AUDIT OF PRIORITY SPECIES OF RIVERS AND WETLANDS

Southern Damselfly *Coenagrion mercuriale* in South Hampshire and the Isle of Wight

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INTRODUCTION

The following report has been commissioned by the Environment Agency (Southern Region).It has been prepared on behalf of the Hampshire and Isle of Wight Wildlife Trust and is one of seven audits covering species of rivers and wetlands that are considered to be a priority for conservation action by the Environment Agency and its partners.

The species covered by the audits are:

- Wetland and river molluscs:
  - *Anisus vorticullus*
  - *Pisidium tenuilineatum*
  - *Pseudanodonta complanata*
  - *Segmentina nitida*
  - *Vertigo moulinsiana*
- Fresh water Cray-fish
- Southern Damselfly
- Marsh Fritillary
- Black Bog Ant
- Birds of rivers and reedbeds
  - Kingfisher
  - Bittern
- Water Vole

The report has been prepared following a desk study of literature and discussion with field workers who have observed or studied the species in Britain (particularly in Hampshire) and abroad. It is thus a collation of existing information involving no original work. Thanks and acknowledgement are due to the authors of the reference material and to the people who kindly contributed their knowledge including David Winsland, Dr Derek Jenkins, Alan Hold, Leslie Kerry, Dr Norman Moore, Mrs Jill Silsby, Prof Michael Parr, Graham Vick, David Chelmick, Bob Kemp, Don Tagg and Peter Follett.

1. DESCRIPTION OF SPECIES

The Southern Damselfly (*Coenagrion mercuriale*) is classified within the order Odonata (Dragonflies), Sub-Order Zygoptera (Damselflies), Family Coenagrionidae. The species was first described and named by T. de Charpentier in 1840. A North African subspecies, C. m. *hermeticum*, was described by Sélys in 1872 and an Italian subspecies, C. m. *castellani*, by Roberts in 1948. Earlier synonyms were *Agrion mercuriale* and *Agrion fonscolombii*.

This is a small delicate species of blue damselfly. The immature male is lilac becoming bright blue on maturity. In Britain it may be separated from other similar blue damselflies by its size and the characteristic Mercury sign on the first abdominal segment, however this is subject to numerous variations in detail. The common form of the female is mainly black on the dorsal surfaces with blue inter-segmental rings and with olive green on the sides of the thorax and abdomen. There is also a blue form of female (estimated as 15 to 20% in the New Forest female population) where blue replaces green on the sides. Other distinguishing features include the shape of the pterostigma, an almost straight posterior margin to the prothorax, details of the abdominal appendages and large rounded postocular spots. The body length of the adult is 29 mm and wing span 35 mm. The flight period in Britain is early June to mid August sustained by a progressive emergence. The flight is weak and low over boggy areas and streams and amongst nearby grasses. The larvae, which take two years to develop, have been the subject of studies and are well described in the literature.

Where it occurs in Britain *C. mercuriale* is the dominant damselfly, sometimes to the exclusion of all others. It shares a habitat on wet heathland with the Small Red Damselfly (*Ceriagrion tenellum*) and the Scarce Blue-tailed Damselfly (*Ischnura pumilio*), however it forms discreet and separate neighbouring colonies. There are various accounts of its relationship with the Azure Damselfly (*Coenagrion puella*), one indicating that the two species are seldom found together on heathland sites and the other indicating that they can coexist on the chalk streams. At one chalk stream flood-plain location it is reported that *C. puella*, a larger and more robust species which emerges first, was replaced by *C. mercuriale* later in the season when the latter species emerged, although still well within the overall flight period of *C. puella*. At a heathland location it is reported that a small colony of *C. puella* lasted only one season whilst a colony of *C. mercuriale* continued to thrive in the same area. Closely related and similar Mediterranean species are *C. scitulum* and *C. caerulescens* with which *C. mercuriale* is reported to associate in southern Europe.

2. HABITAT REQUIREMENTS

The literature describes the breeding habitat as small vegetated runnels, streams or rarely ditches flowing across shallow sloped wet heath / valley mire vegetation or flood plains / water meadows, which range from slightly acidic to highly calcareous. Seepages, base enriched flushes on wet heathland / soligenous mire are also mentioned.

The larvae take two years to develop and the average life expectancy of the adult is about 5 days (a few last a month). This means that some 99% of the life cycle is spent as a larva in water and knowledge of the habitat requirements of this stage is therefore of paramount importance to the conservation of the species. The adults must find mates and lay eggs during their brief existence, but probably the key element for them is also the aquatic habitat in which their larvae will develop.

2.1 Europe

Recent observers of the species in Europe have described the habitats in which they have found *C. mercuriale* in France and Spain. These vary from fast flowing chalk streams in the south of France with colonies of 1000+ to seepages in fields / calcareous flushes supporting small colonies. Records include those from the Source de Lez near Montpellier (springs) and from the limestone streams of the Brennes. Other records refer to disused canals and pools in river flood meadows left behind in summer as the main river (Rhône) recedes. Some observers feel that colonies in the New Forest are stronger than any they have found in Europe, which is surprising for a species described as Mediterranean on the northern limit of its range.

2.2 Hampshire

In the New Forest *C. mercuriale* is found on heathland streams, mire runnels, seepages and boggy areas. It is also found on chalk streams, the Test and Itchen Rivers, where it seems to be confined to disused water meadow systems. Although superficially very different, these habitat types, where utilised by this species, yield similar conditions.

2.3 Water factors

The species requires a continuous supply of running surface water throughout the year, even through dry summers. The pH tolerance of the species in Britain (down to 4.5 in Devon) indicates that an alkaline water is not essential but the water does require base enrichment which may be derived from a calcareous source and may be augmented by passage over a calcareous substrate to the water course. It is not clear how sensitive the species is to water pollution, but it is suspected that pollution is not greatly tolerated.

In Hampshire the spring sources seem reliable even in years of drought leading to a continuous supply of surface water. The best heathland streams are often spring-fed from calcareous geological formations and flow through outcrops of Headon Beds which include fossil shells so that the water is more calcareous than might be expected. The boggy areas on heathland are also often spring-fed from calcareous geological formations and so produce basic flushes / calcareous mires locally. The location of the springs, remote from human developments, protects the water quality from pollution. The chalk stream colonies are more at risk from pollution from agricultural run-off and trout farm effluent.

2.4 Watercourse factors

An inorganic substrate (clays, mud, sand or gravel) overlaid with organic detritus, silt or soft mud less than 30 mm deep seems to be optimal for stream living colonies. A calcareous substrate is sometimes mentioned as required, but this seems less important than a basic enrichment of the water itself. The organic detritus or soft mud is a necessary habitat for the larvae in their final stages of development.

The water flow in main streams can be moderate but in the areas where the larvae develop it is slow. The larvae are reported to be most abundant in shallow water (less than 10 cm deep) along narrow stretches (less than 15 cm wide) where the flow is locally reduced by topography or vegetation and most numerous where there is an organic layer over the substrate.

The minimum water temperature in winter may be an important factor in the survival of the larvae. In the New Forests the spring water tends to remain relatively warm in winter keeping the streams flowing even under a crust of ice. The concentration of colonies high up near the source of the streams indicates that this is an advantage to the species. The density of aquatic vegetation may need to be sufficient to prevent the spring warmed surface water from sinking too much in deeper water channels.

The Hampshire climate is relatively warm and mild, the New Forest and the area from Southampton south-eastwards having one of the best climates in England in terms of mildness, sunshine, low frost and incidence of snowfall. This will be a further factor in escaping the lowest winter temperatures. A southerly aspect is probably also an advantage since this will enable the water to warm quickly in Spring. The colonies in West Wales enjoy an oceanic climate which again is relatively mild.

2.5 Vegetation factors

The eggs are laid into emergent vegetation and the younger larvae are weed dwelling. Local field work confirms a need for abundant but not too dense vegetation in streams such as Marsh St John's Wort (*Hypericum elodes*), Bog Pondweed (*Potamogeton polygonifolius*), Water Mint (*Mentha aquatica*), Fool's Water-cress (*Apium nodiflorum*) and Water-cress (*Rorippa nasturtium-aquaticum*). A systematic study of the vegetation associated with the species in Britain was undertaken by Fiona Evans (see References). It is not clear that any particular association is important.

The species occurs in some very exposed places such as open boggy areas and is observed at water under weather conditions dull enough to deter all other Odonata. However the adult seems to need some shelter from the elements and refuge from predators in bankside grasses, rushes or sedges such as Reed Canary-grass (*Phalaris arundinacea*), Reed Sweet-grass (*Glyceria maxima*), Jointed Rush (*Juncus articulatus*) and Black Bog-rush (*Schoenus nigricans*) along the stream edges. The bankside vegetation must not become too tall or rank and grazing down to a short sward with some poaching and trampling seems to encourage the species.

