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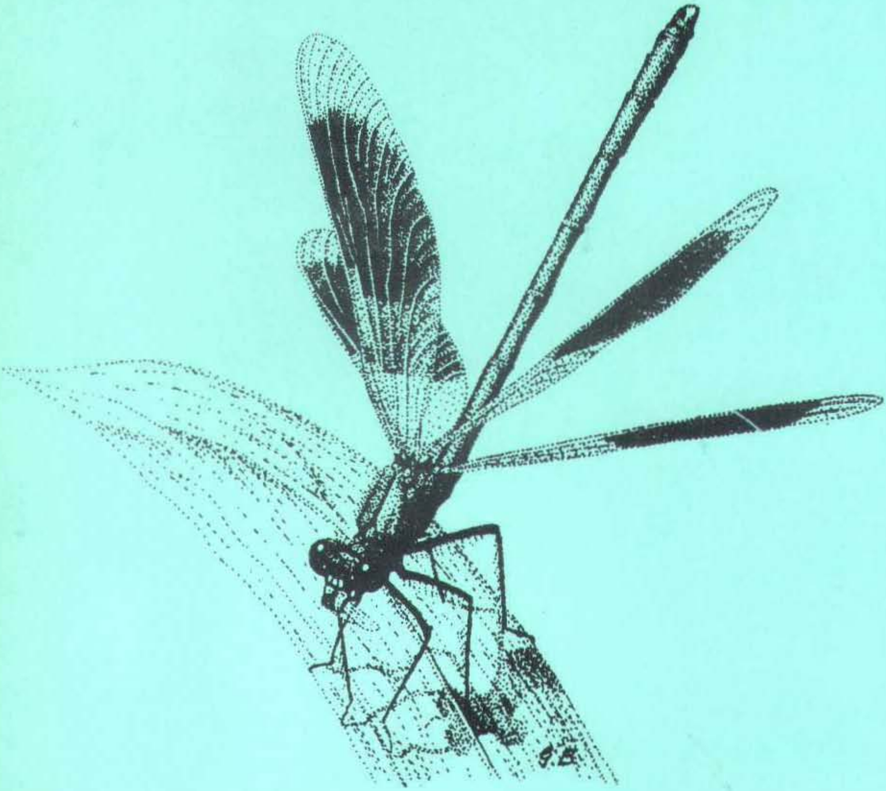

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member of the Societas Internationalis Odonatologica

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 a member of the Societas Internationalis Odonatologica (S.I.O.).

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Front cover illustration of *Calopteryx splendens* by Gill Brook.

A population study of *Coenagrion mercuriale* (Charpentier) at a New Forest site. Part 4. A review of the years 1985 to 1989

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Previous papers (Jenkins, 1986a; 1986b; 1987) have described the effects of timing and weather conditions when estimating the relative size of populations of *Coenagrion mercuriale* in four areas in the Crockford area of the New Forest. Although the original work involved weekly counts throughout the flight season, it became evident that maximum emergence occurred a week or two either side of the first week in July, the actual date depending on previous weather conditions. It was thus possible to compare maximum numbers by counting for a limited period of three to four weeks covering the estimated date of maximum emergence. This, in turn, made a regular annual count possible, weather permitting, in the minimum of time and effort.

In general this routine has worked well except in 1988 when suitable days at the required time were very few due to cloudy weather, or mist until mid-morning on the better days. As pointed out in previous papers, it should be borne in mind that counts at Upper Crockford were done between 11am and noon, at Lower Crockford between noon and 12.30pm and at the Peaked Hill sites between 12.30 and 1pm. Thus the figures do not represent the total number of *mercuriale* present but form a basis for comparison from year to year using figures obtained on the same day, and as far as possible under the same weather conditions. Although it has not been possible to estimate the error involved in counting, the fairly smooth change in size of populations recorded and the similar trends found at all sites are encouraging.

The total numbers of *mercuriale* over the five year period are shown in Fig. 1, while a break-down into male and female numbers is given in Table 1. The low number of *mercuriale* recorded in 1985 at Upper Peaked Hill is almost certainly due to a sudden deterioration in weather on the day. From total numbers it appears that up to 1989 there has been a serious decline in the population at Upper Crockford amounting to a fall of around 50%, a slight decline in numbers at Upper Peaked Hill and a drop in numbers at Lower Crockford and Lower Peaked Hill followed by a slight recovery. In the absence of any other known factors, the general decrease in populations could be attributed to relatively poor weather during the flight season and very cold spells during the winters, particularly of 1986-87. However, it is difficult to see why Upper Crockford should have suffered such a marked decline compared to the other sites, since they are all within a radius of 1km and both Upper Crockford and Upper Peaked Hill share a similar ecological structure. The high numbers recorded at all sites in

Table 1. Annual populations of *C. mercuriale* at sites in the Crockford area.

		Upper Crockford	Lower Crockford	Lower Peaked Hill	Upper Peaked Hill
1984	Male	266	****	****	****
	Female	116 (30%)	****	****	****
	Total	382	****	****	****
1985	Male	254	134	84	123
	Female	104 (29%)	25 (16%)	15 (15%)	17 (12%)
	Total	358	159	99	140
1986	Male	205	101	60	407
	Female	11 (5%)	20 (17%)	12 (17%)	153 (27%)
	Total	216	121	72	560
1987	Male	167	107	90	433
	Female	20 (11%)	24 (18%)	16 (15%)	78 (15%)
	Total	187	131	106	511
1988	Male	158	109	94	433
	Female	35 (15%)	26 (19%)	23 (20%)	63 (13%)
	Total	193	135	117	496
1989	Male	194	130	279	618
	Female	66 (25%)	56 (30%)	143 (34%)	282 (31%)
	Total	260	186	422	900

1989 reflect the exceptionally favourable weather conditions and, although it is not possible to separate the effects of the mild winter and the warm, dry pre-emergence weather in May, it seems likely that a greater number of larvae survived the winter than in previous years. The almost four-fold increase in numbers at the Lower Peaked Hill site may be related in part to the return of this stretch to its natural state, after ditching operations carried out at the beginning of the 1980's.

One unexpected and unexplained feature of the results is the change in percentage of females (Table 1). This is particularly noticeable at Upper Crockford and Upper Peaked Hill when in the best years the proportion of females counted is of the order of 30%, while in other years the percentage is much lower.

The 1990 season should be of considerable interest for all Odonata in the New Forest, since many ponds and streams dried out completely during 1989,

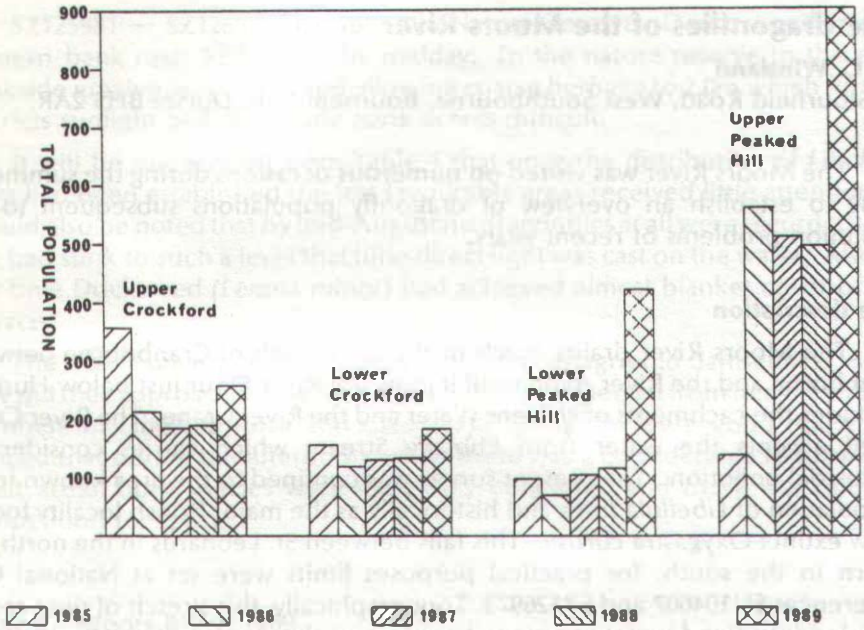

Figure 1. Total annual populations of *C. mercuriale* at sites in the Crockford area.

presumably with complete loss of ova and larvae. However, since most *mercuriale* sites are fed by water from valley mires, most of them retained a flow of water, albeit at a reduced rate, right through the drought. Given a reasonable winter and spring, the upsurge in numbers should be maintained.

