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The *Journal of the British Dragonfly Society*, normally published twice a year, contains articles on Odonata that have been recorded from the United Kingdom. The aims of the British Dragonfly Society (B.D.S.) are to promote and encourage the study and conservation of Odonata and their natural habitats, especially in the United Kingdom. The B.D.S. is affiliated
(S.I.O.).

ADDRESSES

Editor: S. J. Brooks
4, Nelson Road, London N8 9RU

Secretary: R. H. Dunn
4, Peakland View, Darley Dale,
Matlock, Derbyshire DE4 2GT

Organiser of Odonata Recording Scheme:
R. Merritt
38, New Road, Holymoorside,
Chesterfield, Derbyshire S42 7EN

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From cover illustration of *Cordulegaster bolto* exuvia by S. P. Jones.

Notes on the folklore of dragonflies

D. A. Sheppard

10, Stainfield Road, Hanthorpe, Bourne, Lincolnshire PE10 0RE.

The recent letter by Lucas (1985) questioned the existence of British myths and legends associated with dragonflies. I searched my files and found a few instances of dragonflies in British folklore and came across a number of uses to which dragonflies have been put, both in flesh and in symbolism. Nevertheless the instances have been few compared with other insects, such as bees or butterflies.

The belief that dragonflies can sting, hence the name 'Horse Stinger' or 'Hoss Adder', is most widespread. It is recorded from America and the Isle of Wight (Clausen, 1954), Dorset (Udal, 1899) and I heard it stated as fact in Oxfordshire in 1983. It is also widely thought that dragonflies are associated with snakes and the welsh name of 'Gwas-y-neidr' means 'Snake Servant' (Kloet, 1941). In America they are also known as 'Snake Doctor'
dragonflies warned snakes of danger and helped them to find food. If a dragonfly were killed, the snake would kill the slayer (Clausen, 1954). In Norway, on the other hand, they are known as 'Øyestikker', 'eye-stingers' or 'Orsnell', 'ear-snail' (Corbet, Longfield & Moore, 1960) and in Lancashire as 'Heather-Bolts' (Anon, 1910). The oft-quoted name of 'Devil's Darning Needle'
where it was believed that dragonflies could sew up various parts of the body, eg. ears, lips, nostrils, eyelids, fingers and toes, if left exposed when the owner went to sleep (Clausen, 1954).

In Cambridgeshire, dragonflies are considered to be omens of good luck and those who see one are said to cross their fingers and wish (Porter, 1969). In the Isle of Wight, dragonflies are said to show the good boys where the fish are settling but will attack and sting the bad boys (Clausen, 1954). This myth is described in the song 'Snake Stanger' and in the nursery rhyme 'Dragonfly! Dragonfly! fly about the brook' (Weiss, 1938). Elsewhere dragonflies have been commemorated in song and poetry. Burl Ives made 'The Ugly Bug Ball' a popular children's song in the 1960's wherein the dragonfly played but a small part. It is mentioned in the sixth verse of 'The Butterfly Ball and Grasshopper's Feast' by William Roscoe (Aldridge, 1973), but a whole poem is dedicated to it as 'The Dragonfly' by Humbert Wolfe (Wolfe, 1935). Other poems are given by Corbet, Longfield & Moore (1960).

Dragonflies appear in a number of paintings by acclaimed artists (Schimitschek, 1968). They are popular topics in stamp design (Smit, 1978; Stanley, 1979) and it is not unusual to see them portrayed more stylistically on birthday cards and calendars.

Sometimes they are portrayed as water-nymphs or fairies, although it is not always clear whether their wings are derived from Odonata, Lepidoptera, Diptera or what. *The Radio Times* (12-18 July 1980) once illustrated, what was presumably meant to be a dragonfly with the body of a violin, under the title of 'Summer Sounds'. Elsewhere dragonflies have appeared on porcelain, eg. the Royal Doulton set of 'Wind in the Willows' and in the well-known 'Botanic Garden' set of tableware and kitchenware by Portmeirion.

In jewellery, dragonflies are not uncommonly portrayed on ear-rings and brooches and cheaper plastic versions feature as novelties in Christmas crackers. In the cinema, the dragonfly in the Walt Disney cartoon 'The Rescuers' and in the TV cartoon 'Crazy-Legs Crane' should not be overlooked. There is even an aeroplane called the 'Flying Flea' which, for some reason carries representation of a dragonfly on its tail fin (Shuttleworth collection, Bedfordshire). In Japan the dragonfly appears as a symbol of victory throughout literature and art, in commemorative or patriotic associations (Clausen, 1954) and dragonflies form part of the coat of arms of the Doublet de Persoan family of Normandy and Champagne (Keisser, 1966).