Strong colonies are not found where the streams are overgrown or narrow runnels and seepages obscured by overhanging bankside vegetation or shrubs such as Bog Myrtle (*Myrica gale*) and Brambles (*Rubus fruticosus*). The species seems to need a relatively clear passage over the water or perhaps the shaded water is not warmed sufficiently by the sun. It does not seem to benefit from woody shrubs or trees close to the water and does not thrive where even one bank is shaded by tall vegetation (e.g. Bog Myrtle - *Myrica gale* growing on the enriched levees left along heathland streams after dredging operations).

3. DISTRIBUTION

The global distribution of *Coenagrion mercuriale* is limited to Europe and northern Africa. Its stronghold is south-west Europe around the Mediterranean (France and Spain) up to an altitude of 700m, with a sub-species in Italy and another found along the northern rim of Africa (Morocco, Algeria and Tunisia). There are scattered populations east to the Caucasus and north to Holland with significant populations in southern Britain.

In Britain the species occurs in a discontinuous scatter of sites in Hampshire (New Forest, Itchen and Test valleys), Dorset (Isle of Purbeck), Devon (Pebbled Commons), South Wales (Gower Peninsula), south-west Wales (Mynydd Preseli, Pembrokeshire) and north-west Wales (Anglesey). The distribution of sites in Hampshire is detailed in maps (Appendix 3) and some are described below under Conservation Work.

There is a single record of an adult male *C. mercuriale* by Dr John Paul in July 1991 from Cothill NNR in Oxfordshire (SU4498). This is well away from any known site for the species but has been accepted as a true record. A search of the area in subsequent years has so far failed to find another specimen.

4. HISTORIC RECORDS

In 1900 the New Forest was thought by Lucas to be the only location for *C. mercuriale* in Britain with two or three centres connected with the Lymington river (at one of which the species was found commonly). It was first recorded from the River Itchen in 1920 and from the River Test in 1927. In 1932 there are references to the species in the New Forest in swamps with Bog Myrtle (*Myrica gale*) and in deep runnels with Marsh St John's Wort (*Hypericum elodes*), marsh *Galiums* and Lesser Spearwort (*Ranunculus flammula*). In 1934 it is recorded from a bog near Brockenhurst. In 1938 it is described as frequent "lower down the bog" in the same area as the Small Red Damselfly (*Ceriagrion tenellum*) but segregated in several compact and numerous colonies. In 1939 it is described as occurring in the same bog as the Scarce Blue-tailed Damselfly (*Ischnura pumilio*). In 1949 it is described by Longfield as nationally fairly rare, occurring in only five counties, widespread in Hampshire. In 1960 it is described by Cobet, Longfield and Moore as having a scattered distribution south of the Wash, suffering from drainage of bogs except in the south-west where running water is sustained in peat bogs. Blackwell Common is mentioned in literature as a former New Forest site.

4.1 Hampshire records

Goatspen Plain may be the same sites as Holmsley Bog proper, an area where it has not been found since.

Sowley (SZ39) The major inflow to Sowley Pond is Crockford Stream. This is now wholly over shadowed and overhung by a dense hedgerow where it borders private land to the west. There is also evidence of the stream having been straightened.

Roydon Wood (SU30) This was a private estate so that recorders would have needed permission for access. The site may be the same as or adjacent to the Roundhill site. It is possible that strays from that site were seen on the estate.

Ober Water (SU253038) below Markway Bridge down to Puttles Bridge. A small but viable colony was recorded there in 1977 and 1978 but in the latter year Conservation Volunteers removed all of the aquatic vegetation from that particular stretch of the stream and it has not been recorded since. The Club Tailed Dragonfly (*Gomphus vulgatissimus*) has also disappeared from the Ober Water.

A survey of specimens in the Natural History Museum has been instigated to establish dates and locations of collection, but the results were not available at the time of finalising this report.

5. POPULATION TRENDS

Where conditions remain stable and suitable, such as in spring fed flushes on heathland, the colonies seem to stabilise at an appropriate population size. The numbers drop where drainage reduces surface water or where streams become overgrown and shaded out or where emergent vegetation is removed and channels cleared with an increase in water depth and flow.

The species is seldom found far from its breeding colonies and does not seem inclined to disperse to colonise new areas (however note the Oxfordshire record described under Distribution above).

5.1 New Forest

Within the New Forest the overlying trend is one of stability with some individual populations displaying periods of growth and decline. It is noticeable that populations in natural localities (those left unmanaged without interference) show the greatest stability although not always the largest populations. In instances where historical management has occurred there appears to be cyclical population trend as a function of vegetation re-growth. This is particularly noticeable where past stream excavation has created levees. These conditions promote the unbroken linear growth of Bog Myrtle (*Myrica gale*) beside the stream which eventually over shadows the water rendering it unsuitable for plant life and use by *C. mercuriale*. This is the single greatest and possibly the only threat to the species in the New Forest. It is particularly noticeable at Upper and Lower Crockford, the lower section of Gypsey Hollies and possibly Holmsley Bog.

Factors involving alterations in population at specific New Forest sites are as follows:

Stag Brake (41246029). Prior to 1986 a colony of 100+ males (counted at midday) occurred in a mire / runnel / stream system. After 1990 the numbers had dropped to about 10. Immediately prior to this a dense tongue of Scots Pine some 20 ft. tall lying immediately to the NW had been felled in a heathland reclamation programme. It would appear that the sheltering effect provided by these trees had been beneficial to the colony.

Holmsley (41232008) This was one of the two sites used by Prof. Phillip Corbet in establishing the life history of the species in the early 1950's (the other was the Ober Water). Subsequent to his work the road system was altered which, due to its bisection of the site, altered the hydrology. The decline in the colony was probably caused by this but collection of larvae could also have been a factor.

Lower Peaked Hill (40361990) Prior to the late 1980's a small population existed there but then the ditch / stream was dug out. For the first three or four years the population declined dramatically but in the fifth year it began to increase and subsequently stabilised above the original level. At this location there is very little flow and as the ditch silts up again and enough of the water is absorbed by the silt the population may be expected to decline again. This may provide some insight into the population dynamics of a colony as the habitat conditions are changed.

6. CURRENT STATUS

C. mercuriale is considered globally threatened. It is listed in Annex II of the EC Habitats Directive which requires member states to designate SACs for its conservation. Six of its UK sites have been proposed as SACs under the EC Habitats Directive, the New Forest being a candidate SAC and the River Itchen a possible SAC. The species is also included in Appendix II of the Bern Convention.

In Britain it is reported to have suffered a 30% decline in its distribution since 1960, now being recorded from only 24 10 Km squares. In the British Red Data Books: 2 Insects it is listed as Category 3 (Rare). It is being considered for full protection under Schedule 5 (Protected Animals) of the Wildlife and Countryside Act 1981 and if accepted would become only the second species of Odonata, after the Norfolk Hawker (*Aeshna isosceles*), to enjoy such protection. It is one of the target species included in "Biodiversity: the UK Steering Group Report, Volume 2: Action Plan".

In 1988 Jan Van Tol influenced the selection of *C. mercuriale* as a European target species in his paper to the Council of Europe. The literature at that time, as now, noted the species as rare and in need of protection and detailed knowledge of its status was much less complete than it is today. We now know that the species has a widespread if scattered distribution across Europe and North Africa with strong colonies in Britain, particularly in the New Forest and Pembrokeshire and with lesser colonies on the Hampshire chalk streams, in Devon, Dorset, the Gower Peninsula and Anglesey. It seems that the species has specific habitat requirements and a low tolerance to adverse conditions.

The sites in Hampshire which support current colonies are listed in Appendix 1 with an indication of colony strength and trend where known. All records available from regional and national recording centres are listed in Appendix 2 showing site name, grid reference, date and recorder ID with a table to interpret recorder codes. Distribution maps are shown in Appendix 3 at a 1 Km plot resolution for the whole of Hampshire and at the plot resolution of 100 m for the strongest group of colonies.

7. STATE OF KNOWLEDGE

There is some doubt about the completeness of our knowledge of the distribution of *C. mercuriale* in Hampshire. The New Forest has been studied intensively over a long period and is probably known as well as any area of its size in Britain. There is some local knowledge of the Test and Itchen River valleys but this is limited in relation of the potential of these two areas. They have as yet not been adequately surveyed for Odonata primarily because of restricted access to private land, however the River Itchen has been surveyed for Water Voles.