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The dragonflies of the Moors River

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The Moors River was visited on numerous occasions during the summer of 1989 to establish an overview of dragonfly populations subsequent to the pollution problems of recent years.

Site description

The Moors River drains much of the land south of Cranbourne between Wimborne and the River Avon until it joins the River Stour just below Hurn. It includes the cachments of Uddens Water and the River Crane. The River Crane itself accepts the water from Ebblake Stream which carries considerable industrial pollution. The present survey was confined to the area known for its population of *Libellula fulva* and historically as the major British locality for the now extinct *Oxygastra curtisii.* This falls between St. Leonards in the north and Hurn in the south, for practical purposes limits were set at National Grid references SU104007 and SZ126973. Topographically, this stretch of river can be divided into five separate sections based upon the degree of shade, exposure and flow rate.

SU104007 — SZ116994. Well grazed meadows on both banks giving open aspect except for occasional mature deciduous trees. Good aquatic vegetation.

SZ116994 — SZ119991. Extremely dense woodland on west bank coupled with a continuous line of mature trees on the east bank make the area very shaded and thus unattractive to dragonflies. Adjacent to the meadows flanking the eastern bank, there is an extensive area of marsh and fen carr. This is to the south of Key Copse and management compatible with this type of biotope would be of immense value to the whole ecosystem.

SZ119991 — SZ125985. Dense mixed woodland on the western bank and well-grazed meadows to the east. The meandering nature of the stream gives rise to alternating stretches of sunlight and shade. The proportions change unfavourably during the afternoon but this still proved to be the most productive area.

SZ125985 — SZ125981. Scrub and dense coarse herbage, mainly Common Nettle *(Urtica dioica)* and Common Reed *(Phragmites communis)* to 2.5m made bank access difficult. On the airport height restriction zone the lack of tree cover has encouraged the Common Reed to encroach into the river thus narrowing the bed and thereby increasing the flow rate.

SZ125981 — SZ126974, Troublefield Nature Reserve. Dense woodland on western bank casts 95% shade by midday. In the nature reserve to the east, bankside grazing was prevented allowing coarse herbage to 2.0m which further restricts sunlight and also made bank access difficult.

It will be understood from Table 1 that once the distribution of *Libellula fulva* had been established the less favourable areas received little attention. It should also be noted that by mid-August no dragonflies at all were recorded. The sun had sunk to such a level that little direct light was cast on the water. Also by this time Duckweed *(Lemna minor)* had achieved almost blanket cover of the surface.

The main concern must be the paucity of coenagrionid damselflies. At no time did they approach the densities that might be expected from healthy waters. Numbers of *Libellula fulva* and *Calopteryx splendens* were good but it was noticed that during the afternoon, when there was a considerable reduction in sunlit areas, both species were extremely congested and there was unusual competition for space.

Table 1. Moors River, 1989

	JUNE						JULY		AUGUST	
Km. sq.	10/00	10/99	11/99	11/98	12/98	12/97	12/98	12/97	12/98	12/97
Anax imperator	A	—	B2	—	—	—	—	—	—	—
Aeshna grandis	—	—	—	—	—	—	A	—	—	—
Libellula fulva	B2	B2	—	B2	D60	D	C	B	—	—
Sympetrum sanguineum	—	—	—	—	—	—	B	—	—	—
Calopteryx virgo	A	—	—	—	—	—	—	—	—	—
Calopteryx splendens	C	C	B	B	C	C	C	C	—	—
Pyrhosomma nymphula	B	B	A	—	C	B	C	B	—	—
Coenagrion puella	B	B	B	—	B	A	B	—	—	—
Platycnemis pennipes	—	B2	—	—	—	—	—	—	—	
Ischnura elegans	—	—	—	—	B	B	B	B	—	—

Coding letters are as used by B.R.C. Monks Wood and should be interpreted as follows.

A = 1, B = 2-5, C = 6-20, D = 21-100, E = 101+.

Conclusion

For the Moors River to continue as a nationally important locality for Odonata, there are two major problems to be addressed. One for the adult insect and one for the larval stage.

There are extreme restrictions placed on the adult insect in preferred areas because of the degree of shade. This is caused primarily by the woodland on the western bank. The solution to this would appear only to be limited by the formulation of a management plan, the co-operation of the land owners concerned and supervision of the management.

The low numbers of coenagrionid damselflies in all probability reflects a correspondingly low number of larvae. The species concerned, being primarily plant dwellers, could be affected in several ways: the overall pollution level in itself; the pollution (eutrophication) is causing excessive growth of primitive plants on the foliage of submerged vegetation, rendering them unsuitable as a habitat; the pollution has in some way upset the predator/prey relationship. These three alternatives should form the basis for further studies.

This is a preliminary report, further recording and studies based on this and other information will be undertaken.

The last of Oxygastra curtisii (Dale) in England?

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Introduction

Oxygastra curtisii, a species with a limited global distribution, was first discovered and described in England. Sadly, it is now over 30 years since it was seen for certain in this country. Therefore, it seems worth recording two of the last sightings of the species as well as two attempts to rediscover it.

Last records

Askew (1988) states that the last record of the species in England was from the Moors River in Hampshire in 1951. I saw it on two occasions after that date. On 23rd June 1954 I was introduced to the species by no less a person than the late

Colonel F. C. Fraser. We saw (and caught) a male in the pine-heath which at that time bordered the eastern edge of the Moors valley just north of the village of Hurn.

On 4th July 1957, I made a more thorough search for *Oxygastra* by walking along the Moors River from Hurn (SZ 127 970) to near Pussex Common (SZ 125 982) (Fig. 1). I saw two males by the river. One patrolled a beat of c.10m, the other of c.22m. Even at that date trees shaded much of the Moors River, and so the amount of available habitat for territorial males was very much restricted. I doubted whether there was room for more than six territories in the 1200m of the river which I visited. This stretch represented about a third of the total available habitat (Fig. 1).