Dragonflies, it seems, have never formed part of the diet in Britain, but are eaten as delicacies in Bali where they are caught on sticks coated with bird-lime. The wings are broken off and the bodies mixed with spices and vegetables and fried in coconut oil until crisp (Clausen, 1954; Taylor, 1976). However, in North Sumatra the larvae are prepared as a thick curry soup containing highly seasoned, fried or roasted nymphs, various 'small fry' and sometimes tadpoles (Mohr, 1965). They were also eaten by North American Indians and by the Japanese (Schimitschek, 1968). Also in Japan, as well as in Tibet, dragonflies are used in folk-medicines to help against ear, eye and throat infections, asthma, convulsions, choleric cramps, boils, tumours and fever (Kunzang, 1973; Schimitschek, 1968). Relief of a different kind may be obtained by attending the 'Dragonfly' public houses. There are two of them, one in Peterborough and one in Tokyo (Still, 1981).

There seem to be two contrasting themes in dragonfly folklore. It is odd that the names attached to dragonflies present them as evil and dangerous, but their presence and their portrayal in art show them as omens of good luck and symbolic of summertime.

These notes make no claim to being complete, but merely summarise the information which has been casually gathered over a decade or so. I would be pleased to hear of any other incidences, ancient or recent, of dragonflies in folklore or symbolism.

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The dragonflies of Ceredigion — an update

A. D. Fox

Nature Conservancy Council, Fraser Darling House, 9, Culduthel Road, Inverness IV2 4AG

The geological uniformity of Ceredigion (the old county of Cardiganshire and Watsonian vice-county 46) belies the considerable variety of wildlife habitats retained in this part of west Wales. From the cold, exposed 753m summit of the Pumlumon massif with an annual rainfall of over 2500mm, it is barely 14 miles to the mild, sunny coast at Aberystwyth with less than 1000mm precipitation. The topography of the county is a matrix of upland and lowland plateau of base-poor Silurian and Ordovician shales, dissected by river systems and buried under varying amounts of glacial alluvium. The high rainfall and poor soils dictate a pattern of farming which ensures the perpetuation of large areas of poor pasture, much of it relatively undrained. The result is little industrial or agricultural development until very recent times and the survival of a range of riverine and wetland habitats for Odonata. During the last century, mineral exploitation, particularly lead and the resultant toxic waste accumulation, has damaged the freshwater flora and fauna of rivers such as the Rheidol and Ystwyth (eg. Jones, 1940), but the catchments of the Teifi and Aeron remain little affected by such sources of pollution. Over the past two decades, there has been increasing pressure to reclaim marginal land in such areas, and the availability of government grant aid for drainage and reclamation has accelerated the loss of wet acidic pasture, wetlands and mires. More recently the acidification of ground-water due to afforestation and "acid rain" has posed an insidious additional threat to the

Interest in Welsh Odonata has taken a considerable up-turn in the last
and it is easy to forget how little was previously
1970s. Dr J. H. Salter was Professor of Botany at University College of Wales Aberystwyth at the turn of the century and spent some thirty-six years in the county studying its flora and fauna, yet his detailed Natural History Diaries (lodged with the National Library of Wales, Aberystwyth) contain but a few tantalising references to Odonata, often using ambiguous or unconventional names. His extensive invertebrate collections (held with the National Museum of Wales in Cardiff) contain only 9 labelled Odonata specimens. More recently, Sage's (eg. 1973) annual reviews of Welsh dragonflies listed many early references to Cardiganshire sites. Fox (1981) described the district Odonata fauna known at the time, recording 21 species in the county, but further substantial recording has brought about a better understanding of

the status of several species, resulting in distribution maps published in Coker and Fox (1985). The present article seeks to put some of the changes in Odonata records in perspective.

In 1981, *Brachytron pratense* was discovered as a new Ceredigion species on the ditches of the coastal raised mire of Cors Fochno ("Borth Bog", still the most important Odonata site in the district), and it has since been seen every year, never in substantial numbers, but from at least four different parts of the mire complex. This remains the only new species for the district since 1981.

Two other contenders for inclusion on the district list cannot be presently substantiated. *Platycnemis pennipes* was reported (in larval form) in the lower Rheidol by Carpenter (1924), and by implication from Afon Clarach in Carpenter (1927). In the former instance, this was the only Zygopteran species noted, whilst the latter also records *Coenagrion pulchellum* (not noted subsequently: in view of the habitat and difficulties of larval identification this record has been rejected as unlikely) and *Ischnura elegans*. Given the distinctive nature of the caudal lamellae in *Platycnemis*, it seems unlikely that this is a mis-identification. The habitat seems suitable on both rivers mentioned, yet there have been no other records and the nearest extant colonies are on the eastern side of the Cambrian Mountains in Powys (Peers, 1985), making the Ceredigion insects a disjunct if not unlikely outlying population. The other historical record relates to *Leucorrhinia dubia*, reported from Llyn Eiddwen and from Llyn-y-gorlan at Teifi pools by Thomas (1968), and from Pentood Marshes (NCC files). Having been in contact with Dr Thomas, it appears no voucher specimen exist, and he himself stated that the records were "open to some doubt . . .". Llyn Eiddwen looks reasonably suitable for the species, with large areas of open *Sphagnum* carpet and some surrounding scrub, but substantial searches in 1981 and 1982 failed to locate any insects. The Pentood record is acknowledged by the observer to be a transcription error.