There are big gaps in our knowledge of the species, its survival needs and life style. The only long term in depth study of the species in the New Forest has been on population assessment including a mark and recapture programme, undertaken by Dr Derek Jenkins on the strong colonies at Crockford and Peaked Hill. His work is published in many papers (see References). With the exception of this work there are insufficient records from other sites to be of value in assessing population trends. The data does not exist in an objective sense. In addition to the population studies of the species, a survey of water quality and content was carried out in 1982 by David Winsland et al (see References).

In summary it is considered that the species is adequately known in the New Forest but inadequately so on the chalk streams.

8. PREDICTIONS FOR ADDITIONAL SITES

The New Forest has been systematically studied over many years by the New Forest Odonata Group and latterly by the New Forest Study Group. In spite of this there may be more colonies to be discovered, but they would not be expected to be of major size. David Winsland has 'discovered' three new colonies in the past 12 years at **Frogmoor (40153978)**, **Common Moor (41205045)** and **Acres Down (41271086)**. Almost any runnel / small stream on a sheltered south facing slope is a potential site. It is not possible for the few field workers involved to cover all potential areas in the season given other interests. A good area to explore would be Beaulieu Heath East, to the east of Hill Top and south of the road to Fawley, 10 Km squares 4002, 4003, 4102 and 4103.

By contrast it seems almost certain that additional colonies will be found in the Test and Itchen valleys. The justification for this is that little of the potential has been surveyed due to restricted access to private land. However both rivers are intensively used by fly fishers some of whom are probably competent entomologists and would be expected to have recorded *C. mercuriale* if they had seen it. The bankside vegetation is maintained to permit easy access for fly fishing and this coupled with the presence of so many observers makes further discovery of the species on the main channels unlikely. Some fishing related activities and side effects are not likely to favour Odonata as detailed under Threats below. However there are many side channels and a multitude of feeders near the sources of these streams and it is there that further colonies may exist.

A systematic survey of these river valleys backed by the authority of the Environment Agency to obtain permission to access privately owned reaches would be necessary to reveal the full extent of distribution of the species along these chalk rivers and their feeder streams beyond the few colonies already located. Such permissions were obtained, with the support of the Environment Agency, for the Mammal Society to perform a Water Vole survey of the River Itchen basin.

9. CONSERVATION WORK

The UK Action Plan Objectives and Targets aim to maintain the current status of the species in the UK, preventing further loss of breeding populations in England and Wales, and if feasible to re-introduce the species to 5 former sites by the year 2005.

The Conservation (Natural Habitat, &c.) Regulations 1994, which implement the EU Habitats Directives, include provisions (section 50) for a review of existing decisions and consents affecting SACs, even if those decisions have been taken before the designation of the site. Given that *C. mercuriale* is one of the criteria on which both the New Forest and the River Itchen qualify as possible SACs, such section 50 reviews should particularly focus on existing and likely locations for the species as well as on the factors operating within the possible SACs that might affect it.

Grazing of vegetation seems to be an important part of the ecology of the species to keep ditches and runnels open and the bankside sward short and trampled. Cattle are used for this at Devon and Pembrokeshire sites and in the Itchen valley, whilst in the New Forest ponies perform a similar function. The increase in Devon populations is attributed largely to cattle grazing and trampling and also to reduced predation by Stonechats (*Saxicola torquata*) through removal of all perches, which were woody shrubs of no apparent benefit to *C. mercuriale*. The Itchen sites are in disused water meadows which are maintained by cattle grazing and water level control with some ditching work.

Given a reliable supply of base-rich, preferably warm spring water, the general habitat management prescription is to control bankside vegetation to a short sward by grazing or burning, to remove shrubs and trees on the banks of streams by cutting or hand pulling and to ensure that emergent vegetation flourishes in shallow slow flowing runnels which are kept open by grazing / trampling.

9.1 Current / Past Conservation management.

9.1.1 New Forest In the New Forest there has been no past conservation management for the benefit of this species. Where emergent vegetation has been removed from streams colonies of *C. mercuriale* have died out. Where sections of a streams have become overgrown the species has abandoned those sections. The New Forest Study Group did clear a section of Upper Crockford Stream adjacent to the marl pits but it proved to be too remote from existing colonies to achieve further colonisation. Pony grazing is probably beneficial, especially in the lower, more vegetated reaches of these streams. In the upper boggy areas near the source the habitat probably needs no intervention since both the habitat and the colonies in these areas appear to be stable. Drainage or other modification of mires and streams has tended to lead to the development of Willow (*Salix*)and Bog Myrtle (*Myrica gale*) scrub.

9.1.2 Chalk Streams On a visit to the Itchen Valley country Park in 1992 the potential population was assessed as equal to that of the New Forest in total. Local opinion indicates that 1992 represented an unprecedented cyclical peak. Since then numbers have diminished. A management plan had been formalised and work had commenced the preceding year. Anecdotal evidence would indicate that this work (a combination of water flow control by weirs and progressive bankside vegetation cutting) has not been beneficial to *C. mercuriale*. It seems that the species thrives at a certain stage in the succession of flood meadow management. When the ditches are newly dredged removing emergent vegetation and straightened to increase the water flow and bankside vegetation is removed, the population suffers a big decline. As the ditches mature with some silting up, the water flow is reduced,

emergent vegetation flourishes and bankside vegetation develops. For a number of years the habitat will be optimal for *C. mercuriale* and the colony will reach peak abundance. If the succession continues unchecked, the ditches will become overgrown with invading scrub and the colony will suffer a decline which could be terminal. It seems that there is a certain phase in the dereliction of water meadows that is particularly favourable to *C. mercuriale*. Very carefully controlled management is required to maintain the habitat in this condition and a combination of cattle grazing, maintenance of existing ditches and perhaps the progressive creation of new ditches seems to offer the best prospect.

9.2 Current Conservation Issues.

In the Itchen Valley Country Park the management plan needs reassessing if it is to be of benefit to *C. mercuriale*. It is felt that non intervention apart from cattle grazing may provide the greatest benefit although that may well conflict with other conservation ambitions there.

In the New Forest there seems to be no immediate danger to the overall population. There are, however, several sites where population declines are indicated which would benefit from remedial work in the removal of bankside and stream bed scrub and Bog Myrtle (*Myrica gale*).

With the following exceptions and with current knowledge it is felt that *C. mercuriale* is fulfilling it's potential and has no need for large scale conservation plans.

- Adequate surveying of Test and Itchen Valleys and subsequent revision of requirements in the light of it.
- A reappraisal of the management plan at the Itchen Valley Country Park an a monitoring scheme inaugurated.
- Modest stream / bank clearance as indicated in the specific management recommendations below.

9.3 Specific Site Management recommendations

Recommendations for habitat management on specific sites are detailed in Appendix 4.

9.4 Associated Benefits

Habitat management for the benefit of *C. mercuriale* will also benefits other species of Odonata. These undoubtedly include , the Keeled Skimmer (*Orthetrum coerulescens)* and the Small Red Damselfly (*Ceriagrion tenellum*), two scarce species occupying habitats declining throughout Europe. The management may benefit the Scarce Blue-tailed Damselfly (*Ischnura pumilio*), although this is a species of transient habitats. It is likely to benefit all of the more common species of riverine dragonfly occurring in the New Forest where most have declined over the past half century. The vast majority of invertebrate and other fauna associated with water are likely to benefit from it being open and well vegetated. It is felt that the modest amount of scrub clearance suggested will have no adverse effect on bird populations as a whole, however the importance of thorn scrub (and particularly hawthorn), which is a scarce resource in the open Forest, should not be underestimated. An added benefit would be a small increase in the availability of stream side lawn for commoners stock.

10. THREATS AND OPPORTUNITIES

10.1 Threats

10.1.1 Vegetation

The greatest threat to colonies in the New Forest is from bankside scrub, and in particular Bog Myrtle, overgrowing and shading out the water.

Clearance of vegetation from stream beds or weed cutting is fatal to a colony since it will remove all eggs and two generations of weed-living larvae as well as depriving any surviving adults of a place to lay their eggs.

The cessation or reduction of grazing / trampling by stock animals has been found to adversely affect colonies since the sward is not then controlled to an optimum height.

10.1.2 Watercourses

Failure of the springs is not greatly feared in the New Forest but hot dry summers do pose a natural threat to water supplies in streams and bogs. Human activities which threaten the continuous availability of running surface water include drainage schemes, agricultural and forestry uses of water and abstraction by water utilities. Where the water table is lowered sites dry out and become unsuitable.

Dredging and straightening of water courses is inclined to increase the depth of water and / or flow outside the optimum (perhaps tolerable) limits defined under Habitat above. Water meadow management can pose a threat at certain times in the cycle of ditch maintenance. Dereliction of a water meadow system probably poses a similar threat of scrub succession. Correct management is required.