Search in Devon

By the 1970s it appeared that *Oxygastra* had become extinct in its Moors River locality (Moore, 1976). However, there was an old record from Braunton Burrows in North Devon (Lucas, 1900) and a more recent one (1946) from the Tamar valley (Brian Eversham, Biological Records Centre, pers. comm.), therefore it seemed worth making a search on the Devon rivers. I made a reconnaissance study of the rivers Torridge and Tamar on 4th-7th July 1973. Some stretches of these rivers appeared to provide possible habitats for *Oxygastra* and so I carried out a much more thorough search on 1st-4th July 1975. I looked at 36 sites on the rivers Tamar, Torridge, Taw, Mole, Exe and Dart. I paid particular attention to the 13 sites (7 on the Tamar, 3 on the Taw and 3 on the Torridge) which contained *Platycnemis pennipes*, since this was a characteristic species on the Moors River where *Oxygastra* occurred. Weather conditions were ideal, but as briefly reported in 1976 (Moore, 1976), no *Oxygastra* were observed.

Search in Dorset and Hampshire

In July 1989 Mr Keith Corbett wrote to me describing a dragonfly he had seen perched on the ground between heather bushes at Baker's Hanging (Fig.1) (SU 126 064) about 2km northwest of Ringwood on 9th June 1989. It was a dark dragonfly with 'orangy-bronze to copper' blotches on the abdomen which tended to be diamond shaped. He was sure it was not *Cordulegaster boltonii*, and almost certain that it was not *Gomphus vulgatissimus*. Baker's Hanging is 6km from the Moors River but only $1^1/_4$km from the River Avon (Fig. 1). Therefore it seemed worth searching both rivers as thoroughly as possible. I did this under good, but not perfect, weather conditions from 28th June to 5th July 1990.

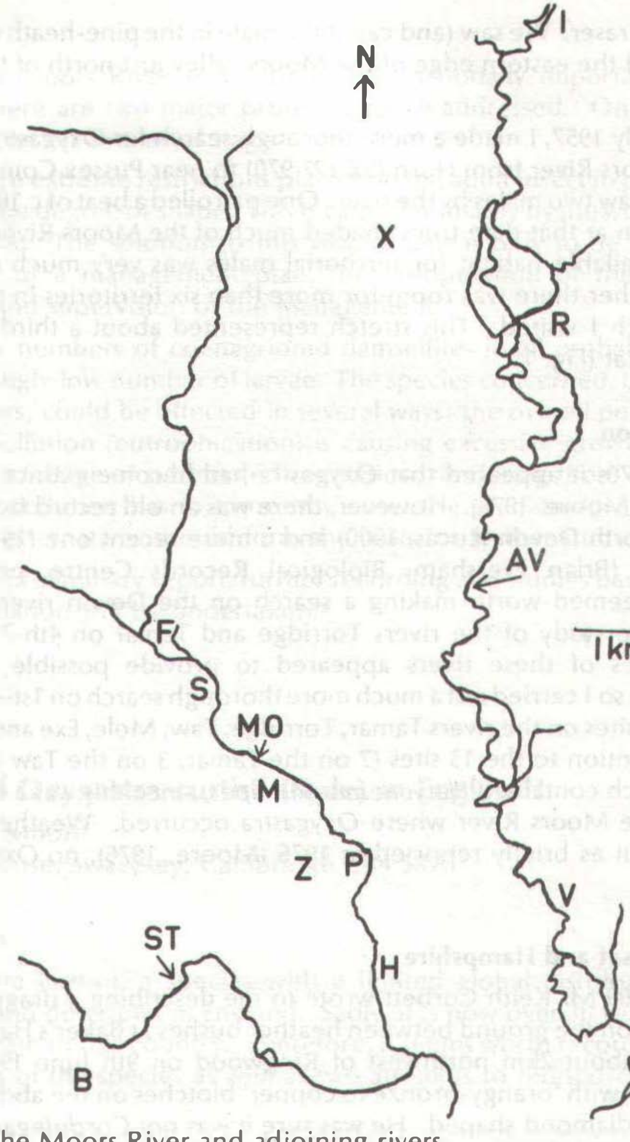

Figure 1. The Moors River and adjoining rivers.
AV — River Avon, B — Bournemouth conurbation, F — Palmer's Ford, H — Hurn, I — Ibsley, M — Merritown Heath, MO — Moors River, P — Pussex Common, R — Ringwood, S — Sewage Farm, ST — River Stour, V — Avon Crossing, X — Baker's Hanging, Z — Hurn Airport. Habitats once suitable for *Oxygastra* on the Moors River were confined to the stretch between F and H.

Most of the River Avon is too fast for *Oxygastra* and the bottom is too sandy, however there are places where the flow is less fast and there is detritus, which might be suitable for *Oxygastra* larvae. I visited ten localities between Ibsley (SZ 150 097) and the Avon Causeway near Court Farm (SU 150 978) (Fig. 1). I recorded *Calopteryx splendens* in five localities on the Avon, *Ischnura elegans* in three, *Coenagrion puella* in two, and *Enallagma cyathigerum* in one, but no *Oxygastra* or other anisopterans.

During the same visit I returned to the places where I had seen *Oxygastra* on the Moors River in the fifties. *C. splendens*, *C. puella*, *Pyrrhosoma nymphula* and almost certainly one *Libellula fulva* were seen. Trees on the west bank of the Moors River adjacent to Troublefield (now a reserve of the Dorset Naturalists Trust) had grown considerably, and much of the river was shaded and so less suitable for dragonflies.

Later I visited the river at two or three places northwest of the Pussex bridge. This part of the river is flanked by overgrown meadows and adjoins Merritown heath to the west. I observed *C. splendens*, *C. puella*, *E. cyathigerum*, *I. elegans*, *P. nymphula* and several *L. fulva*, but again no *Oxygastra*.

Finally, I made a thorough search of the river at Palmer's Ford (SZ 099 009) which lies upstream of the outflow of the sewage works a few hundred metres away (Fig. 1). Here I saw *C. splendens*, *C. puella* and *P. nymphula*. On scrubby heathland nearby I got a tantalising glimpse of a smallish dark anisopteran. It is just possible it was *Oxygastra*, but I did not get anything like enough of a view to be sure.

The most striking difference between the odonate fauna of the Moors River in 1990 compared to the 1950s was the absence of *P. pennipes*. In case this might have been due to unusual weather in 1990, I visited the River Stour at places 1$^3/_4$km and 4km distant from the Moors River; *P. pennipes* was abundant at both.

Conclusions

The apparent absence of *P. pennipes* on the Moors River suggests that the river is still polluted to some extent, certainly the water looks less clear today than it did in the 1950s. Since the Poole/Bournemouth conurbation, which surrounds the Moors River, is the fastest growing conurbation in Western Europe (Andrew Mahon, in press) there is little hope that the Moors River can be restored to its original condition. If *Oxygastra* does still survive in the area it must be in very small numbers, and it may be based on the Avon rather than the Moors River. The Avon is a difficult river for the visitor to survey as it is crossed or bordered by few roads or rights of way. My survey showed how varied its different arms and sections are. It is not inconceivable that *Oxygastra* breeds somewhere on the Avon.

The Devon rivers have suffered considerably in recent years from farm effluents. If the farming community and the NRA succeed in improving water quality in the Devon rivers, parts of some of them would almost certainly provide suitable habitats for *Oxygastra*. If a small population of the species still exists then it may expand, or new emigrants from the continent may recolonise Devon. If they do not, and if pollution problems on the Devon rivers are solved, consideration should be given to re-introducing the species into Devon.

I hope this paper will encourage others to put on record their memories of this beautiful insect, to continue looking for it in the British Isles and to study its habits abroad so that, if necessary, we can re-introduce it.

