farmland, housing, parkland and the Manchester to Liverpool railway. In 1969 Risley Moss was taken over by Warrington New Town Development Corporation and since 1975 has been managed with the aim of returning to the original mossland conditions. In April 1984 it will be handed over to Cheshire County Council.

During the last century the moss was used for peat extraction while the surrounding area was reclaimed for agriculture. A layer of peat was stripped from the surface of the bog and ditches were dug to drain the area and lower the water table. The lowering of the water table led to a large increase in the abundance of Purple Moor Grass (*Molinia caerulea*), Bracken (*Pteridium aquilinum*), birches (*Betula pendula* and *B. pubescens*) and willows (*Salix* spp.).

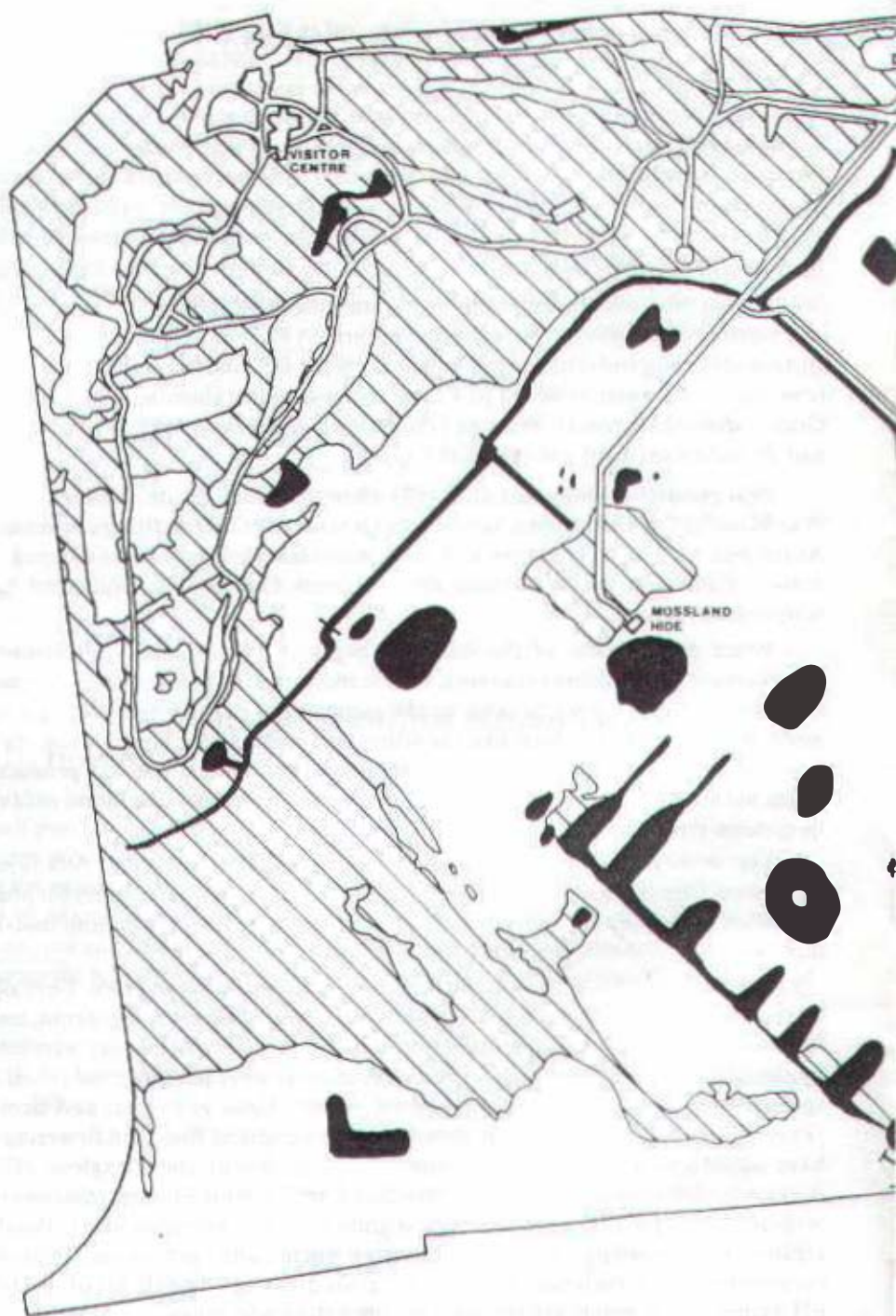
Peat extraction continued until 1938 when the Risley Estate was acquired by the War Ministry for an ordnance factory, and was used for the test firing of ammunition. At the end of War incendiaries and other materials were burned or dumped on the moss. Following the War there were frequent fires and the mossland became progressively drier.