The threat of water pollution is not great for New Forest springs, but the water chemistry of the chalk streams which start with a very pure water can be upset by arable run-off, particularly nitrates, and effluent from trout farms.

10.1.3 Predators

C. mercuriale has evolved in conjunction with its natural predators, nevertheless some consideration of predation is probably in order in case predator number are artificially increased as a result of management activities.

No reference has been found in the literature to larval predators. It would be normal for larger Zygoptera larvae and Anisoptera larvae to predate the larvae of small Zygoptera. Larvae of the Golden Ringed Dragonfly (*Codulegaster boltonii*), Keeled Skimmer (*Orthetrum coerulescens*) and Large Red Damselfly (*Pyrrhosoma nymphula*) have been found within the larval populations of *C. mercuriale* but occupying different habitat niches. Other invertebrate predators will doubtless include the larvae of some Coleoptera. Vertebrate predators may include fish, amphibians and mammals such as water shrews. Serious predation on adults by Stonechats (*Saxicola torquata*) is reported from Devon, otherwise no reference has been found to predators of adults. In addition to birds, adult predators may include Sundews (*Drossera*), Spiders and larger Anisoptera.

10.1.4 Fishing

The conflict between fishing interests and the conservation of *C. mercuriale* hinges on the way bankside vegetation is managed, weed cutting in the streams, effluent from trout farms, stocking with trout who will predate the larvae and general disturbance of adults by fishing. The restricted access to fishing banks is a problem to survey work.

10.2 Actionable Opportunities

The opportunity exists to do some habitat management calculated to benefit *C. mercuriale*. This could include management at the sites of existing colonies and management of other sites to make them suitable for natural colonisation or introduction. This could lead to an increase in the population of existing colonies as well as enabling them to spread out further along streams and colonise new areas adjacent to the streams.

10.2.1 New Forest

The opportunity exists in the New Forest to stop draining mires and stop deepening and straightening streams. If these features could be allowed to return to a more natural open state it would probably benefit *C. mercuriale* and much other wildlife.

10.2.2 Chalk Streams

Sympathetic management is probably required in the floodplains of the rivers Test and Itchen to maintain the water meadows in a tolerable if not always optimal state for *C. mercuriale*. This should be preceded by making an opportunity to fully survey these areas to establish the distribution of the species in these floodplains and details of the habitat where it is found. Incentives to landowners may be appropriate to motivate them to undertake this management work. Management of the Test Environmentally Sensitive Area and support from Countryside Stewardship in the Itchen Valley would seem to be appropriate vehicles for such incentives.

11. DISCUSSION

A scheme of habitat management for the benefit of a species requires base line survey data followed by long term monitoring of the species and the managed habitat. The criteria for success should be established at the outset. The best that can be done is to achieve a natural colony size appropriate to each site. The factors which control this colony size need to be studied and finally understood. The factors may be expected to include territorial tolerance, availability of food for larvae and adults and availability of suitable breeding conditions.

The list of sites in Hampshire (Appendix 1) has in many cases several grid references assigned to a site These are indicated on the 100m resolution distribution maps (Appendix 3). It would be interesting to know whether this is due to uncertainty of position on the part of some recorders or a large colony covering several 100 m squares or the existence of several discreet colonies on the site. The definition of a colony and a population involves a knowledge of the dispersal behaviour of the species. Colonies some 200 m apart are considered by local field workers to be distinct populations and many sites close to known colonies would seem suitable and yet the species is not found there. An interconnecting water course may in some cases provide a means for distinct colonies to exchange members. No report can be found of the actual emergence and maiden flight of *C. mercuriale*. It would seem that the species has a colonial tendency without much territorial aggression and without much tendency to disperse but it does not seem to tolerate mixing with other species.

The apparently poor power of dispersal is in contrast to the pattern of many other species of Odonata which breed in excess of their territorial limits at the breeding site so that many are forced to disperse and colonise new places. In some species with a strong flight dispersal / migration may take place over very long distances, and even some damselflies with basically weak flight are capable of rising high in the air and being carried with wind assistance to places remote from their emergence site.

The number of New Forest sites seems to have increased from 18 in 1987 (F Evans) to in excess of 30 by 1993 (D Winsland). It would be interesting to know if this is a genuine colonisation of new sites or if more sites which have been there all the time have been noticed during that period.

The specialised habitat requirement of the species means that potential sites are small, few and far between. This coupled with the apparently poor powers of dispersal make natural colonisation of new sites less probable. Captive breeding and release comes to mind as a possible solution to the perceived dispersal problem, but much more study of the species, its habitat requirements and natural powers of dispersal are needed before such a programme should be undertaken. Great difficulty has been experienced, as reported in the literature, in breeding larvae in captivity through to adult emergence. The running water conditions required by trout eggs have been simulated in commercial hatcheries and perhaps lessons could be learnt from that source. This begs the question where the eggs or larvae should be obtained for a captive breeding programme. To rob existing wild colonies could be to put them into jeopardy and to introduce strains from Europe would be ill advised. An advantage of a captive breeding programme would be to guard against a crash in the wild population. Such a crash does not seem likely in the New Forest.

The wisdom of embarking on any programme of habitat management requires a careful balance between the risks and potential benefits, bearing in mind also the risks of neglect if no habitat management is undertaken. Local opinion is divided on the rate and scale which is prudent. Any intervention in the habitat of an existing colony carries with it some risk and offers the prospect of some reward. There is no certainty of the outcome of any management work undertaken and it would have to be viewed as an experiment on a colony with base line and subsequent monitoring of both that colony and an appropriate control colony. Any management of habitat which does not support a current colony may be futile if the species is as reluctant to disperse naturally as it seems and if re-introduction is rejected.

The management proposed is mainly related to scrub (including Bog Myrtle) clearance from stream beds and banks to open up the streams. It is not considered feasible to manage the intensity of grazing on New Forest sites.

Habitat management for the benefit of one species is often at the expense of another. An assessment should be made of what other wildlife is likely to be disadvantaged by the sort of habitat management proposed.

The cautious urge restraint and very gradual small scale experiments. The bold claim that there are enough strong colonies in the New Forest to take some risk, and enough evidence to be sure that the removal of scrub in stream beds and along the banks where it is shading out the watercourses would be beneficial.

In considering any work involving the emergent vegetation in streams, it should be borne in mind that the eggs are laid into this vegetation and the young larvae are weed living in the summer months.

13.2 Research

Study association with / tolerance of other Odonata species
Study tolerance of degrees of overgrowth, shading of stream habitat
Study larval tolerance of cold water in winter
Correlate colony abundance with habitat factors including water pH, calcareous content, depth, flow, stream substrate, width, aspect, emergent vegetation, bankside vegetation
Study emergence, maiden flight and dispersal distance
Survey specimens in Natural History Museum and Hampshire museums
Study association with specific emergent plant species (building on the work of Fiona Evans)
Identify larval food and its abundance
Identify adult food and its abundance
If predation is felt to be a significant survival factor then a study to identify larval and adult predators and their impact would be worthwhile.

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Appendix 1 Southern Damselfly (*Coenagrion mercuriale*) Colonies in Hampshire

Grid Ref	Site Name(s)	Habitat	Colony	Trend	Management
Group 1	**Crockford / Peaked Hill**				
40337987	Greenmoor Stream S Bull Hill	Stream	25		
40335995	Greenmoor Stream Greenmoor Stream N	Stream	25		
40343997 40344997 40346993	Upper Crockford,stream Two Bridges Bottom	Stream	Strong 100+	Down	To clear bog myrtle from levees 40350989 to 40346994
40351978 40350978	Frogmoor Norley Wood, Frogmoor	Small	Weak		
40350990 40350991 40351990 40353989 40355989 40359988 40360987	Lower Crockford,stream Crockford Bridge	Stream	Small		To clear bog myrtle and scrub from levees 40350989 to 40361984
40360995	Peaked Hill Upper Peaked Hill,stream Peaked Hill, West	Stream	Very Strong 1000+		
40361990 40361991 40362994 40363998	Lower Peaked Hill Lower Peaked Hill,stream Peaked Hill E	Stream	Weak	Down /Up	Old (1980) ditch dug 3-4 year decline then recovery above previous level
40369995 40369998 40369999 41369001	Bagshot Moor East Boldre East End		Weak		To remove shrubs
40367993	Horsebush Bottom		Medium		
41341006	Beaulieu Heath				
41355013 41356013 4136-01-	Hatchet Moor (3.5km WSW of Beaulieu) Hatchet Moor, stream Hatchet, pond\stream		Good		To remove overgrowth PRIORITY
Group 2					
40289994 40290994 40291995	Widden Bottom	Basic Flush	Good		
41293002 41293004	Three Beech Bottom (stream+bog)		Good		
41296003 41296004	Setley Plain		Strong 100+		