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The condition of *Lestes dryas* Kirby larval populations in some Essex grazing marshes in May 1990

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Introduction

Lestes dryas was re-discovered in Essex in 1981 after apparently becoming extinct in England (Benton & Payne, 1983). For several years it spread encouragingly along the East Anglian coast as far as the Aveley Marshes at the Greater London-Essex border and to a few Norfolk sites, with the greatest numbers along the Thames estuary. Recently, I described some records of the larvae caught during a general survey of the aquatic invertebrates of grazing marsh ditches on the Essex coast (Drake, 1990a). At the request of the local Nature Conservancy Council Officer, I re-surveyed the ditches on the more-or-less continuous band of marshes from Fobbing to Hadleigh to establish what effect the dry weather in the intervening three years had had on the population size of *L. dryas*, using my 1987 survey as a baseline. This gave an opportunity to confirm some of the tentative conclusions drawn from the earlier survey.

Methods

The survey took place from 21-24 May 1990 to coincide with the final instar of *L. dryas*. The area divided naturally into three sites, Vange and Fobbing, Pitsea and Bowers and Hadleigh marshes, and a large proportion of the ditches on each was visited (Fig. 1). A number of physical and vegetational features was noted for each ditch, some of which are discussed later. Dry ditches were checked for shallow pools remaining along their lengths although this precaution was not necessary for the majority which had obviously dried completely. Nearly all wet ditches were sampled for *L. dryas*. The collecting method was designed to sample as many sites as possible in a relatively

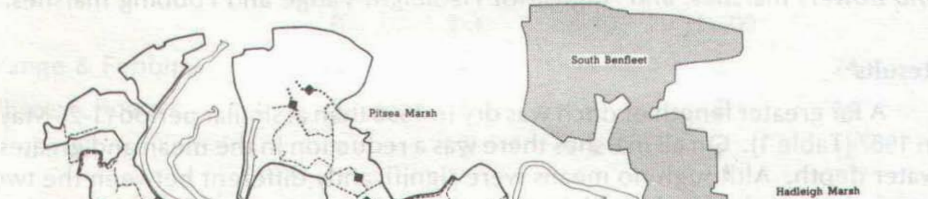

Figure 1. The survey sites. The solid line shows the approximate extent of grazing marsh. Ditches that were inspected are shown by dotted (containing water) or dashed (dry) lines. The solid symbol shows that locations of *L. dryas* larvae.

standardised manner so that the counts of larvae could be compared between ditches. At each ditch, a representative length about 20m long was pond-netted, collecting about 1-2 litre of weed and debris in each haul. The dredged material was spread on a polythene sheet with a pool of water in its centre to help the larvae escape from the debris. The number of larvae per haul was counted and the process continued for 15-20 minutes, during which time 2-5 hauls were inspected. The water in some ditches was so shallow and sludgy that it was easier to detect larvae by submerging a shallow tray so that larvae were washed into it. The long gonapophysis of last instar female *L. dryas* provided a useful check on their identity. Other Odonata were noted.

Water depths for 1987 were obtained from the botanical survey undertaken concurrently with the 1987 invertebrate survey (Drake, 1988; Wolf-Murphy & Leach, 1990). The dates of the visits were late June and late September for Pitsea and Bowers marshes, and August for Hadleigh, Vange and Fobbing marshes.

Results

A far greater length of ditch was dry in 1990 than at similar period (1-26May) in 1987 (Table 1). On all marshes there was a reduction in the mean and greatest water depth. Although no means were significantly different between the two years, this may be partly explained by the ditches being naturally drier in late summer when the botanical survey, from which the 1987 figures were derived, was carried out.

Table 1. Length (km) and mean depths (m) of ditches with or without water or *Lestes dryas.*

	Vange & Fobbing		Pitsea & Bowers		Hadleigh		Total	
Lengths (km)	1987	1990	1987	1990	1987	1990	1987	1990
Dry	3.32	16.34	1.92	10.04	0.10	0.90	5.34	27.28
Wet without *L. dryas*	15.97	6.72	10.33	1.24	3.50	0.92	29.80	7.75
Wet with *L. dryas*		1.52		1.61		1.52		5.78
Total	19.29	24.58	12.25	12.89	3.60	3.34	35.14	40.81
Water depths (m)								
mean	0.38	0.22	0.27	0.22	0.34	0.30		
± 95% CL	0.29	0.06	0.12	0.10	0.15	0.14		
range	.02-1.1	0.05-0.5	0.1-0.65	0.05-0.5	0.1-0.7	0.15-0.6		
n	35	24	21	14	8	12		

Fifty ditches still contained water although only shallow, isolated pools were left in four of these. Live *L. dryas* larvae were found in 27 of the wet ditches, including some of the pools, and dead larvae were found in the smallest pools on Vange and Pitsea marshes. Each of the three marshes had at least two ditches with abundant larvae but only those on Hadleigh marsh supported reasonable numbers throughout the area (Table 2; Fig. 1). It may be significant that the block of ditches on Bowers marsh with abundant *L. dryas* was in an area of relatively unimproved hay meadows.

Table 2. Number of ditches where *L. dryas* larvae were absent or present at three levels of abundance (1-3, 4-10 or 11-100 larvae found in 15-20 minutes' search) and the total number of ditches sampled.

	Abundance of larvae				Total Sites
	0	1-3	4-10	11-100	
Vange & Fobbing	15	6	1	2	24
Pitsea & Bowers	5	5	0	5	14
Hadleigh	3	2	3	4	12

The attempt at quantifying the catches was only partially successful as the standard haul with a pond net was inappropriate in some shallow sludgy or alga-dominated ditches in which larvae were sometimes abundant. These larvae were plainly visible once any algal mats or scum were pushed aside and were caught in large numbers using the tray method, with often 5-10 larvae in each quick dip of the tray. Their abundance here was partly explained by them being concentrated into narrow, shallow and often short lengths of channel or pools. Under normal conditions, they may have appeared to be less numerous. For example, at Hadleigh, where the water depth was not far from normal (15 to 45 cm, $\bar{x}$ = 30.0cm), the mean number of larvae per net haul in ditches where they were found was 4.08 ± 1.45 (- ±95% CL, n = 24), which was rather fewer than the numbers caught in single tray samples.

Several environmental factors were investigated to see whether they influence the presence of larvae, using x^2 tests. The null hypotheses were rejected for all tests but there were trends for three factors which were probably important: salinity, the total amount of aquatic vegetation, and the amount of upright emergent monocotyledonous plants. *Lestes* appeared to avoid completely fresh and strongly saline ditches, basing the assessment of salinity on the composition of the flora and fauna. For example, no larvae occurred together with the prawn *Palamonetes varians* (Leach) and single specimens were found in only two of the nine freshwater ditches that were sampled. However, there was no correlation between the conductivity of the water and numbers of larvae. When the three separately measured categories of percentage cover of emergent, floating and submergent vegetation were combined, larvae occurred more frequently in the better vegetated ditches and were absent when there was less than 90% cover (note that because the three components overlie one another, the maximum total cover is 300%). Emergent monocotyledonous plants are an important feature of the adults' environment as shelter and oviposition sites and it was expected that larvae may be more numerous at favourable adult locations. There certainly was a trend for larvae to be more frequent at ditches where *Scirpus maritimus, Phragmites australis* L. or *Eleocharis palustris* (L) Roem & Schult were abundant actually in the water. There were no trends following the abundance of these plants growing on the banks or when *Scirpus* alone was considered.

