



British Dragonfly Society

Draft Management Fact File

Please note: These MFFs are still draft versions. Any comments sent to the [Conservation Officer](#) would be most welcome.

The Norfolk Hawker *Aeshna isosceles* (Müller)

"The Norfolk Hawker is a delight to study. This is because places that are good for Norfolk Hawkers are also good for other species of dragonflies, notably Hairy dragonfly, Scarce Chaser and Variable Damselfly"¹.

Identification



The Norfolk Hawker, *Aeshna isosceles*, is one of 2 brown hawker dragonflies found in Britain^{2, 3} (Fig. 1). The male and female are very similar in appearance and the species derives its scientific name from the yellow triangular mark which is located on the second abdominal segment^{1, 3}. *A. isosceles* can be separated from the commoner Brown hawker by its clear untinted wings and green eyes, although individuals at Upton Broad have been recorded with a pale gingery tint². The Norfolk Hawker emerges much earlier than the Brown Hawker, although there is

an overlap in July and early August. During June Hairy dragonflies are generally the only other hawkers encountered on the wing. The dark abdomen marked with blue or yellow spots of this species and its smaller size make it very different from the Norfolk Hawker. Thus, identification of both species is relatively easy¹.

Larvae of the Norfolk Hawker are typically aeshnid with large eyes. However, separation from other members of the family requires close examination and textbooks should be consulted. Hammond⁴ provides useful information on both larval and adult identification.

Status

A. isosceles is listed under Category 1 (endangered) in the British Red Data Books on Insects⁵ and as a consequence it is legally protected under schedule 5 of the Wildlife and Countryside Act, 1981. A permit from English Nature is required before specimens of this rare species are caught¹. It is also included on the long list of globally threatened/declining species in the UK Biodiversity Strategy⁶.

Distribution

The Norfolk Hawker is basically a Mediterranean species that is widely distributed in lowland areas of North Africa and Southern and Central Europe². It is absent from Scandinavia apart from Gotland³.

In Britain it has always been a scarce and local insect, although at the turn of the century the Norfolk Broads supported thriving populations. Historically the species was also found in the Cambridgeshire fens⁷ but in the late 1970s and the early 1980's surveys indicated that the populations had greatly reduced and the Norfolk Hawker was found to be absent from many of its former haunts. Currently it is confined to fens and grazing marshes that are relatively isolated from polluted water³ in the Broadlands of Norfolk and Northeast Suffolk^{2, 8}. Since the 1980's the Norfolk Hawker has steadily spread, re-colonising former sites. This has coincided with habitat restoration, protection of grazing marshes by government, improvements in water quality and several warm summers^{2, 7}. The Norfolk Hawker has been swift to follow improvements⁹ but despite this, it is still vulnerable even in sites where it is protected.

[Distribution map](#) from the [National Biodiversity Network Gateway](#) website.

Ecology and Habitat Requirements



The Norfolk Hawker is characteristically a species of fen and grazing marsh dyke systems in Broadlands where it exploits unpolluted ditches and dykes, (fig. 3) and occasionally small turf ponds². It requires clean water, a rich aquatic flora and space to hunt⁷. Inhabited water bodies usually contain water soldier (*Stratoites aloides*) among the floating vegetation² which provides a large surface of plant material throughout the year. Other plants that are often present include frogbit, pondweed and greater bladderwort³. The importance of water soldier is not known, although it does indicate good water quality⁸ and "supports a wide range of invertebrates, which are potential prey items for the Norfolk Hawker". On the continent it is not confined in this way and in Suffolk, *A. isosceles* has recently been confirmed breeding at sites that are devoid of water soldier (Moore, pers. comm).