Records of *Coenagrion mercuriale*, reported from the north side of Cors Fochno in 1978 and 1980 (Fox, 1981) have been withdrawn since the species was not present in subsequent summers, and the records are thought to be mis-identifications of aberrant *C. pulchellum*. The peat cuttings in this part of the mire do not constitute suitable habitat for *mercuriale* which has a very distinctive habitat preference elsewhere in west Wales (Coker and Fox, 1985). *Coenagrion pulchellum*, however, was again found in 1982 and 1983 and a voucher specimen in the collection of Dr Roger Bray at NCC Regional Office, Plas Gogerddan, was taken from what was then an apparently numerous population at Cors Fochno in the year of its capture, 1973. This remains the only site in the county for the species (dismissing the record of Carpenter above), with records dating back to 1959.

Of the less common species, one at least has shown a dramatic increase in numbers of records. *Ischnura pumilio* was known from two sites in the late 1970s and was nowhere abundant (Miles, 1978). Since then it has been found at a further 12 sites, and 9 of these are within SSSI. Coverage is confounded by its short flight season, the vagaries of the Welsh climate and the apparent differences in abundance in different years, but it is doubtless more widespread than currently appreciated. The aberrant record from Cors Fochno in 1980 has been rejected and there have been no further records from this site since then despite intensive searches. The site is, in fact, unsuitable habitat, since the species is almost exclusively known from mesotrophic water in the county, either from spring flushes, or from small dew ponds, stock pools, farm ponds etc., on specifically mineral, muddy substrates, ie. never associated with more acidic waters with abundant *Sphagnum* species. *Ischnura pumilio* would thus be expected to be more widespread than it is currently known in Wales, and there can be little doubt that close examination of early flying *Ischnura* species will produce many more records than of *I. pumilio*. The most important site for this species is an artificial stock pond in mid-Ceredigion which dries out in some seasons, so even the temporary nature of the habitat need not preclude its presence. *Ceriagrion tenellum* remains rare and local away from its stronghold Cors Fochno, where recent increases appear associated with ditch blockage activities (Fox, 1986). A recent record from a small mire near Cors Caron suggests it may occur in that area, although there are still no records of *C. tenellum* from the National Nature Reserve despite attention which Cors Caron has received from entomologists in the past.

Of the other species, there are few gross changes to report. The survey of the entire Teifi catchment by a joint RSPB/UWIST/Welsh Water Authority team in 1981 brought to light many new records (data with NCC), and underlined the importance of this relatively undamaged river system for *Calopteryx splendens* which is increasingly rare away from the Teifi system. Further records of *Anax imperator* and *Aeshna cyanea* (both approaching their northern limit in Ceredigion) still give little clue as to the reasons behind their distribution and more information is still sought regarding the status of both *Orthetrum* species in the district. Much still needs to be done before our knowledge of Odonata in Ceredigion is complete, but it is cheering to note that the currently most important sites are reasonably well protected. Of the 14 sites with more than 10 species present, all but 3 are SSSI and the best sites (Cors Fochno, Cors Caron and Rhos Llawr Cwrt) are all National Nature Reserves (although the last named has yet to be formally declared an NNR). Three of the SSSI are also reserves of the West Wales Trust for Nature Conservation, including Rhos Pil-bach, where the excavation of new ponds has already attracted *Ischnura pumilio*. Further survey and monitoring is always required to ascertain that this protection safeguards a representative cross-section of the habitats required to perpetuate the Odonata interest of this varied and fascinating district.

Acknowledgements

My thanks go again to all those who sent records of dragonflies from Ceredigion to me or BRC over the years, particularly Ieuan Williams, fully acknowledged in Fox (1981). Particular thanks go to Adrian Fowles for his extraction of all Odonata records from the diaries of Dr Salter, for checking specimens of the NMW in Cardiff, for the many records he has provided and for comments on an earlier draft. Thanks to Dr D. Glyn Jones (NCC) for his supervision, help and advice on sites over the years, to Dr Roger Bray (NCC) for assistance with past records and to Bob Merritt for his assistance regarding the reconsideration of past records; all made comments on earlier drafts. Steven Evans (NCC) also helped with queries regarding some of the records.

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More characters to separate *Aeshna subarctica* (Walker) from *Aeshna juncea* (L.) in the field

W. Clausen

Oppenwehe 459, D-4995 Stemwede 3, West Germany

Dunn & Vick (1985) gave some characters to separate *Aeshna subarctica* and *A. juncea*. However, there are some additional characters which can be seen without the need of a hand lens (Figs. 1-3).