As the objective of the survey was to investigate *L. dryas*, only a few other conspicuous invertebrates were recorded thoroughly. *Sympetrum* sp. was present in 37 of the 50 sampling locations and showed a significant positive association with *L. dryas* ($x^2 = 10.55$, $P < 0.01$, df = 1). Ten-spined Sticklebacks *(Pungitius pungitius* (L.)) were present in a third of samples and were probably under-recorded. They showed no significant association with *L. dryas* but they sometimes occurred together in some of the shallow, nearly dry ditches. Small *Aeshna* sp. were found in a fifth of samples, often in fair numbers, and, like Coenagrionidae larvae, which were found only in seven ditches, showed a negative association with *L. dryas,* though their numbers were too small to test statistically. The Coenagrionidae were presumably mostly *Ischnura elegans* (Vander Linden) and occasional *Coenagrion puella* (L.) in the fresher ditches. Positively identified *L. sponsa* (Hansemann) were smaller than most *L. dryas* and were recorded at only four ditches together with *L. dryas* on Hadleigh marsh and at one ditch lacking *L. dryas* on Pitsea marsh.

Discussion and Casual Observations

The proportion of wet ditches on the three marshes had fallen from 85% in 1987 to 33% in 1990. *Lestes dryas* larvae were present in at least 54% of the wet ditches in 1990, so although the total population must have suffered a serious reduction, this was due to complete loss of water rather than to degradation of the quality of what remained. In 1987, larvae were found in 13 of 28 ditches surveyed on these three marshes, ie. a similar proportion to that found in the present survey. Bearing in mind the different emphases and sampling methods of the two surveys, this similarity of occurrence suggests that *L. dryas* has occupied at least half the available ditches for the past three years.

The larvae were remarkably tolerant of conditions that many invertebrates would be unable to cope with. Together with Ten-spined Sticklebacks, *Sympetrum* sp., and a few species of beetle larvae, including *Agabus* sp. and *Dytiscus* sp. they were among the most conspicuous and numerous species in isolated, dessicating pools less than 5cm deep and only about 0.5-2m long. Unshaded examples of such pools were all that remained of four ditches and it was thought unlikely that the larvae would survive to adulthood before the next period of rain which fell at least 12 days after the survey. The waterfelt very warm and the invertebrates present were extremely active. The *Lestes* larvae were obviously smaller than those in deeper ditches. Ten specimens were removed from one pool and kept in an aquarium where they fed on unlimited *Simocephalus* cladocerans, occasional small *Notonecta* larvae and the springtails *Podura aquatica* on the water surface. These changed to the final instar within 2-13 days. The first adult emerged after 12 days and the last after 36 days compared with 3-5 days for three typical final instar larvae taken from a deeper section of the same ditch where one adult was seen on the day of sampling (24 May). It was likely that the development of these crowded larvae was retarded due to shortage of food; Pickup & Thompson (1984) have shown that the interstadia of *L. sponsa* larvae are longer when they are underfed. It is noteworthy that all ten of the small larvae emerged eventually, suggesting that there was nothing abnormal about retarded development which is probably a widespread response in Odonata. For example, Lawton *et al.* (1980) showed that *Ischnura elegans* remains in the same instar for many weeks when kept on low food rations. Pickup & Thompson (1990) showed that well-fed *L. sponsa* larvae develop rapidly compared to *Ischnura elegans* and *Coenagrion puella*, and this is an adaptation to living in temporary water bodies. *Lestes dryas* is likely to have a similarly high rate of development so, in the Essex ditches, if they could survive near-starvation for a few weeks, they stood a good chance of reaching adulthood when food conditions temporarily improved following rain. However, starvation was not the only problem for *L. dryas* in these shallow ditches; large *Dytiscus* larvae and, in one instance, numerous *Gammarus duebeni*, were probably responsible for the many dead *Lestes* here.

In one series of ditches that were nearly dry, swathes of filamentous algae had become stranded on emergent plants as the water had receded, leaving a canopy that probably kept conditions cool beneath. Larvae were abundant here and, in contrast to those in the unshaded pools, they were all in their final instar. These individuals were likely to have survived to adulthood. These particular ditches superficially resembled those normally associated with a eutrophic arable setting, even though the adjacent pasture appeared to be only slightly improved. This highlighted an instance where aesthetic appeal bore no relationship to the wildlife value of the site. It also suggested that *L. dryas* cannot be used as an indicator of general invertebrate interest.

Early summer drought is accompanied by unusually warm weather. This should speed up the development rates of larvae, leading to earlier emergence than normal; the adult seen on 24 May in this survey appears to be an exceptionally early record. It is therefore likely that a sufficiently large proportion of the population will emerge to maintain the colony, even under the extreme conditions experienced in 1990. However, whether females will oviposit in the vegetation of dry ditches is unlikely, though this needs to be confirmed.

The attempt to identify features that correlated with the presence of *L. dryas* was no more successful than that in Drake (1990). The only features that may have been important were the lower attractiveness of fresher ditches and possibly mesohaline ditches, and a slightly greater attractiveness of ditches with high covers of total aquatic vegetation and the tall, stiff monocotyledons *Phragmites*, *S. maritimus* or *Eleocharis palustris*. The presence of *S. maritimus* was not well correlated with *L. dryas* larvae and in three cases the larvae were frequent in *Phragmites*-dominated ditches with no *S. maritimus* with 80m of the sampling point.

The steps needed to conserve *L. dryas* would appear to be restricted to ensuring that there are some sites with a minimum of 5-10 cm depth of water well into June and an adequate density of *S. maritimus* or *Phragmites*. As the larvae appeared to be remarkably tolerant of seemingly unpleasant conditions and no obvious factors correlated well with their presence, it is unlikely that the species will disappear from Essex if this minimum water depth can be maintained. This was successfully done on Wennington and Aveley marshes in south Essex by deepening short sections of ditches that were prone to drying up by about 20 cm. Healthy *L. dryas* larvae were found here in early June 1990 when adjacent sections of the dredged ditches were dry (Drake, 1990b). Freshwater diverted to field drains may make them less attractive to *L. dryas* but as an emergency measure lasting until the majority have emerged, any water is better than none. Regular irrigation by freshwater is not recommended because the primary invertebrate interest of the Essex marsh ditches lies in those species that require or prefer slightly brackish conditions. Apart from straightforward dessication, a second problem may make the unseasonally dry ditches less valuable when they re-flood. Unlike the regularly ephemeral ditches which were dominated by *Alopecurus geniculatus* or *S. maritimus* over a hard clay bottom, these newly dry ditches had a moderately soft bottom and appeared to suffer unduly from cattle trampling. The remaining pools and wet hoof-print hollows were frequently enriched with dung, making them uninhabitable to the typical ditch fauna. Under normal conditions, trampling and dunging are considered valuable in modifying margins; when it extends to the majority of ditch bottoms over large areas, as at Vange and Fobbing, it may well be detrimental in the short term.

The main conclusion from this survey is moderate optimism for the future of *L. dryas* on the Essex grazing marshes. As politically important animals, rare dragonflies are a valuable asset in protecting habitats. The Essex marshes have relatively low aesthetic appeal so it is encouraging that this species finds them so much to its liking. Future studies may usefully investigate whether more non-brackish sites may be colonised as *L. dryas* is widespread in freshwater throughout Europe. If the apparent avoidance of fresh ditches on Essex marshes is a quirk in the present survey, there seems to be no reason why the Fens, where it once lived, should not provide suitable colonisations sites.