When development of the mossland began in 1975 ponds were desilted, new ponds created and ditches excavated, but the most important management feature has been the raising of the water table by the damming of ditches. This has also created more open water areas which, like the others, are acidic and dystrophic (i.e. they have low inorganic nutrient content, high organic nutrient content and low productivity). Some of the ponds have been affected by pyrotechnic residues and recent excavations to remove these residues.

The woodland area was planted with Oak (*Quercus robur*), Ash (*Fraxinus excelsior*), Elm (*Ulmus* sp.) and also *Rhododendron* sp. to provide cover for pheasant, partridge and rabbit. The area was used for game shooting until the mid-1930's, during and after which the rhododendron spread extensively.

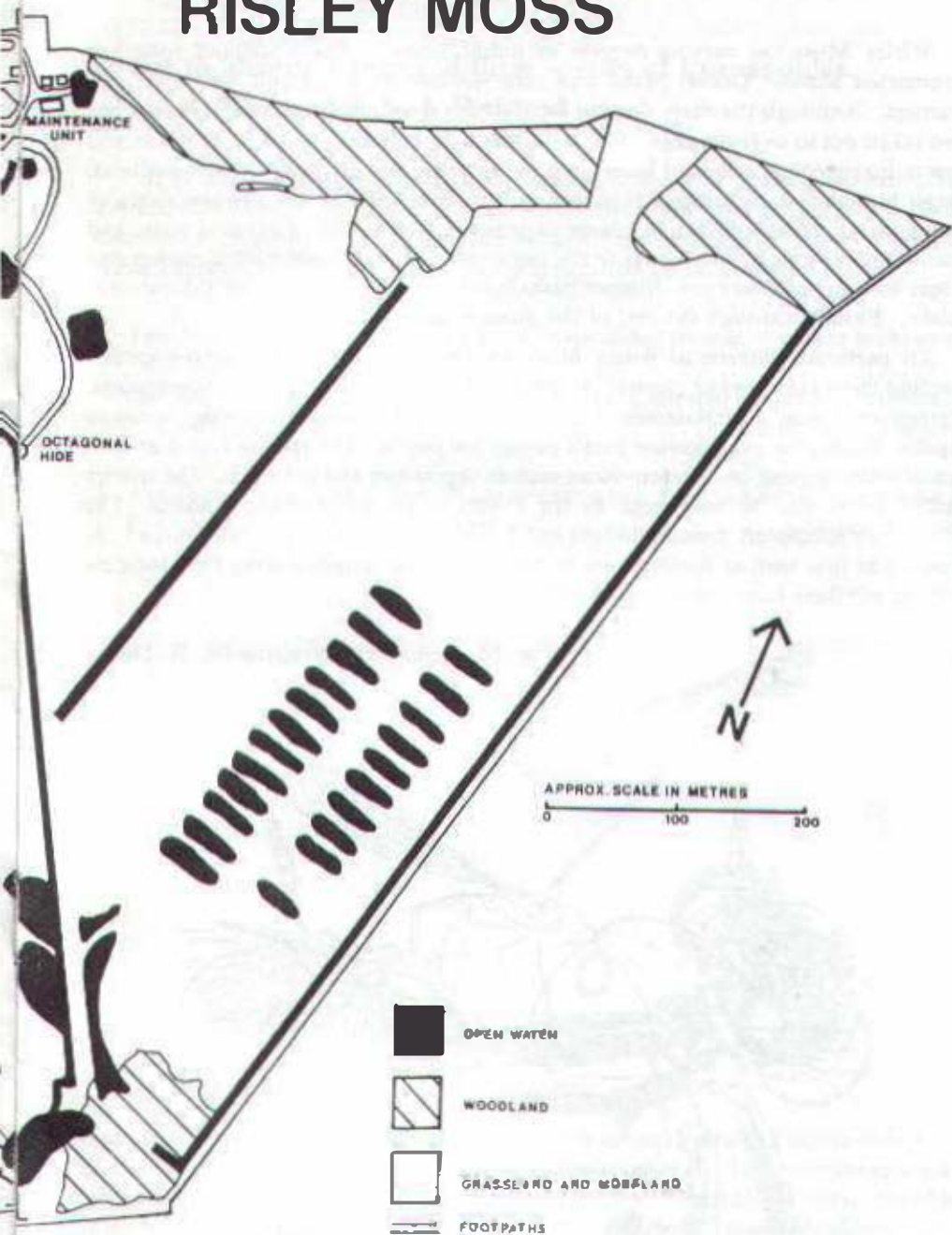
When Risley Moss was taken over by Warrington New Town Development Corporation, most of the rhododendrons were removed from the woodland, leaving a few as cover for birds. Large areas of bracken, which posed a fire threat, were removed by the application of herbicides. The cleared areas were planted with mixed native species such as Hazel (*Corylus avellana*), Alder (*Alnus glutinosa*) and Scots pine (*Pinus sylvestris*). More light can now reach the woodland floor and flowering plants have appeared including Red Campion (*Silene dioica*) and Foxglove (*Digitalis purpurea*). Other species have been introduced, for example Bluebell (*Endymion non-scriptus*). Selected sites were cleared and grass sown to form picnic areas. Ponds were created by deepening hollows and lining them with grit stone, thinning the surrounding trees, underplanting and marginal planting. The effects of the different pH values of the ponds are reflected by their flora and fauna.