Grid Ref	Site Name(s)	Habitat	Colony	Trend	Management
Group 3	**Oberwater**				
41204045 41205045 41205046	Common Moor (Burley Street)	Small	Weak		
41227034 41227035 41226035	Mill Lawn Mill Lawn Brook		Medium / Small		
41234036 41234034 41235035	Burley Lawn	Riverine	Small	Down	
41236036 41236035	Rooks Bridge		Small		
41240030	Rock Hills (1.5km E of Burley)				
41246029 41246031 41246033	Stag Brake Stag Brake Bog Stag Brake, mire		Weak	100>10	Old pine screen felled
41252022 41256026 41257028	Duckhole Bog (Rhinefield)		Weak		
41236039 41240037 41253038 41260034	Ober Water Markway to Puttles		Extinct seen 1978		Old emergent vegetation clearance

Grid Ref	Site Name(s)	Habitat	Colony	Trend	Management
Group 4	**Isolated**				
41185163 41185166 41187168 41188168	Millersford Bottom Millersford Bottom E. (runnel)	Molinia	Two small colonies 200 m	Stable	
41192126 41191129	Lay Gutter Valley Latchmore Bottom	Open no shelter	Weak		
41194127 41194128 41194129	Gypsey Hollies Gypsey Hollies Bottom Alder Hill Valley		Strong		To remove scrub from levees
40214992 40213995 40214995 40214996	Stony Moors Bell's Hat		Strong		
4021-99- 412--0--	Holmsley Bog Holmsley Airfield (?Goatspen Plain)		Extinct		To clear scrub 41218017 to 41227008
41232008	Holmsley Station (disused railway)		Weak 10	1950 Dense	To remove scrub and clear channel Old road changes hydrology / larva collection
41271086 41269087	Acres Down	Basic flush	Weak		
41329020 41330021	Round Hill Roundhill		Small Isolated		To clear scrub to 41327018
41357045	Rowbarrow, stream Rowbarrow Pond		Isolated		
41357045	Rowbarrow Pond, area		Extinct		
41394071	Applemore Stream (1.5km W of Hythe)		Relict Isolated Weak		To clear bog myrtle 41395073 to 41391968
41404032	Hill Top area		?Extinct		Needs survey
41434017 41435018	Blackwell Common		Medium		
Group 5	**Chalk Streams**				
41460169 41461169 4145-16-	Itchen Valley CP, (ditches)	Water meadows	Strong	Down	Old weir and ditch management
41470227	Otterbourne,R Itchen,Colden Common				Needs survey
4147-24-	Mariners Meadow, Twyford				Needs survey
41347315 41347316	King's Somborne,R Test Houghton, R Test	Trout fishery			Needs survey
Group 6	**Probably Extinct**				
41263174	Nomansland		?Extinct seen1989		Needs survey
412--0--	nr, New Park		Extinct		
403--9--	Sowley		seen 1947		
413--0--	Roydon Wood (?Roundhill)		seen 1926		

Appendix 2 Southern Damselfly (*Coenagrion mercuriale*) Records in Hampshire

Coenagrion mercuriale post 1969 VC11

Yr	*Grid Re*	*Locality*	*Dy*	*Mh*	*Sce*	*Alt*	*Sq*	*A C O L X E*
1973	412--0--	Burley,nr			1	40.00	41/20	
1973	4122-03-	Mill Lawn Brook	10	07	1		41/20	
1973	4122-03-	Mill Lawn Brook	07	07	1		41/20	
1973	4125-03-	Ober Water			1		41/20	
1974	4035-98-	Beaulieu Heath			1	24.00	40/39	
1974	412--0--	Ober Water			1		41/20	
1974	41245038	Burley,4km ENE of	05	07	1	31.00	41/20	
1974	41253039	Burley,5km ENE of	05	07	1	31.00	41/20	
1975	4124-03-	Red Rise	18	07	1		41/20	
1976	4034-98-	Crockford Bridge			1	24.00	40/39	
1976	4121-04-	Burley Moor	13	07	1		41/20	
1977	401--9--	Bournemouth+Christchurch,Moors Rive			1		40/19	
1977	403--9--	Lymington			1		40/39	
1977	41250039	Markway Bridge,E of			1		41/20	
1978	40348992	Crockford Stream			1	22.00	40/39	
1978	40348992	Crockford Bridge			1	24.00	40/39	
1978	41236039	Ober Water			1	25.00	41/20	
1978	41260034	Ober Water			1	24.00	41/20	
1978	41360013	Hatchet Pond+stream			1	31.00	41/30	
1979	4034-99-	Crockford Bog	26	07	1		40/39	
1979	40348992	Crockford Bridge	27	07	1	25.00	40/39	
1979	40350991	Crockford Bridge,stream	13	07	1	30.00	40/39	
1979	41260034	Ober Water			1	24.00	41/20	
1979	41262032	Markway-Puttles Bridge,Ober Water	31	07	1	8.00	41/20	
1979	41334024	Round Hill Inclosure	22	06	1		41/30	
1980	4035-99-	Crockford Stream	03	08	1		40/39	
1980	40350992	Crockford Bridge area	16	07	1	20.00	40/39	
1981	40350991	Lymington,Crockford Stream 4km NE of	08	07	1	20.00	40/39	
1981	40350991	Crockford Bridge			1	30.00	40/39	
1981	4122-03-	Burley Lawn	25	07	1		41/20	
1981	4122-03-	Mill Lawn Brook	10	07	1		41/20	

Yr	Grid Re	Locality	Dy	Mh	Sce	Alt	Sq	A C O L X E
1981	41329020	Round Hill Inclosure	14	06	1	30.00	41/30	
1981	4133-02-	Roundhill Bog	14	06	1	30.00	41/30	
1982	40213996	Thorney Hill,Stoney Moors 1km E of	29	07	1	54.00	40/29	
1982	40345994	Beaulieu Heath,Crockford	31	07	1		40/39	
1982	40347993	Beaulieu Heath,Crockford	30	07	1	27.00	40/39	
1982	40348992	Crockford Stream	26	07	1	22.00	40/39	
1982	40349992	Lymington,Crockford Stream 4km NE of	09	06	1	25.00	40/39	
1982	40350991	Crockford Bridge	05	06	1		40/39	
1982	40360994	Peaked Hill area,4km SW of Beaulieu	30	06	1	20.00	40/39	
1982	40362993	Beaulieu Heath	10	06	1	25.00	40/39	
1982	40364995	East Boldre,Beaulieu Heath	10	06	1	30.00	40/39	
1982	40369999	East End	10	06	1	30.00	40/39	
1982	4119-12-	Latchmore Brook			1	75.00	41/11	
1982	41252022	Rhinefield,Ouck Hole Bog	29	07	1	40.00	41/20	
1982	41256026	Rhinefield,Duck Hole	29	07	1	33.00	41/20	
1982	41292002	Setley Plain,E of	04	08	1	27.00	41/20	
1982	41327018	Round Hill	08	07	1	30.00	41/30	
1982	41329019	Perrywood Ironshill Inclosure	28	07	1	30.00	41/30	
1982	41329020	Round Hill	08	07	1	30.00	41/30	
1982	41329020	Round Hill	08	06	1	30.00	41/30	
1982	41330020	Round Hill,nr	05	06	1	30.00	41/30	
1982	41331021	Round Hill	08	07	1	30.00	41/30	
1982	41355013	Hatchet Moor,3.5km WSW of Beaulieu	08	07	1	38.00	41/30	
1982	41355013	Hatchet Moor,3.5km WSW of Beaulieu		06	1	38.00	41/30	
1982	41435018	Blackwell Common	19	07	1	15.00	41/40	
1983	40214995	Stony Moors			1	50.00	40/29	
1983	403-9-	Crockford Stream	12	06	1		40/39	
1983	4033-99-	Greenmoor			1	30.00	40/39	
1983	40337987	Greenmoor			1	29.00	40/39	
1983	4034-99-	Two Bridges Bottom			1	35.00	40/39	
1983	40346994	Crockford,4km NE of Lymington	21	07	1	20.00	40/39	
1983	4035-98-	Crockford Bridge			1	20.00	40/39	
1983	41192126	Lay Gutter Valley			1	45.00	41/11	