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The Scarce Blue-tailed Damselfly, *Ischnura pumilio* (Charpentier): its habitat preferences in south-east England

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Introduction

Ischnura pumilio is widely reported as having a south-westerly distribution in the British Isles (Hammond, 1983; Gibbons, 1986; Askew, 1988; Fox, 1990) where it shows a preference for base-rich flushes, spring lines and mesotrophic ponds (Fox, 1987; Fox, 1989). In the New Forest, it occurs widely on sheltered bog pools, seepages, shallow heathland pools and slow-flowing streams (Welstead & Welstead, 1984). In Northern Ireland it appears to show a preference for shallow water in disused quarries (Rippey & Nelson, 1988). It was therefore of great interest when the species was discovered during 1987 at two chalk quarries in Bedfordshire and one in Buckinghamshire, nearly 90km from the nearest previously known colonies. These three sites represent the first records of *I. pumilio* from chalk quarries in the British Isles, a biotope frequently utilised by the species on the continent (Zimmerman, 1972; Rudolph, 1979).

The first colony was discovered during survey work at Sundon Springs chalk quarry near Luton by John Comont. Three days later another colony was discovered at the nearby Houghton Regis chalk quarry (Comont, 1988). Later in the year it came to light that *pumilio* had also been found at College Lake chalk quarry just over the county boundary in Buckinghamshire (G. Atkins, pers. comm.). *I. pumilio* appears to be restricted to very specific areas of these quarries and this paper describes the sites and the habitat preferences at these locations.

The study sites

Sundon Springs chalk quarry

This is a large complex of chalk quarries comprising dry chalk grassland at the northern end, a large fishing lake in the centre and other wet areas at the southern end. These comprise several flooded ditches and spring-fed pools. A two-tiered chalk cliff forms the southern boundary of the site and a spring line forms marshy seepages along the step. *I. pumilio* is found along this spring line which seeps out from the base of the west-facing part of the cliff. This area is dominated by Hard Rush *(Juncus inflexus)* and is permanently wet. The water in this seepage zone is shallow and slow-moving and feeds into shallow pools at the base of the quarry. Water in the seepage area overlies varying depths of liquified chalk sludge which is a favoured oviposition site for *pumilio.* Females have been observed with their abdomens and wing tips covered in dried chalk dust following oviposition in these areas (Cham, 1990). The seepage zone supports the growth of several species of algae and the highest concentrations of *pumilio* larvae are associated with stonewort (*Chara* sp.), an alga with a high affinity to lime.

A similar seepage zone on the site exists nearby yet *pumilio* has never been found there. The only apparent difference between the two areas is that the second seepage occurs on a slope and the water flows away faster.

Of the three sites, Sundon holds the strongest colony where over 60 adults have been seen at any one time. This site now has SSSI status and supports 16 species of Odonata. Despite this status, the site is currently under threat of development and the future of this colony is in some doubt.

Houghton Regis chalk quarry

This is a smaller chalk quarry than Sundon but with much greater areas of open water, the most prominent being a shallow lake at the base of an east-facing chalk cliff. The lake is fed by a series of springs that flow from the base of the cliff and a spring-fed stream that flows across the main area of the quarry. The original discovery of *pumilio* was made along this stream which forms shallow seepage areas dominated by *Juncus inflexus*. During 1990 *pumilio* was absent from this area which had largely dried out. It was, however, found at two seepage areas at the base of the cliff. Close inspection of this spring-line has shown *pumilio* to favour only those where the water flow is very slow. Houghton Regis is an SSSI and also supports 16 species of Odonata. It is also under the threat of industrial development but some effort is being made to protect the lake area.

College Lake chalk quarry

This is a large chalk quarry managed as a nature reserve by Castle Cement in association with the Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust. The site comprises a series of man-made pools and ditches with a lake at the lowest point. Spring-line seepages eminate from the slopes surrounding the lake. Part of the site is still a working quarry which will eventually extend the lake area and hopefully create new seepage areas. *I. pumilio* was found in small numbers at one of the flatter seepage areas but during 1990 alterations to a nearby water course changed the direction and velocity of flow and *pumilio* numbers appear to have declined. Despite this, the site holds great potential for the development of shallow scrapes and seepage zones which should prove beneficial to *pumilio.*

Habitat requirements

I. pumilio's habitat preferences at the three sites appear to be very similar.

Although alternative areas of open water occur at each site, *pumilio* favours only a few spring-fed seepages in these quarries. It is probable that an interplay of factors is involved in the selection of such specialised habitat but at these sites certain factors appear to be more important.

Water flow

At the sites described here, spring-fed seepages occur on areas with varying gradients. This has the effect of producing water flow of various velocities. At each locality *pumilio* has only been observed at seepages where the water has little or no perceivable movement. These areas allow the accumulation of a layer of chalk sludge which, when colonised by *Juncus* and/or *Chara*, provide favoured oviposition sites. Despite other seepages being in close proximity, their moderate to fast water flow makes them unsuitable for *pumilio*.

Water temperature

I. pumilio is primarily a Mediterranean species (Corbet *et al.*, 1960) and is on the northern limits of its range in the British Isles. Fox & Jones (in press) have suggested that shallow water with relatively high temperatures is important for rapid larval growth in transient habitats. Shallow seepages with little water movement warm up readily in warm weather and probably provide suitable conditions for *pumilio* larvae to develop. Winter temperatures have also been suggested as influencing *pumilio* distribution in the British Isles (Chelmick, 1980). At spring-fed seepages the constantly flowing water rarely if ever freezes and this would ensure larval survival in cold winters.

Substrate disturbance

At Houghton Regis and Sundon there is unauthorised public access which leads to considerable disturbance from motorbikes and four-wheel drive vehicles. There is the additional disturbance at Sundon from army recovery units on practise. This can cause a varying degree of disruption; low level disturbance maybe beneficial, creating runnels which lead to the formation of new seepage areas suitable for *pumilio* colonisation. At Sundon some of these areas have already been colonised during the early part of the 1990 flight season. Disturbance may also be important in reducing the growth of emergent vegetation. High level disturbance on the other hand has a detrimental effect. It not only destroys areas by churning them up into thick mud but it also diverts water flow resulting in seepages drying out. This appears to be the reason for the original *pumilio* area drying out at Houghton Regis and has also affected some areas at Sundon.

Drought

Natural drought can also lead to *pumilio's* habitat drying out. The shallow water in the *pumilio* areas was particularly prone to drying out in the prolonged hot summers experienced in 1989 and 1990. If these areas become completely dry, larvae would be unlikely to survive. It seems probable that larval development is only completed in the areas of seepage which remain permanently wet. During the early part of the 1990 flight season, over 90% of observed emergence and exuviae occurred in the 'core' seepage areas. The peripheral areas are probably recolonised each year. A permanent water supply such as a spring-line would therefore increase the chances of larvae surviving drought conditions.

Vegetation density

It has been suggested that disturbance that keeps emergent vegetation to a minimum is of importance to *pumilio* (Coker & Fox, 1985) and that dense growth ultimately leads to disappearance of the species (Fox, 1989; Fox & Jones, in press). The seepage area at Sundon stretches for nearly 100m, within which the density of vegetation varies from bare chalk to dense patches. These plant communities are dominated by *Juncus inflexus* with *Equisetum* sp. and several patches of *Phragmites australis*. *I. pumilio* has not been observed in the newly created areas where there is no plant colonisation. The dense areas of *Juncus* growth are also avoided. Dense growth may shade the water preventing it from warming up. *I. pumilio* shows a marked preference for areas with an open growth of vegetation and appears to move into new seepage areas where *Juncus* has started to colonise.