Fig. 11.





# RISLEY MOSS





Risley Moss has varying degrees of public access. The woodland zone has unrestricted access. Gravel paths lead into the mature woodland, to ponds and clearings. Although the early development of the woodland was complex, care has been taken not to over-manage. Many visitors may be unaware of the previous and present management aimed at increasing the richness and diversity of the woodland. Simple bird hides are strategically placed and an observation tower provides a view of the mossland, which appears as a large expanse of *Molinia* with flashes of water and small areas of birch scrub. Access to the mosslands is restricted to guided parties and people with a special interest. Sleeper paths lead to two specially created 'Educational Ponds'. Passage through the rest of the moss is more difficult.

Of particular interest at Risley Moss are the dragonflies. The eleven species breeding there are: *Aeshna cyanea*, *A. juncea*, *A. grandis*, *Libellula quadrimaculata*, *Sympetrum danae*, *S. striolatum*, *Lestes sponsa*, *Pteronarcys nymphula*, *Ischnura elegans*, *Enallagma cyathigerum* and *Coenagrion puella*. The species found at each area of water depend on characteristics such as vegetation and pH value. The species present might also be influenced by the effects of the pyrotechnic residues. The *Sympetrum* species are most abundant and *L. quadrimaculata* is also widespread. *L. sponsa* was first seen at Risley Moss in 1982 and observations during 1983 indicate that the numbers have greatly increased.