I can confirm the value of the thoracic and head markings. I too have always found *A. juncea* with two yellow spots behind the head. Nevertheless, in Finnish Lapland, Valle (1929) found many *juncea* specimens which were entirely black behind the head. Bilek (1960) pointed out two characters of importance in the field. When you have netted an *Aeshna*, look at the third and fourth dorsal segment of the abdomen. The medio- and posterio-dorsal spots are very dissimilar in *juncea* but very similar in *subarctica*. This character is present in both sexes as well as in teneral and matured specimens. The anal appendages of the females are also worth examining. In *subarctica* they are horizontal (Dunn & Vick, 1985) but in *juncea* they are twisted, as figured in Hammond (1977). Seen from behind they resemble the letter V.

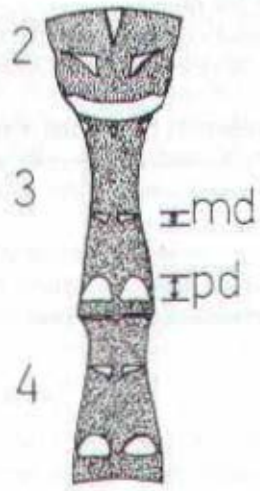

Fig. 1a *Aeshna juncea* ♂

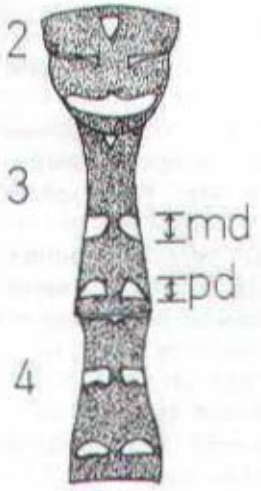

Fig. 1b *Aeshna subarctica* ♂

Dorsal view of the 2nd-4th abdominal segments
md — medio dorsal spots
pd — posterio dorsal spots

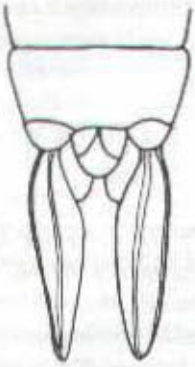

Fig. 2a *Aeshna juncea* ♀

Fig. 2b *Aeshna subarctica* ♀

Anal appendages, ventral view (after Bilek)

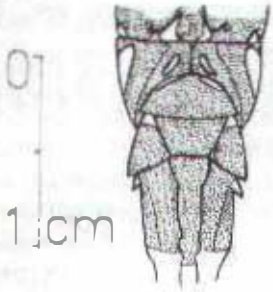

Fig. 3a *Aeshna juncea* ♂

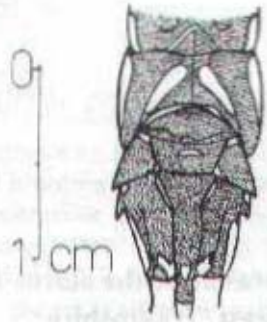

Fig. 3b *Aeshna subarctica* ♂

Yellow spots on the ventral side of thorax.
In *subarctica* always bright, in *juncea* small, dull, often missing.

Studying the territorial behaviour of these two *Aeshna* species I found some yellow spots on the ventral side of the thorax which are very bright and clear in *subarctica*, but small and dull and often missing in *juncea* (Clausen, 1982). Jurzitza (1960) reported characters which can be used to separate *subarctica* and *juncea* in flight. To do this accurately you need a good eye for colours and the ability to adapt to fast movements. I have never succeeded in separating these species on the wing.

ovipositing females should be watched very carefully. While in most cases *juncea* females oviposit into the stems of *Eriophorum* or *Juncus*, sometimes even into the wall of a peat bog, *subarctica* females oviposit into *Sphagnum*-moss only. When doing this they often sit on *Eriophorum*. Therefore, it is important to look carefully for the action of the ovipositor.

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A reappraisal of the status of *Sympetrum sanguineum* (Müller) in the New Forest, Hampshire

Noelle and Tony Welstead

3, Kelvin Close, Blythe, Southampton, Hampshire SO4 5LW

Killington (1926) and Fraser (1950) both reported the absence of published records for *Sympetrum sanguineum* from the New Forest although the latter stated that this species was present to the immediate east and south. In our booklet, *The Dragonflies of the New Forest* (1984), we wrote that 'although *S. sanguineum* breeds close to the south-eastern boundary, it is not known to be established within the New Forest.' This conclusion was based on extensive surveys by the New Forest Odonata Study Group who, prior to 1984, concentrated mainly on areas open to grazing by Commoners' cattle and ponies.

M. Palmer recorded two adults in the west of the area in September, 1980 (Merritt, pers. comm.), but these were thought to be migrants. During August and September, 1984, David Winsland found *S. sanguineum* at four sites within the perambulation of the New Forest. Up to twenty adults, including ovipositing pairs, were seen at a deer-browsed, woodland pond within an inclosure in the eastern New Forest. Two adults were also noted at a nearby pond sheltered to one side by a conifer plantation. This latter site is open to ponies, but has some tall, emergent plants. Several adults were observed at a large pond in private woodland in the central region, coupled with a casual sighting at David's garden pond which is in the same general area.