Yr	Grid Re	Locality	Dy	Mh	Sce	Alt	Sq	A	C	O	L	X	E
1983	41194127	Latchmore Bottom	18	08	1		41/11	X					
1983	4122-03-	Burley Lawn			1	40.00	41/20						
1983	41236036	Burley Lawn,Rooks Bridge			1	40.00	41/20						
1983	41246033	Stag Brake Bog			1	40.00	41/20						
1983	41293004	Three Beech Bottom,stream+bog		07	1	35.00	41/20						
1983	41327018	Round Hill		06	1	30.00	41/30						
1983	41329020	Round Hill	15	06	1	30.00	41/30						
1983	41347316	King's Somborne,R Test	02	07	1	30.00	41/33						
1983	41361012	Hatchet Pond area	21	07	1	37.00	41/30						
1983	41369001	East Boldre,Bagshot Moor Ditch	01	07	1	32.00	41/30						
1983	41369001	East Boldre,Bagshot Moor Ditch	08	08	1	32.00	41/30	*					
1983	41394071	Hythe,Applemore Stream 1.5km W of	17	07	1	10.00	41/30						
1983	41404032	Hill Top area		07	1	34.00	41/40						
1983	41435018	Blackwell Common	10	06	1	15.00	41/40						
1983	41460169	Itchen Valley		06	1	6.00	41/41						
1983	41468226	Otterbourne,R Itchen	11	06	1	15.00	41/42						
1983	41470227	Otterbourne,R Itchen	11	06	1	15.00	41/42						
1984	40346995	Crockford Stream			1	35.00	40/39						
1984	40349989	Crockford Valley	05	08	1		40/39	*					
1984	40351990	Crockford Stream			1	30.00	40/39						
1984	41186169	Millersford Bottom,Densome Corner	24	06	1	90.00	41/11						
1984	41194127	Latchmore Bottom,Site B	06	08	1		41/11	X					
1984	41232008	Holmsley			1	40.00	41/20						
1984	41246029	Stag Brake	01	07	1	40.00	41/20						
1984	41269087	Acres Down			1	60.00	41/20						
1984	41359013	Hatchet Pond	18	07	1	40.00	41/30						
1985	40291995	Widden Bottom	04	07	1	25.00	40/29						
1985	40346993	Crockford Bridge	31	07	1	30.00	40/39						
1985	40347992	Crockford Bottom,Upper	25	07	1	30.00	40/39						
1985	41227035	Mill Lawn Brook	16	06	1	40.00	41/20						
1985	41470227	Colden Common,R Itchen nr	31	07	1	20.00	41/42						
1986	40344997	Upper Crockford,stream	16	08	1	35.00	40/39	X					
1986	40344997	Upper Crockford,stream	26	06	1	35.00	40/39						

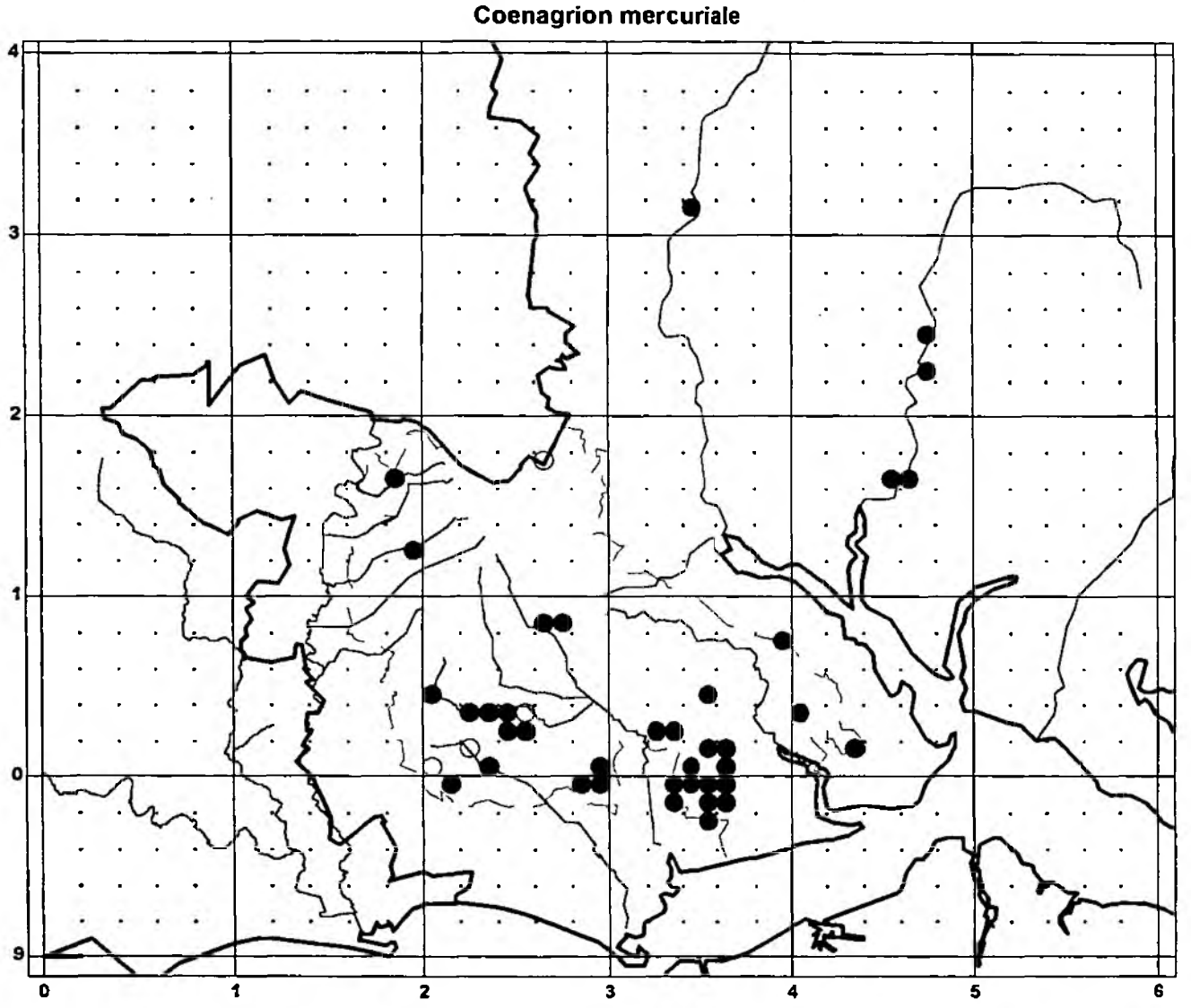
Yr	Grid Re	Locality	Dy	Mh	Sce	Alt	Sq	A	C	O	L	X	E
1986	40344997	Upper Crockford,stream		08	1	35.00	40/39						
1986	40344997	Upper Crockford,stream	01	08	1	35.00	40/39						
1986	40344997	Upper Crockford,stream	30	08	1	35.00	40/39	X					
1986	40344997	Upper Crockford,stream	13	07	1	35.00	40/39						
1986	40344997	Upper Crockford,stream	14	06	1	35.00	40/39						
1986	40355989	Lower Crockford,stream	13	07	1	20.00	40/39						
1986	40355989	Lower Crockford,stream	30	08	1	20.00	40/39	X					
1986	40355989	Lower Crockford,stream	28	06	1	20.00	40/39						
1986	40355989	Lower Crockford,stream	16	08	1	20.00	40/39	X					
1986	40355989	Lower Crockford,stream	01	08	1	20.00	40/39						
1986	40355989	Lower Crockford,stream		08	1	20.00	40/39						
1986	40359995	Peaked Bottom-Upper Peaked Hill,strea	28	06	1	35.00	40/39						
1986	40359995	Peaked Bottom-Upper Peaked Hill,strea	13	07	1	35.00	40/39						
1986	40359995	Peaked Bottom-Upper Peaked Hill,strea	01	08	1	35.00	40/39						
1986	40359995	Peaked Bottom-Upper Peaked Hill,strea		08	1	35.00	40/39						
1986	40359995	Peaked Bottom-Upper Peaked Hill,strea	16	08	1	35.00	40/39	X					
1986	40361990	Shipton Holms-Lower Peaked Hill,strea		08	1	20.00	40/39						
1986	40361990	Shipton Holms-Lower Peaked Hill,strea	16	08	1	20.00	40/39	X					
1986	40361990	Shipton Holms-Lower Peaked Hill,strea	01	08	1	20.00	40/39						
1986	40361990	Shipton Holms-Lower Peaked Hill,strea	13	07	1	20.00	40/39						
1986	40361990	Shipton Holms-Lower Peaked Hill,strea	28	06	1	20.00	40/39						
1987	40344997	Upper Crockford,stream	30	05	1	35.00	40/39	X					
1987	40344997	Upper Crockford,stream		06	1	35.00	40/39						
1987	40344997	Upper Crockford,stream	04	07	1	35.00	40/39						
1987	40344997	Upper Crockford,stream	25	07	1	35.00	40/39						
1987	40344997	Upper Crockford,stream	13	06	1	35.00	40/39						
1987	40344997	Upper Crockford,stream	30	06	1	35.00	40/39						
1987	40344997	Upper Crockford,stream		07	1	35.00	40/39						
1987	40344997	Upper Crockford,stream	11	07	1	35.00	40/39						
1987	40349988	Crockford Bridge	09	07	1		40/39						
1987	40350990	Crockford Stream	04	06	1		40/39						
1987	40351989	Crockford Stream	10	08	1	30.00	40/39	*					
1987	40355989	Lower Crockford,stream	30	06	1	20.00	40/39						