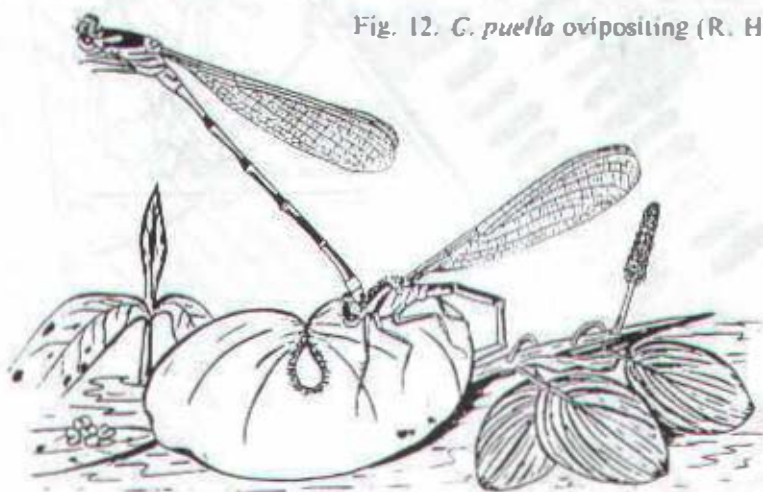


Fig. 12. *C. puella* ovipositing (R. H. Dunn)

Colonisation by further species would add interest to the site. *Leucorrhinia dubia* is a scarce species which has been recorded in the nearby Delamere Forest, Cheshire. It prefers to settle in heather and breeds in *Sphagnum* ponds. Cross-leaved Heather (*Erica tetralix*) has been introduced to the mossland. Ling (*Calluna vulgaris*) is present and areas of *Sphagnum* are increasing, so colonisation may be possible.

#### Acknowledgements

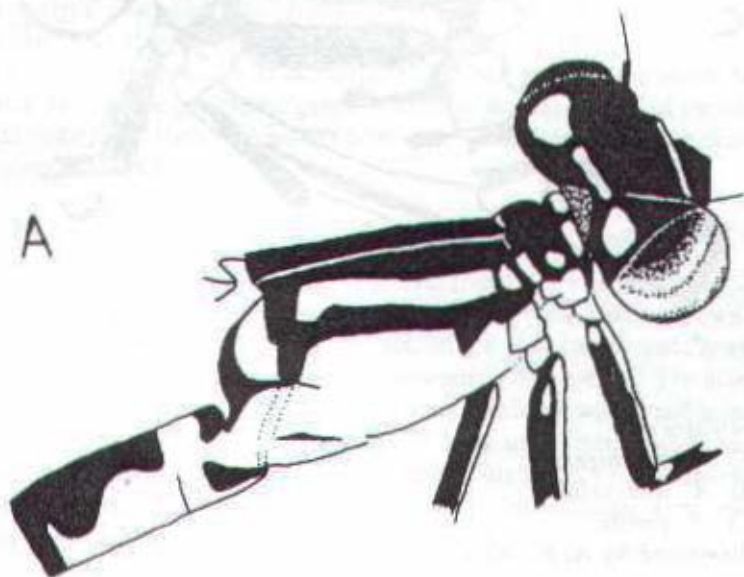
I thank Kenn Watt and Robert Willows for help in producing this article.

# A key to identify females of three species of Coenagriidae.

— A. R. Welstead & N. I. Welstead

It is often difficult to distinguish between females of *Enallagma cyathigerum*, *Coenagrion mercuriale* and *C. puella* which sometimes occur together in British localities such as the New Forest, Hampshire. The following key draws attention to some characters which are useful in the separation of these species.

1. Two black stripes on side of thorax. Coloured bar present or absent between eye-spots (B & C) ..... 2
- One low, narrow black stripe on side of thorax. Coloured bar present between eye-spots (A) ..... *Enallagma cyathigerum*
2. Eye-spots small, with coloured bar between (B) ..... *Coenagrion mercuriale*
- Eye-spots large, coloured bar absent (C) ..... *Coenagrion puella*