Several new records were added during the summer of 1985. In August, Alison Bolton caught a single male *S. sanguineum* as it flew along the river bank in a wooded reserve at the southern edge of the New Forest. The following day Alison observed five males on a sheltered, well vegetated pond just within the southern boundary, but to the south east of her previous record. This species was absent from a nearby larger, but open, heathland pond.

During our surveys in 1985, we (N. & J. W.) located *S. sanguineum* on a series of ponds in an area of private, broadleaved woodland within the eastern boundary of the New Forest. These proved to be well established breeding populations, known locally, but not to the Group recording scheme. Further adults were found at a pond on a Nature Reserve initiated for the disabled on Forestry Commission land isolated by the construction of the A326. This pond was largely overgrown by *Typha latifolia* prior to the creation of the reserve. We also visited the coastal breeding site for *S. sanguineum*, beyond the south-eastern boundary, during the emergence period. This area of brackish marshland, dominated by *Phragmites australis* and with tidal drainage channels and a small pond, contrasted markedly with the New Forest breeding sites. Newly emerged *S. sanguineum* were seen clinging to the reeds adjacent to the dykes, other species present included *Calopteryx virgo*, *Ischnura elegans* and *Sympetrum striolatum*.

S. sanguineum breeds in shallow margined water bodies which are moderate to rich in nutrients and have lush emergent and marginal vegetation, including *Typha latifolia* and *Sparganium* and *Equisetum* spp. Most broadleaved woodlands in the New Forest occupy areas of fertile soil and their associated water bodies are mesotrophic (medium nutrient content). Heathland ponds lie on impoverished soils and are acidic and nutrient poor, but those located in former marl pits are more mesotrophic in nature. The recent sightings of *S. sanguineum* in the New Forest have been at, floristically, mesotrophic water bodies. Populations were largest where

grazing and trampling by animals at the water margins was minimal. *S. sanguineum* is vulnerable to the removal of aquatic vegetation (Chelmick *et al.* 1980) and its fragmented distribution locally may be related to both waterchemistry and grazing pressures. However, several breeding sites, for this species, have now been identified within the perambulation of the New Forest.

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A cautionary note on the use of the discoidal cell (or triangle) in the identification of *Somatochlora metallica* (Vander Linden) and *Cordulia aenea* (L.)

Stephen A. Chatt

45, Weltmore Road, Luton, Bedfordshire LU3 2TN

Due to the similarity of the British cordulids, identification can often prove difficult in the field and separation of species often requires close inspection.

In order to distinguish between *Cordulia aenea* and *Somatochlora metallica*, Hammond (1983) draws attention to differences in the facial markings, the size and shape of the anal appendages and the relative position of the arculus to the base of the discoidal cell (or triangle) in the hind wing. Hammond states that the base of the discoidal cell is slightly basal to the line of the arculus in *C. aenea* and level with it in *S. metallica* and that this is diagnostic for each species. In addition, there are two cubitoanal crossveins in *S. metallica* but only one in *C. aenea*.

Specimens of both *C. aenea* and *S. metallica* examined and photographed during 1984 and 1985 from Thursley Heath, Surrey, showed the line of the arculus to vary in

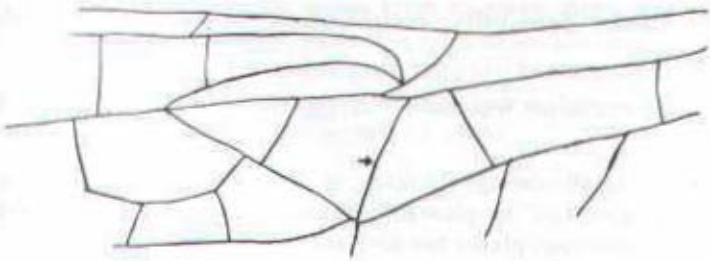

Fig. 1a. Variant of *S. metallica*. Base of discoidal cell of hindwing basal to line of arculus.

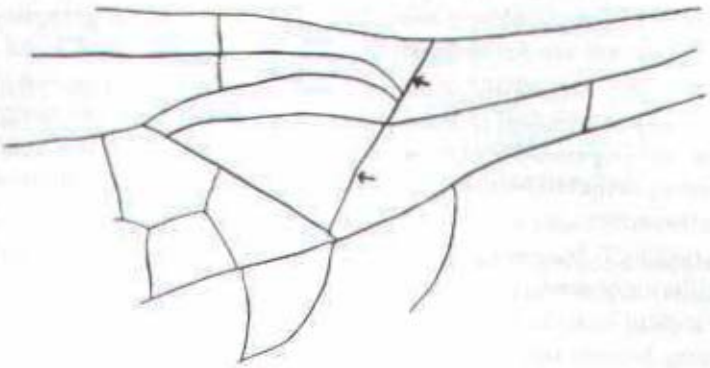

Fig. 1b. Variant of *C. aenea*. Base of discoidal cell of hindwing in line with arculus.

relation to the base of the discoidal cell (Fig. 1). In both *S. metallica* and *C. aenea*, specimens were found with the arculus both level with and basal to the base of the discoidal cell. However, two cubitoanal crossveins were always present in specimens of *S. metallica* and only one in *C. aenea*. It would therefore appear that the use of the discoidal cell is not as diagnostic as Hammond suggests and that other characters should be used to distinguish these two species.