Both the Norfolk Hawker and Water soldier appear to prefer dykes with a reduced flow rate, such as those found in dykes that branch off the main system or those

that have a dead end^{2, 8}. Trees and bushes are needed close to breeding sites, as they provide the adults with hunting routes and resting places over night or during bad weather. Favoured water bodies also have rushes or flags along their margins providing shelter and daytime resting sites². *A. isosceles* hawks less and settles more frequently than other hawkers¹⁰ and consequently territorial males have a higher population density than other Aeshnids³. After mating females lay their eggs alone, almost exclusively favouring the leaves and flowers stalks of Water soldier^{1, 7} and occasionally Frogbit or organic debris. The larvae probably take 2 years to develop and although little is known about the larval habitats it is thought that they survive best in association with Water soldier. During emergence, the insects use a variety of marginal plants, although, most emerge on water soldier leaves⁸. Norfolk Hawkets usually begin to emerge in late May and they are on the wing until mid August.



Fig 4. Flight period of the Norfolk Hawker

As with many other dragonfly species, high quality water appears to be of vital importance. Clean, unpolluted water is required to support *S. aloides* and probably *A. isosceles* as well² although the link has not been proven.

Summary of the Main Habitat Requirements

"The optimum conditions for breeding appear to be unspoilt grazing marsh dyke systems with clean, non-saline water, rushy margins, an abundance of water soldier and the presence of other aquatic plants"².

Current Threats

- **Conversion of grazing marsh to arable farming** - During the last century 30% of the grazing marshes have been lost through conversion to arable land. This has significantly reduced the amount of suitable breeding habitat⁷. The current crisis in farming and the slump in livestock prices could potentially threaten the future of the grazing marshes and their dykes⁷.
- **Inappropriate ditch management** - Unsympathetic management and neglect of the ditch and dyke systems are thought to be the gravest threat to the Norfolk Hawker⁷. The loss of traditional benign dyke management techniques may have serious consequences for this species³. Current dredging of the ditches with machinery removes the plant matter as well as dragonfly larvae and makes the ditches untenable. Traditional management, used in the past, relied on manual labour as stretches were cleared of plants and dredged by hand⁷. Undoubtedly this would have caused less habitat disruption and would have left numerous plants and larvae behind.
- **Eutrophication** - During the last century excessive nutrient enrichment of the rivers and broads has occurred as a result of intensification of agriculture and a rising human population. Changes in agricultural practice and increasing pollution from both domestic and agricultural sources has led to a

rapid increase in the levels of nitrates and phosphate entering the aquatic system⁷. This in turn has led to a loss of aquatic vegetation and an increased incidence of algal blooms. Improvements in sewage treatment have been made and the Environmentally Sensitive Areas scheme which promotes and supports traditional management has been beneficial. However, in 1990 the results of a survey indicated a general decline in the quality of the vegetation in the dykes, suggesting a movement towards eutrophication. It is thought that poor quality water is flowing into dykes from intensively farmed non-ESA land^{2, 11}.

- **Toxic inputs** - The runoff from agriculture (pesticides), industry, road run-off and domestic sources all pollute the aquatic environment, and have contributed to a general decline in suitable systems.
- **Penetration of saltwater into grazing marshes** - *A. isosceles* is not tolerant of brackish or saline water and there are likely to be serious implications for the conservation of this species as a result of climate change and increasing sea levels. Without sufficient coastal protection, the predicted sea level rise is liable to inundate the broads with salt water, forming an estuarine ecosystem. If this happens, this vulnerable species will be further threatened as sea water kills the larvae and has similar effects on water soldier¹². This was illustrated at Ludham marshes where the inundation of saline water overflowing from the adjoining tidal river during the winter of 1993/94 was considered to be the reason for the recorded fall in numbers of flying adults between 1993 and 1995.
- **Fluctuation in water levels** - Changes in water level caused by pumped drainage systems⁴ and especially lowered water tables^{3, 7} disrupt suitable habitat.