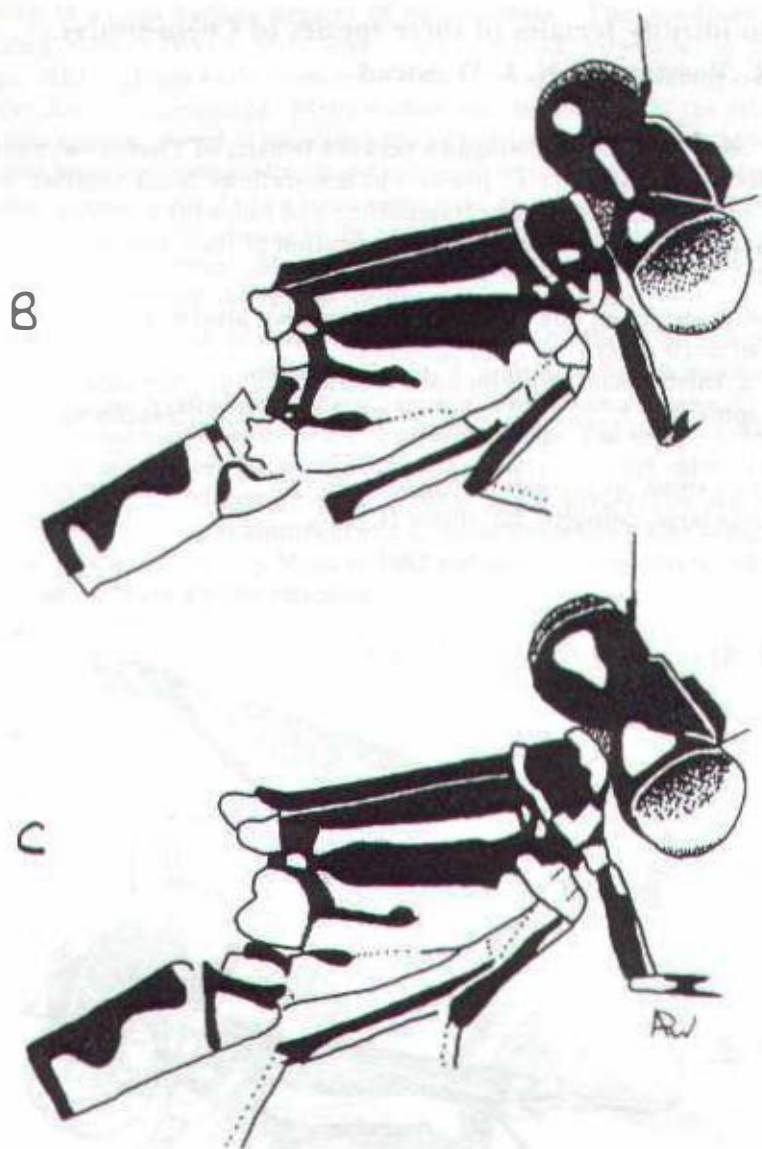


Fig. 13 Females of:-

A) *E. cyathigerum*

B) *C. mercatorale*

C) *C. puella*

Illustrated by A. R. Welstead



## A remarkable emergence of *Aeshna cyanea* at a small pond in the Forest of Dean.

— R. G. Gaunt

In 1982 *Aeshna cyanea* was observed at a small pond in the Forest of Dean. In June a small number of exuviae were noted, although no systematic search was made, and by early September about 12 adult males were seen holding territory, and a female ovipositing. The pond has a good balance of emergent vegetation, inaccessible places, open water and sun and shade, having been cleared by the Forestry Commission about five years ago. The pond is U-shaped with an accessible outer perimeter of about 190 metres and an inner part of about 50 metres which is inaccessible. The area is estimated to be about 700 square metres and has mature deciduous woodland on three sides.

The 1982 emergence was first noted on 15th June when three exuviae were found. On 29th June there were another eight. At this stage no systematic search has taken place. However, on 5th July there seemed to be a lot of exuviae and a careful search of the accessible bank and margins yielded no fewer than 100. Curiosity had been aroused so the numbers of exuviae collected each day were recorded (Table 9). After 20th July there were no visits made until early September. A grand total of 1437 exuviae were collected but many more must have emerged on the inaccessible margin of the pond. A count through binoculars at the end of July gave a conservative estimate of 100 still in positions that could not be approached. There must have been more out of sight, and some were probably lost because of earlier thunder-storms. It can, therefore, be stated with confidence that at least 1600 emerged. The large numbers of exuviae recorded may be related to the lack of fish in the pond. No exuviae were found during the peak emergence period in another pond of similar size but which contained fish. However, adults of *A. cyanea* had been observed over this pond in the summer of 1982.