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Hammond, C. O. 1983. *The dragonflies of Great Britain and Ireland*. 2nd edition (revised by R. Merrall). Harley Books, Colchester. 116 pp.

Mortality in the damselfly, *Ischnura elegans* (Vander Linden)

Paul Whalley

23, Carron Mead, South Woodham Ferrers, Essex CM3 5GH

There are surely enough hazards in nature for delicate-looking damselflies without being "attacked" by plants, particularly when these are not even one of the well-known carnivorous plants but an (introduced) composite.

The plant causing the trouble has a very descriptive name, Bristly Ox-Tongue (*Picris echioides*) and is a course-leaved Compositae growing up to nearly a metre high with much-brunched stems and yellow flowers. The leaves and stems feel (and look) coarse and when examined closely can be seen to be covered with long hairs. These hairs are stiff but instead of having a fine point, end in a group of 3-4 recurved spines, the tip of the hair resembling a mini-grappling hook. These 'grappling-hook' hairs cover the plant but are particularly dense on the stems.

In July 1985, in an area of S.E. Essex, I noticed a damselfly, *Ischnura elegans*, firmly attached by its wings to the stem of a *Picris* plant. The insect projected from the stem, held fast near the apex of both wings. Examination of the *Ischnura* revealed that the 'grappling-hook' hairs had pierced the wing membrane and hooked over a vein, trapping the insect.

I watched a colony of *Ischnura elegans* flying in the tall grass round the abundant *Picris* plants. While I was watching, a female, closely attended by a male, fluttered too close to a plant stem and was immediately caught by one wing. As she struggled a second wing became trapped. There was no doubt she was completely helpless. The male too, taking no apparent notice of the struggle, moved in closer and was caught by the wing. Very shortly one of his other wings was trapped and he was held fast. When I released them they both flew off, apparently none-the-worse for their ordeal.

Subsequently I found more insects, and even a centipede, trapped by the stems of *Picris*. These included a number of moths (Pyralidae, *Agriphila straminella* D. & S.) as well as several beetles (Cantharidae, *Rhagonycha fulva* Scop.). The moths were caught by the wings, the 'grappling-hook' hairs having penetrated the wing membrane and hooked over the veins. There were a number of dead moths caught in this fashion as well as several still struggling. The beetles and the centipede were all trapped by their legs which were caught between the modified plant hairs. Neither the beetles nor the centipede had been able to free their legs. Adjoining hairs, with their 'grappling-hook' ends, effectively trapped the legs between them. Several of the trapped beetles and the centipede were dead; other beetles were still struggling.

The structure of the damselfly wings seem to make them vulnerable to the 'grappling-hook' hairs of *Picris* and, while it is hard to see the value to the plant of actually catching the insect, it is certainly of no value to the insects! Bristly Ox-Tongue is spreading along the banks of the River Crouch in Essex. I would be interested to hear of other observations on insects trapped by *Picris*.

Some notes on the behaviour of Odonata

L. A. Thicket

17, Woodland Place, Totley Rise, Sheffield S17 4JG

We all know how alert and active Odonata can be. Little that moves, it seems, escapes their notice, but how do they perceive the changing scene around them, and what predisposes them to act and react in the way that they do? In particular, what stimulates mating responses in the males? Will the simple availability of a female trigger a mating response or does the male need to be predisposed?

Recently, I watched a male *Aeshna cyanea* at a pool for about 15 minutes. For the first 10 minutes he patrolled the water along one side of the pool. This beat ended in a small bay where he occasionally confronted an *A. grandis* patrolling an adjacent beat. These confrontations did not appear to involve physical contact. At the other end of his beat was a patch of emergent vegetation into which females of *A. grandis* were constantly and quietly flying and ovipositing. I cannot believe that the male *A. cyanea* was ignorant of these ovipositing females, but he ignored them. He certainly seemed to investigate everything else that moved, including me. After about 10 minutes his behaviour totally changed. Instead of feeding and patrolling, he came down low and began investigating the small open areas amongst the emergent vegetation, and its margins. Hovering, he would face this way, then that, and then fly over a clump of irises and repeat the performance in another nearby open area. I have watched *A. mixta* males doing this before grabbing hold of seemingly unsuspecting perched females and mating with them.

Within a couple of minutes a female *A. grandis* approached, but this time, instead of ignoring her, the male *A. cyanea* swiftly flew directly at her and she responded with a tail-down, pseudo-ovipositing posture, thus refusing mating. Within a few more minutes he left the pool entirely.

This series of events would suggest two separate motivational stages. Stage one elicited appropriate feeding and aggression responses to prey and male aeshnid stimuli. In stage two his motivation was tuned to mating and only then did a female flight pattern attract his attention, where previously he ignored such stimuli.