Aspect varies at each of these sites, one east, one west and one northwest facing and all are exposed to strong winds at times with little shelter. pH has not been properly investigated but the similarities in geology and spring situations make it unlikely that it could vary sufficiently to explain any differences in site selection.

Discussion

Before the discovery of these colonies in 1987 it seemed highly unlikely that *pumilio* could occur in chalk quarries. These sites appear very different to the localities in which it occurs in southwest England, the New Forest and Wales. On closer inspection, however, the specialised nature of the microhabitat is not that dissimilar. *I. pumilio* occurs at wet seepages where water flow is slow and where the vegetation is sparse. In southeast and central England this biotope is most likely to be created where earth extraction has exposed the upper levels of the water-table, enabling spring lines and seepages to develop. These are often of a transient nature, a biotope that *pumilio* is well-suited to colonise (Fox & Jones, in press).

During 1990, colonies of *pumilio* were discovered at quarry sites in

Oxfordshire and Berkshire. In Oxfordshire, it was found at a shallow seepage area in a gravel pit near Stanton Harcourt and at a shallow pool in a limestone quarry near Woodstock. Both of these sites were created relatively recently, and would have been colonised by *pumilio* within the last five years (J. M. Campbell, pers. comm.). In Berkshire the species was discovered at a gravel pit at Aldermaston; also a site of recent origin (A. D. Fox & G. Vick, pers. comm.).

I. pumilio currently appears to be undergoing an easterly expansion in its range in the British Isles (Fig. 1) and it is likely that more colonies await discovery in southeast and central England. *I. pumilio* is well known to disperse and colonise newly formed biotopes in continental Europe (Askew, 1988) and during 1990 a single male was discovered at a newly created pond in Shropshire more than 60km east of the nearest known colonies in Wales (S. Butler, pers. comm.). The Bedfordshire sites (currently the most easterly in Britain) may have resulted from a succession of colonies spreading eastwards across England. It is also possible that a series of small, temporary and unobserved populations have been lost prior to the discovery. Documentation has recently come to light which establishes that *pumilio* has been present in Bedfordshire since 1975, well before

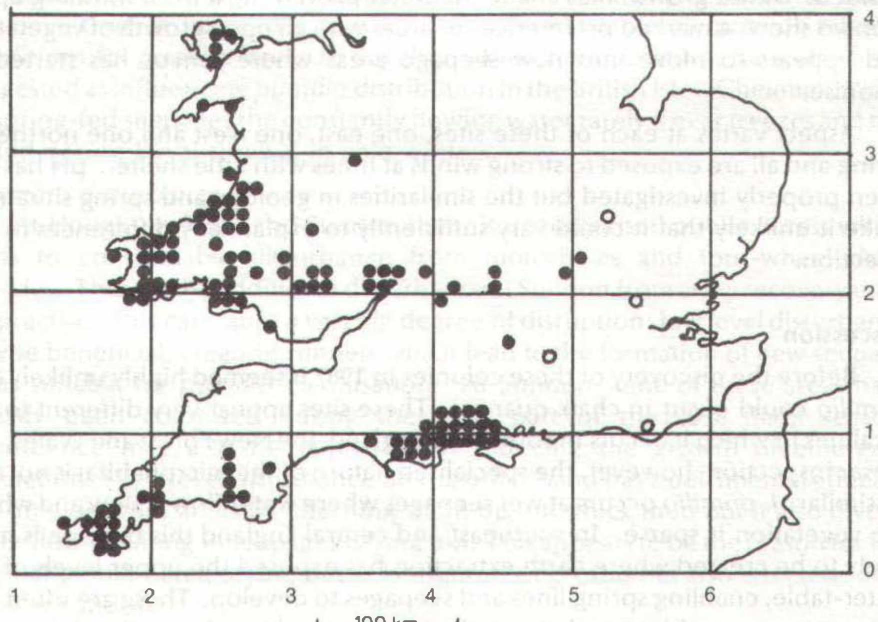

Figure 1. The distribution of *I. pumilio* in England and Wales up to and including 1990 (modified from Merritt *et al.*, in prep.).

the sites in Buckinghamshire, Berkshire, Oxfordshire and Wiltshite came into existence. An annotated coloured drawing was made by Dr N. Dawson on a visit to Houghton Regis on 1st July 1975 and clearly shows an f. *aurantiaca* female.

It may also be possible that *pumilio* has colonised some of these sites from continental Europe. However, it is a small, dainty damselfly and does not seem capable of sustained migratory flight. Dispersal over such long distances would require assistance from wind currents. In the British Isles the dominant prevailing winds blow from the west and therefore it is more likely that individuals dispersing from colonies in the west would reach the Bedfordshire sites. Fox (1989) describes a possible mechanism of dispersal utilising thermals formed on warm still days. Individuals have been observed flying vertically upwards until they are out of sight, presumably to be carried by wind currents to new areas. Dispersal by such means has also been observed in *I. aurora* in New Zealand (Rowe, 1987), a species which has colonised much of the south Pacific.

The sites discussed here are not the first time colonies of *pumilio* have been reported in southeast England. Benton (1988) discusses an old record from Essex where Doubleday (1871) noted it as being rare, occasionally being found among the old gravel pits in the Epping area. K. J. Morton also recorded it in Cambridgeshire at Gamlingay on the county border with Bedfordshire. This record, published in the Victoria County History for Cambridgeshire (published in 1938), in an area of sand extraction where shallow water is known to have been present. The natterjack toad *(Bufo calamita)* was common in the area (Jenyns, 1830; Smith, 1973). This amphibian requires warm, shallow water for its tadpoles to develop, conditions well-suited to *pumilio*. This biotope no longer exists in the area, having been lost to various drainage schemes and housing developments.

By whatever mode of dispersal *I. pumilio* has reached southeast England, it appears to be able to locate its very specialised habitat, often over considerable distances. I hope that this paper will encourage more people to look for *pumilio* in new areas so that a complete picture of its distribution can be built up. Much more research is needed before we can improve our understanding of the dispersal and survival strategies of this fascinating little damselfly.

Acknowledgements

The work presented here would not have been possible without the kind help provided by others. I would therefore like to thank Graham Atkins, Steve Butler, John Campbell, Nancy Dawson, Brian Eversham, Tony Fox and Graham Vick for providing useful information and discussion.

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Brief notes and observations

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From **Eric Blood,** *51, Algilha Road, Skegness, Lincs. PE25 2AJ,* comes the report from Gibraltar Point NNR on 1st September 1990, of a Common Blue Damselfly *(Enallagma cyathigerum)* landing on the head of a swimming Grass Snake *(Natrix natrix).* The snake did not appear to notice this, and the damselfly was carried along in the fashion of a wind-surfer for about 30 feet!!