The larvae did not appear to be selective about the vegetation on which they emerged. Where grass or rushes were used several blades were drawn together, otherwise one broad blade of reed-mace would suffice. The horizontal distance moved from the water's edge before ascending was between 0 and 4 metres. The mortality rate during emergence appeared to be very low. One specimen was found jammed, with only its head out, another had emerged but was dead, and a third had damaged wings and could not fly. Three more had suffered predation as only the wings were found. The numbers of adults that returned to the pond in late summer were small and no more than single figures were counted at any one time.



**Table 9** Numbers of exuviae of *A. cradna* collected between June 15th and July 29th 1983.

June 15	3
29	8
July 5	100
7	92
8	43
11	165
12	85
13	41
15	142
18	361
20	21
22	7
25	41
26	268
29	60

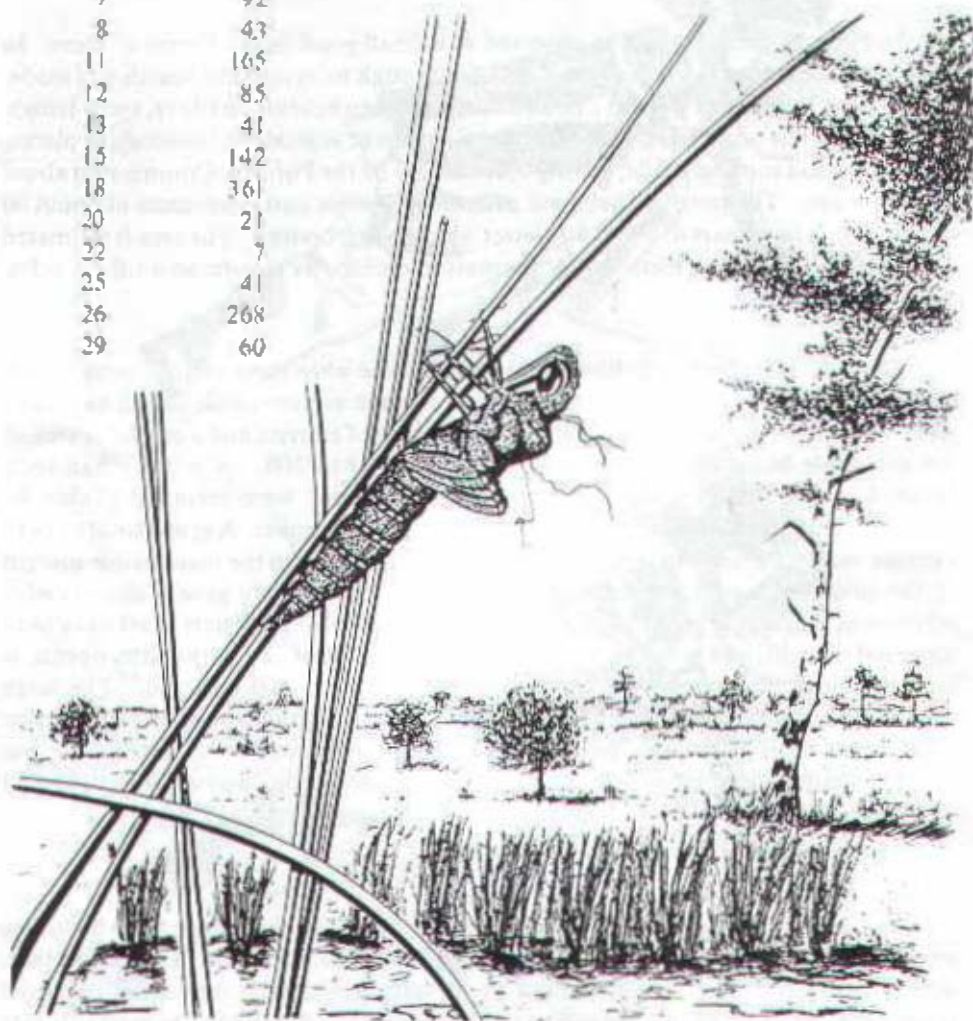


Fig 14. *Acanthix* exuvia.

Illustrated by R. H. Dunn

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Front cover illustration of *Ischnura elegans* mating by R. H. Dunn