If males are aggressive to other males, how do females react to each other? I recently observed two female *A. grandis* ovipositing around the base of a small submerged tree stump. They had both obtained secure footholds and were not hovering. Nevertheless, their wings were held up in a sort of 'pre-hovering' posture. When their wings relaxed, and slowly moved towards the horizontal position, the wings of the two individuals touched. How curious it was, after watching females of this species causing tremendous damage to their wings by haltering them on surrounding vegetation during oviposition, to see these two females jerk their wings away from each other at the slightest touch. Close proximity was apparently tolerable, but touching definitely not.

Adult Odonata locate their prey visually and so presumably react to a target profile consisting of, perhaps, a combination of size, movement and probably more subtle clues. I was amused recently when a male *Pyrrhosoma nymphula* was confronted by a single strand of my wife's hair which was blowing in the breeze. The damselfly grabbed the strand of hair in its mouthparts and hovered for several seconds before letting it go! A second example of this kind of behaviour gave me quite a start. I was peering through the view finder of a camera, photographing a young female *A. cyanea*, when something grabbed my shirt with much clattering. It was an *A. grandis*, and it had seized my chequered shirt where the patterned areas crossed to form a dark spot. It was trying to fly backwards with my shirt, though, at such eye-crossingly short range, I could not tell whether it was using its mouthparts or legs. Within seconds it gave up and ruckeled away.

Were both these misguided Odonata responding inappropriately to visual clues, or do their instincts include a 'curiosity factor' similar to that which prompts non-feeding spawning salmon to nevertheless take objects, including fishermen's lures, into their mouths? Similarly I have seen a female *Cordulegaster boltonii* apparently ovipositing on a wet Scottish road. I wonder whether eggs were really laid or whether she was going through exploratory motions before accepting or rejecting the wet surface.

A population study of *Coenagrion mercuriale* (Charpentier) at a New Forest site using a modified "Pollard Walk"

D. K. Jenkins

7, Lakewood Road, Ashurst, Hampshire SO4 2DH

Our local New Forest Odonata Study Group had discussed and eventually rejected the idea of counting Odonata populations by using an adaptation of the "Pollard Walk" method (Pollard *et al.*, 1975; Pollard, 1977) which has been successful, for comparing the abundance of butterflies. Typical difficulties envisaged were the high mobility of species such as *C. boltonii* or *S. striolatum*, the dense concentrations of e.g. *C. puella* and the difficulty of separating the various small blue Zygoptera. However it seemed to me that *Coenagrion mercuriale* might be successfully counted by a modified "Pollard Walk" for the following reasons:-

(a) the males, at least, are highly visible
(b) *mercuriale* is a very weak flier and tends to move only a foot or two after disturbance
(c) in the proposed study area there were virtually no other small blue Zygoptera present
(d) after initial emergence and temporary dispersal, *mercuriale* males were largely confined to the stream.

It was decided that, as for butterflies, certain conditions should be met on each visit in order to reduce as far as possible the number of external variables. Thus visits were made at least fortnightly, at the same time of day (in the present survey between 11 a.m. and 12.30 p.m.) and in warm sunny weather with cloud cover less than 5/10 and wind less than force 3. These conditions were easily met throughout the flight season of 1984 and with some luck were just satisfied in 1985.

The study in 1984 was carried out to determine the feasibility of the project, and the results were encouraging enough to make a comparison survey worthwhile in 1985. (Two further areas were studied in 1985 and this work will be reported separately). The chosen site for 1984/85 was upper Crockford Stream (348999 to 352990) which has the highest number of *mercuriale* in the New Forest, estimated at over 500 insects in 1984. The stream itself runs over the shelly Headon Beds which outcrop in the south of the Forest and is therefore marginally less acid than most New Forest streams. The ecology and geology of this and other typical New Forest *mercuriale* sites has been adequately covered by others (Winsland, 1985; Merritt, 1983). From its emergence point below the edge of Beaulieu Airfield, the stream runs for 100 yards through heathland to a large ponded area, then for about one mile through an open area of