R. M. Belringer, *20, Wakefield Avenue, St Budeaux, Plymouth PL5 1PU* successfully photographed a pairing of teneral Common Darter *(Sympetrum striolatum)* and an Emerald Damselfly *(Lestes sponsa)* at Breney Common on 12th August 1990. They remained together for at least ten minutes, before the *Lestes* (male) flew away, only to return a few minutes later and again try to mate with the female *Sympetrum.*

As would perhaps be expected from the hot summer of 1990, some early and late dates have been reported. From **R. M. Belringer** come the following early dates for E. Cornwall: Beautiful Demoiselle *(Calyopteryx virgo),* 28/4, Keveral Wood, Seaton; Common Blue Damselfly, 28/4, Wolsdon Pond, Torpoint; Large Red Damselfly *(Pyrrhosoma nymphula),* 23/3, Tincombe Reserve, Saltash; Azure Damselfly *(Coenagrion puella),* 5/5, Bodmin moors; Broad-bodied Chaser *(Libellula depressa),* 6/5, Okel Tor; Blue-tailed Damselfly, 12/5, Bodmin moors; Four-spotted Chaser *(Libellula quadrimaculata),* 6/5, Callington; Golden-ringed Dragonfly *(Cordulegaster boltonii),* 13/5, Respryn Bridge.

Late dates are: Golden-ringed Dragonfly, 4 on 19/10 in Penlee and Rame Head area, whilst **S. Knill-Jones,** *2, School Green Road, Freshwater, I.O.W.,* reports a male Common Darter in his garden on 8/11, and what looked like a female there on 13/11.

Book Review

The dragonflies of the Banbury area. Anthony Brownett. Brookside Books, Banbury (1990). 39pp. £3.00 (plus 70p for postage and packing).

Anthony Brownett's booklet joins a long list of publications which have appeared in the last five years or so detailing the dragonfly faunas of England and Wales on a regional basis. Work of this kind provides an invaluable database on which to assess conservation priorities and to monitor long-term changes in distribution and abundance of dragonfly species. I hope that more papers and booklets of this kind will be produced covering other parts of the British Isles. Similarly, in 20 years or so, that the next generation of dragonfly watchers will benefit from these studies, update them and be able to evaluate population trends.

Mr. Brownett is one of the increasing number of dragonfly enthusiasts who have come initially from bird watching. Some of the recording techniques used by bird watchers, which are mentioned in the booklet, are of relevance to the observation of dragonflies and many entomologists can learn a great deal. It is interesting to read, for example, that *Aeshna cyanea* and *A. grandis* are frequently caught in mist nets at dusk.

The useful introductory section of the booklet deals mainly with the technicalities of recording. How to fill in cards, where to send them, the status and types of records and the study area covered in the booklet. Rather than going into details of dragonfly biologies and species identification, readers are referred to the many excellent books currently available which cover these topics.

The broad categories of biotopes available in the Banbury area are mentioned but I was disappointed that more detail was not given. I would have been interested to read about the precise nature of some of the richest localities and also of typical sites. Changes in the countryside over the last 100 years and the effects these had on some of the dragonfly localities would also have been of interest. This all helps to build up a mental picture of the area. *Cordulia aenea* has apparently disappeared from Glympton, where it occurred in 1920, but no mention is made of how the site may have changed since then.

Most of the book is concerned with species accounts and distributions. The records are plotted on 10km maps. When dealing with such a relatively small area I think that it would have been more useful if the records had been plotted on a 1km or tetrad basis because distribution trends are otherwise obscured. For example, although there are records for *Pyrrhosoma nymphula* and *Ischnura elegans* in every 10km square, we are told that in fact the distribution of *P. nymphula* is patchy whereas *elegans* is widespread. Also, there is more encouragement for future recorders to fill in gaps that appear in larger scale maps rather than from a 10km map that seems to be fully recorded already.

The only recent record of *Coenagrion pulchellum* is based on the photograph of a single female. This seems to me to demonstrate the problems of photographic evidence. I think that it would require a very good photograph indeed to be able to distinguish a female *pulchellum* from the female colour form of *C. puella* which resembles the former species.

The booklet is illustrated throughout with black and white line drawings and maps. In general they are good but the drawing of *Orthetrum cancellatum* with a distinctly gomphid-like head looks a bit odd. Of particularly good quality are two beautifully detailed drawings showing examples of localities in the area. The booklet provides a useful starting point for the study of dragonflies in this part of the English Midlands and is obtainable from Anthony Brownett, whose address is in the current BDS membership list.

S. J. Brooks

Recent odonatological publications

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Erratum. Volume 6(2): 36. In the first paragraph of *Results* the record of *Aeshna juncea* is incorrect. Subsequent examination of the larva has confirmed its identity as *A. grandis*.

INSTRUCTIONS TO AUTHORS

Authors are asked to study these instructions with care and to prepare their manuscripts accordingly, in order to avoid unnecessary delay in the editing of their manuscripts.

Manuscripts should be typewritten using black ribbon, double-spaced, 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' for cast skin (plural 'exuviae'); 'larva' (instead of 'naiad' or '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 endof 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: 90-98.

The titles of journals should be written out in full.

Tables should be typed, each on a separate, unnumbered page.

Legends for illustrations should be typed together in sequence on a single unnumbered page.

Illustrations (figures) should be prepared in black ink, and scaled to allow a reduction of 1.5 to 3 times. Lettering should be neat and uniform.

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.

LATIN AND ENGLISH NAMES OF BRITISH ODONATA

ZYGOPTERA	DAMSELFLIES	ANISOPTERA	DRAGONFLIES
Calopteryx virgo	Beautiful demoiselle	*Aeshna caerulea*	Azure Hawker
Calopteryx splendens	Banded demoiselle	*Aeshna juncea*	Common Hawker
Lestes sponsa	Emerald Damselfly	*Aeshna mixta*	Migrant Hawker
Lestes dryas	Scarce Emerald Damselfly	*Aeshna cyanea*	Southern Hawker
Platycnemis pennipes	White-legged Damselfly	*Aeshna grandis*	Brown Hawker
Pyrrhosoma nymphula	Large Red Damselfly	*Anaciaeschna isosceles*	Norfolk Hawker
Erythromma najas	Red-eyed Damselfly	*Anax imperator*	Emperor Dragonfly
Coenagrion mercuriale	Southern Damselfly	*Hemianax ephippiger*	Vagrant Emperor Dragonfly
Coenagrion scitulum	Dainty Damselfly	*Brachytron pratense*	Hairy Dragonfly
Coenagrion hastulatum	Northern Damselfly	*Gomphus vulgatissimus*	Club-tailed Dragonfly
Coenagrion lunulatum	Irish Damselfly	*Cordulegaster boltonii*	Golden-ringed Dragonfly
Coenagrion armatum	Norfolk Damselfly	*Cordulia aenea*	Downy Emerald
Coenagrion puella	Azure Damselfly	*Somatochlora metallica*	Brilliant Emerald
Coenagrion pulchellum	Variable Damselfly	*Somatochlora arctica*	Northern Emerald
Enallagma cyathigerum	Common Blue Damselfly	*Oxygastra curtisii*	Orange-spotted Emerald
Ischnura pumilio	Scarce Blue-tailed Damselfly	*Libellula quadrimaculata*	Four-spotted Chaser
Ischnura elegans	Blue-tailed Damselfly	*Libellula fulva*	Scarce Chaser
Ceriagrion tenellum	Small Red Damselfly	*Libellula depressa*	Broad-bodied Chaser
		Orthetrum cancellatum	Black-tailed Skimmer
		Orthetrum coerulescens	Keeled Skimmer
		Sympetrum striolatum	Common Darter
		Sympetrum nigrescens	Highland Darter
		Sympetrum fonscolombii	Red-veined Darter
		Sympetrum flaveolum	Yellow-winged Darter
		Sympetrum sanguineum	Ruddy Darter
		Sympetrum danae	Black Darter

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