Yr	Grid Re	Locality	Dv	Mh	Sce	Alt	Sq	A	C	O	L	X	E
1987	40355989	Lower Crockford,stream		07	1	20.00	40/39						
1987	40355989	Lower Crockford,stream	11	07	1	20.00	40/39						
1987	40355989	Lower Crockford,stream	13	06	1	20.00	40/39						
1987	40355989	Lower Crockford,stream		06	1	20.00	40/39						
1987	40355989	Lower Crockford,stream	04	07	1	20.00	40/39						
1987	40360995	Upper Peaked Hill,stream	04	07	1	30.00	40/39						
1987	40360995	Upper Peaked Hill,stream		07	1	30.00	40/39						
1987	40360995	Upper Peaked Hill,stream	11	07	1	30.00	40/39						
1987	40360995	Upper Peaked Hill,stream	30	05	1	30.00	40/39	X					
1987	40360995	Upper Peaked Hill,stream	30	06	1	30.00	40/39						
1987	40360995	Upper Peaked Hill,stream	13	06	1	30.00	40/39						
1987	40360995	Upper Peaked Hill,stream		06	1	30.00	40/39						
1987	40361990	Lower Peaked Hill,stream	04	07	1	20.00	40/39						
1987	40361990	Lower Peaked Hill,stream	30	06	1	20.00	40/39						
1987	40361990	Lower Peaked Hill,stream		07	1	20.00	40/39						
1987	40361990	Lower Peaked Hill,stream	11	07	1	20.00	40/39						
1987	41188168	Millersford Bottom	05	07	1	52.00	41/11						
1987	41191129	Latchmore Brook	28	06	1	50.00	41/11						
1987	41227035	Mill Lawn	29	05	1	40.00	41/20	X					
1987	41234034	Burley	04	08	1	38.00	41/20						
1987	41341006	Beaulieu Heath	25	07	1	40.00	41/30						
1988	40214996	Thorney Hill,Stony Moors E of	16	07	1	50.00	40/29	A					
1988	40214996	Thorney Hill,Stony Moors E of	14	06	1	50.00	40/29	D	C	B			
1988	40290994	Widden Bottom	18	06	1	25.00	40/29	B					
1988	40336995	Lymington,Greenmoor Stream	18	06	1	30.00	40/39	C	B	B			
1988	40343997	Pilley Bailey,Two Bridges Pond NE of	22	06	1	30.00	40/39	D	B	B			
1988	40350990	Beaulieu,Crockford Stream 2.5 km SW	24	06	1	30.00	40/39	E	D	D			
1988	40350990	Beaulieu,Crockford stream 2.5km SW o	19	06	1	30.00	40/39	E	D	C			
1988	40355989	Crockford Bridge,Lower Crockford nr	25	06	1	17.00	40/39	B					
1988	40360995	East Boldre,Peaked Hill west stream	15	05	1	30.00	40/39	C					
1988	40362994	Beaulieu,Peaked Hill 2km SW of	19	06	1	30.00	40/39	F	D	D			
1988	40362994	Beaulieu,Peaked Hill 2km SW of	24	06	1	30.00	40/39	F	D	D			
1988	41185166	Millersford Bottom	12	06	1	45.00	41/11	C					

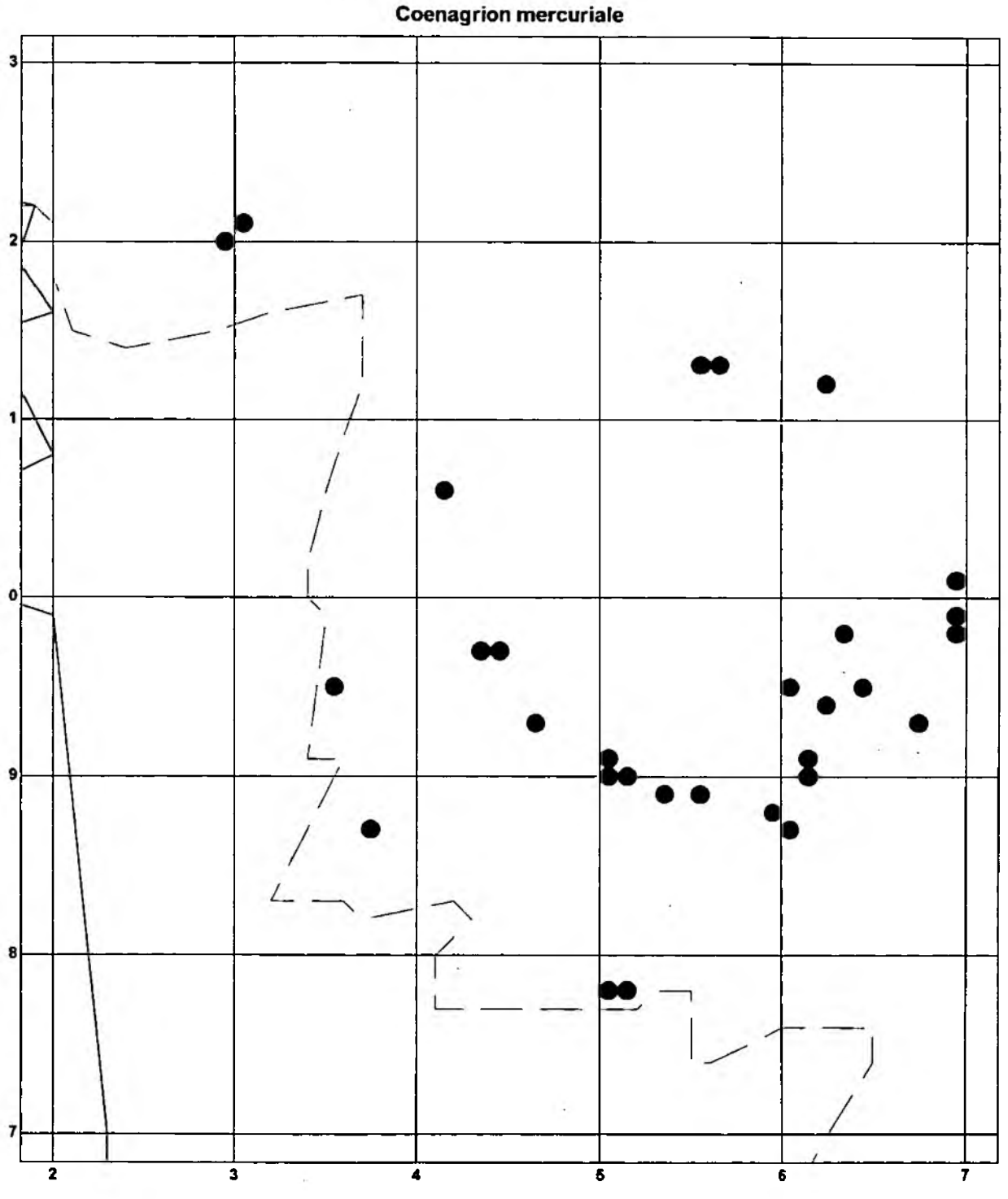
Yr	Grid Re	Locality	Dy	Mh	Sce	Alt	Sq	A	C	O	L	X	E
1988	41187168	Millersford Bottom	12	06	1	50.00	41/11	C	B				
1988	41188168	Millersford Bottom	12	06	1	50.00	41/11	C	B				
1988	41191129	Latchmore Bottom	12	06	1	50.00	41/11	B					
1988	41227034	Burley Lawn,Mill Lawn	05	06	1	50.00	41/20	C					
1988	41232008	Holmsley old railway	09	07	1	35.00	41/20	D	B				
1988	41236035	Burley,Rooks Bridge 1km E of	05	06	1	43.00	41/20	B					
1988	41240030	Burley,Rock Hills 1.5km E of	05	06	1	55.00	41/20	A					
1988	41257028	Brockenhurst,Duckhole Bog 2.5m E of	09	07	1	35.00	41/20	C		A			
1988	41293002	Setley Plain	09	07	1	25.00	41/20	C	B	A			
1988	41296003	Setley Plain	09	07	1	35.00	41/20	B					
1988	41434017	Blackwell Common	19	07	1	25.00	41/40	C	B	A			

Appendix 3 - Southern Damselfly (*Coenagrion mercuriale*) Distribution Maps

Hampshire Distribution of *Coenagrion mercuriale*
10 Km squares, 1 Km plot resolution



Crockford Stream / Peaked Hill distribution of *Coenagrion mercuriale*
1 Km squares, 100 m plot resolution



Appendix 4 - Specific Site Management recommendations

1. Holmsley Station 41 232 008 19 October 1996, pH 6.3, Temp. 11 deg. C.

This was one of Prof. P Corbet's two sampling sites in early 1950's. At that time the population was dense judging by the numbers he collected and observed. Now it would be considered normal to count some 10 individuals each visit.