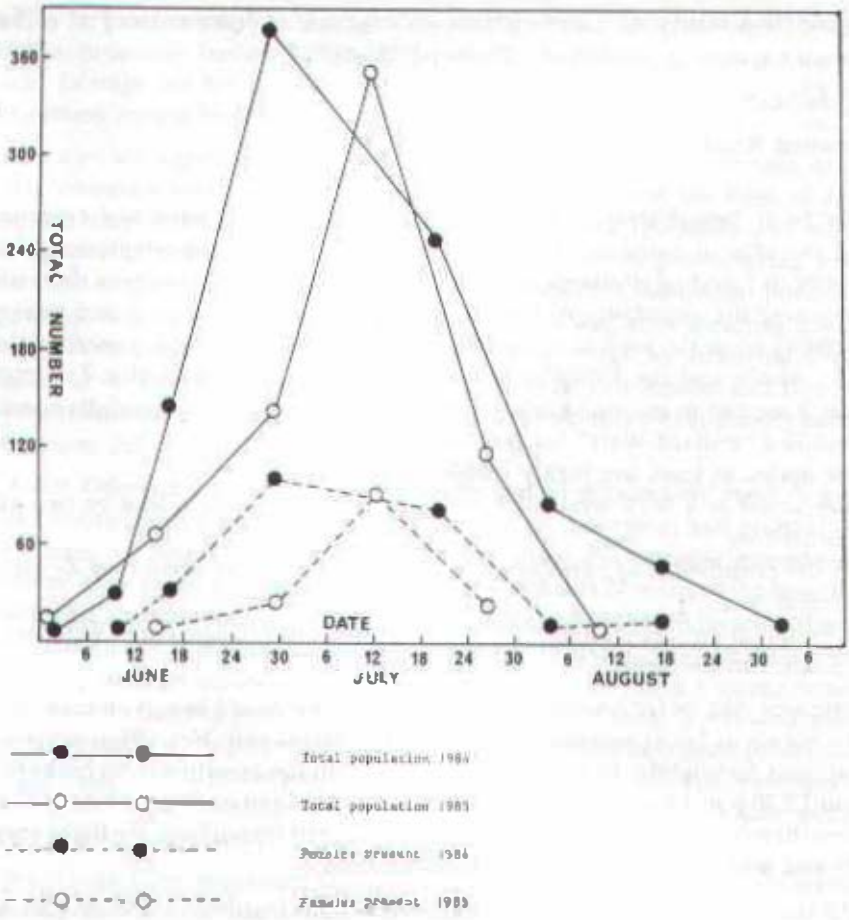

Fig. 1 Numbers of *C. mercuriale* present in 1984 and 1985 at a site in the New Forest.

valley mire to a smaller ponded area and finally through ¼ mile of mixed bog and heathland to an area of scrub near the road bridge. Species found in the vicinity of the stream were *C. virgo, C. boltonii, P. nymphula, C. tenellum, I. elegans* (very rare), *L. sponsa* (very rare), *O. coerulescens, S. danae* and *S. striolatum*. The ponded areas supported very low numbers of *L. quadrimaculata, A. imperator, C. puella, E. cyathigerum, L. depressa* and on one occasion *O. cancellatum*.

As a rough guide to distribution, the position of each *mercuriale* was marked on an enlarged map of the area as male, female or a pair. Populations of *mercuriale* were most dense in the open stream areas, with a higher density in the upper boggy area than in the lower mixed bog and heath area. As a guide to possible fluctuations in the Odonata population as a whole in the area, all the other species present were plotted together on a separate map.

The change in population with time is shown in Figure 1 with the 1985 results superimposed on those of 1984 to give a direct comparison. It was encouraging to see that conditions in early 1985 with two weeks of temperatures continuously below zero had no dramatic effect on total population numbers. The slightly lower figures may easily be accounted for by the poor weather of the 1985 flight season. The onset of very wet and windy weather at the beginning of August 1985 is reflected in the sudden and rapid decline in numbers for this period, leading to a much shorter overall flight season than that of 1984.

Very few single females were ever seen along the stream, even allowing for their good camouflage, and it is presumed that they, like some other Odonata species, disperse into the surrounding heathland or bog until ready to mate. The percentage of females present increased more or less in proportion to the number of males but even at the height of the breeding season only some 25-30% of the total population were females. The nature of the survey and numbers present at this site precluded any attempt to distinguish blue forms of the female.

In conclusion it is not suggested that the project undertaken here gives an accurate count of total *mercuriale* numbers, but it does appear to form the basis for determining the relative abundance in future years. Thus using the same method it should now be possible to count numbers around the time of maximum emergence each year in order to determine fluctuation in populations.

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Erratum

Caption to Fig. 1, on page 101 of volume 1 (6); for "...male..." read "...female..."

INSTRUCTIONS TO AUTHORS

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Manuscripts should be typewritten using black ribbon, doublespaced, on one side of the page only and with margins at least 25 mm at the left, top and bottom; text pages should be numbered. Footnotes should be avoided.

Words that are to appear in italics (e.g. names of genera and species, though not of families) should be underlined.

Use of these terms is acceptable: 'exuvia' (or cast skin (plural 'exuviae'); 'larva' (instead of 'nymph'); 'prolarva' to designate the first larval instar.

References cited in the text should be in the form '(Longfield, 1949)' or '. . . as noted by Longfield (1949).' All references cited in the text (and only these) should be listed alphabetically at the end of the article in this form:

Hammond, C. O. 1983. *The dragonflies of Great Britain and Ireland.* 2nd edition (revised by R. Merritt). Harley Books, Colchester. 116 pp.

Longfield, C. 1949. The dragonflies of the London area. *The London Naturalist* 28: 91–98.

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The legend for each table and illustration should allow its contents to be understood fully without reference to the text. The approximate position of each table and figure should be indicated in the text.

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