Site description: A small stream emanating from and draining the Swigs Helm mire complex and flowing through wet to humid heath. The point of interest begins immediately below the bridge carrying the 'old' road over the stream, continuing under the Brockenhurst to Burley road and finishing adjacent to the 'old' railway underpass below Holmsley Mill. Total length approximately 200 metres.

Recommendations: As the stream has fairly well cut banks (0.5 - 1.0 metre) the Bog Myrtle and Heather growing along the south-western bank casts undue shade upon the water. This could beneficially be removed together with the single sallow in the upper stretch and the few growing in the water immediately below the Burley road. No benefit would be accrued from removing the birch. In this particular instance it would not be disadvantageous to remove the Bog Myrtle form the opposite bank as well. Certain stretches are densely colonised by rush, *Juncus acutiflorus* which would not be favoured by the species. In this case it is suggested that a 0.75 metre channel be cut through one area and the site monitored for the speed of re incursion and the effect upon the damselfly population.

2. Bagshot Moor 40 369 999 21 October 1996, pH 6.4, Temp. 13 Deg. C.

Site description: Valley mire with central watercourse including base enriched flushes to both banks.

Remedial work suggested: Throughout a high proportion of it's length the central water course is now overgrown with Bog Myrtle with some Gorse. All shrubby growth to be cleared from western bank side to a minimum of 1.0 metre plus any sallow / Bog Myrtle in the stream itself. About 250 metres

3. Hatchet Moor Stream 41 356 013 21 October 1996, pH 6.7, Temp. 15 Deg. C

Site description: Man made stream flowing from west to east over Headon Beds with man made side drains to north and south draining mire on Hatchet Moor and emptying into Hatchet Pond. Pronounced levees. Extremely high quality stream exhibiting width to 2 metres, good depth of water with silt base and dense vegetation.

Recommendations: The upper 300 metres, together with the associated side drains, is prime habitat for this damselfly. Generally it is in good condition but the top 100 metres is grossly over grown and the two top bifurcations require some attention. Because of the quality of this site it is argued that it merits some priority.

4. Roundhill Stream and Bog 41 330 021 23 Oct. 1996, pH 6.6, Temp. 12 Deg C

Site description: A small mire at the rear (west) of the motor cycle camp site and stream / drain flowing west through woodland with a small amount of lawn for some distance before tuning south and joining a further drain and eventually emptying into the Lymington River. The whole length of the drain from the bog depression down stream is heavily over shadowed by Sallow and Birch with some Beech and Oak.

Recommendations: Due to the height of the adjacent woodland, stream sides should be cleared of Sallow, Birch and any other scrub to a minimum width of 20 metres on each bank from the start of the drain and as far as the foot bridge at GR 41.327.018.

5. Gypsey Hollies 41 194 128 24 October 1996

Site description: A small valley mire and stream/drain to the west of Lay Gutter Valley and the north of Latchmore Brook. A track crosses the stream/drain about 100 metres north of and parallel to Latchmore Brook. The drain from 50 metres above the track to Latchmore Brook itself is over grown with Bog Myrtle for most of it's length and some thorn scrub at the lower end.

Recommendations: To remove all scrub from drain to one metre width on each bank.

6. Applemore Stream 41 395 073 - 41 391 068 24 October 1996

Site description: Small stream flowing through heathland and lawn from the Applemore roundabout area towards the Beaulieu River. The value of this site is that it is the only stream in the New Forest not associated with adjacent mire where this species occurs. In addition it is an isolated site and as such a totally distinct population. From 30 metres downstream from the footbridge close to the corner of Dibden Inclosure the stream disappears under Bog Myrtle for some 90% of the 300 metres prior to a stand of mature Birch. On leaving the Birch the stream is more open with only isolated clumps of Bog Myrtle obscuring the stream prior to Dibden Bottom.

Recommendations: The main concern is the 300 metres of Bog Myrtle prior to the stand of Birch as this is where the relict population now exists. This area of Bog Myrtle should be totally cleared for two metres on the south bank and at least clear of the water to the north and it would be beneficial if the isolated clumps below the wooded area were removed also. Even were the stream cleared through the wooded area it is hard to believe that this would be any advantage since the shade is an impenetrable barrier to population expansion unless the birch be removed also.

7. Upper Crockford Stream 40 350 989 - 40 346 994
23 October 1996, pH 6.8, Temp. 13 Deg. C

Site description: A valley mire with central water course and many runnels and flushes to each bank. The stream finally disappears into a marl pit complex at about 150 metres above the main Lymington to Beaulieu road. Above the marl pits the stream has, within current memory, become over grown with Bog Myrtle up as far as approximately 100 metres south of the main crossing at the latter grid reference.

Recommendations:
a) That the Bog Myrtle is cleared from within the stream and upon both banks for a minimum width of one metre. Approximate length under discussion 300 metres.

NB. The population here has declined considerably during the past ten years, a period in time when Dr. D.K. Jenkins has carried out an exhaustive study.

b) Where the stream enters the marl pit complex there is an impenetrable barrier of thorn. It is suggested that the whole stream is opened up on it's passage through and past the marl pits to a minimum width of five metres on each bank.

8. Lower Crockford Stream 40 350 989 - 40 361 984
23 October 1996, pH 7.0, Temp 13 Deg. C

Site description: The stream continues below the road bridge through a series of marl pits for less than 100 metres and thence into a shallow valley with mire, runnels and flushes to the south and with runnels and small streams to the north. Throughout there are some levees and lawn areas. The whole valley is extensively over grown with scrub under some Oak and the vast majority of the stream has disappeared under Bog Myrtle. A small population of *C. mercuriale* retains a precarious hold in one small open area.

Recommendations:
a) A minimum requirement would be to remove the all of the Bog Myrtle and scrub from the stream and its south bank to a width of one metre and 0.5 metres on the north bank from below the marl pits to 40 359 986 where the Peaked Hill Stream converges. It would be preferred to continue to Horsebush Bottom at 40 361 984 and to remove a maximum amount of scrub from the north bank leaving only the ecologically significant trees and shrubs.

b) There is a decided advantage in clearing a passage for the stream through the marl pits in a similar manner to that suggested for Upper Crockford.

NB. Full implementation of the suggestions for both Upper and Lower Crockford would enable unrestricted movement of the damselfly throughout the majority of it's habitats on this area of Beaulieu Heath via the waterway system. Crockford Stream is the linking factor. The area in question is without any doubt the most significant and valuable location for the *C. mercuriale* in Britain.

9. Holmsley Bog 41 218 017 - 41 227 008 24 October 1996

Site description: An extensive valley mire system. The central, primarily man made, water course has substantial levees on either bank and many mire runnels and seepages on both flanks. The water is, for a high proportion of it's length, obscured by a thick growth of Sallow, thorn and rank Bog Myrtle. Because of this, in current memory this mire system, which exhibits all features required for the existence of scarce Odonata, has an extremely impoverished dragonfly fauna. We are reliant upon Col. F.C. Fraser in his notes and odd records from the 1950's to realise the extent to which Holmsley bog has deteriorated in the intervening period. Records do indicate that the *C. mercuriale* did occur here but they are inadequate to establish densities.

Recommendations: That the stream be thoroughly cleared of the scrub growing within and on the banks to a minimum of one metre and. In addition the levees be cleared to provide some open areas and it should be ensured that the entry points of streams, runnels and flushes are not obstructed.

Important Note

In conditions where Bog Myrtle gives the appearance of growing in the water it is infinitely preferable to pull it by hand and not to cut the plant at the emergence point. Very often the particular shoot is only lightly rooted in the substrate and originates from a bankside runner. These are easily broken by hand and will further delay regeneration at least to some degree.