Management

General Guidelines

- **Maintaining Grazing Marsh** - Conversion of neighbouring land from grazing marsh to arable use may be detrimental to existing populations and limit the possibility of establishing new ones. Every effort should therefore be made to maintain land under a system of extensive grazing in areas where the species is present, suspected or on adjacent land.
- **Control of Saline Intrusion** - Any action that minimises the seepage of saline water into dykes where the Norfolk hawkler is known to breed, is to be encouraged, although successful action is likely to be very limited in years of severe flooding.
- **Control of Eutrophication** - Steps should be taken to avoid the nutrient enrichment of any dyke systems supporting or capable of supporting *A. isosceles*. Impact of agricultural runoff from arable land can be minimised on adjacent land by the development of buffer strips.

Best Management Practice

- **Management of Dyke Vegetation** - although dykes and ditches containing breeding Norfolk Hawkers need to be cleared periodically, it is important to undertake this on a rotational basis to ensure that there are always undisturbed areas with suitable vegetation for refuge. Furthermore, care should be taken to avoid restricting water flow. Where practical alternate banks should be cleared in different years leaving a reservoir of larvae whilst maintaining the flow. Under these circumstances succession should be prevented allowing *S. aloides* to become dominant, although too frequent dyke clearance (3-4 years) does not allow this to happen. A longer term management regime could be effective, but dykes should not be allowed to become choked with vegetation. In all cases emergent vegetation encroaching from the dyke banks may have to be controlled. Any material removed from the dykes should be allowed to drain on the bank before being removed from the site to allow evicted larvae and other invertebrates to make their way back to the water.
- **Trees and Hedgerows** - Although trees and hedges are required in the vicinity, the judicious lopping of hanging branches is recommended when most of the dyke is shaded for at least part of the day.
- **Survey work** - This should be conducted as a conservation priority to determine the extent of breeding populations of *A. isosceles*. However, searching for larvae is not recommended due to its status under the Wildlife and Countryside Act except as part of an approved research programme.
- **Monitoring** - Once any management techniques have been carried out, monitoring should be undertaken to ascertain the degree of success and any changes in the populations, either positive or negative, to provide feedback for future management efforts.

Habitat Restoration and Recreation

- **Habitat Restoration or Creation** - This should be considered as an option where possible. Sites should be carefully chosen that will support *S. aloides* and emergent vegetation. In addition efforts should be targeted to provide refuge areas in the event that the Norfolk Broads is flooded through sea level rise. Consequently maps predicting the impact of flooding should be consulted. Reconversion of land from arable back to grazing marsh could be beneficial.
- **Introduction** - The introduction of *S. aloides* to dykes in the vicinity of those already hosting the Norfolk hawkers could well increase the number of colonies. This should only be done in dykes shown to be suitable for the plant, since *S. aloides* is itself a rare species and protected by law. Furthermore *S. aloides* is a 'fussy' plant and experiments carried out by the Broads Authority to reintroduce Water Soldier into a variety of dykes appears to have been relatively unsuccessful (Heath, pers. Comm). Water soldier is a

vigorous competitor, consequently it would not be sensible to introduce it into heathly dyke systems outside its current distribution.

- **Translocation** -This is not appropriate within the Broadland area as the species has good powers of dispersal and is likely to colonise suitable habitats unaided. However, re-introduction of the species to the Cambridgeshire fens may require translocation. In this instance it would probably be necessary to re-establish *S. aloides* in the fens first.

Case Study

Aeshna isosceles Enhancement Projects Since 1986 at Ludham and Potter Heigham Marshes NNR

Since 1986 English Nature have been actively undertaking projects to enhance and create new ditch and dyke systems at Ludham and Potter Heigham Marshes in the Norfolk Broadland. This National Nature Reserve is an internationally important wetland site and the enhancement projects have been driven by the desire to increase the amount of valuable aquatic habitats which are the principle features of the reserve. By undertaking this work the amount of good quality aquatic habitat has been increased benefiting the whole aquatic community and although conservation of the Norfolk Hawker was not the driving force behind the projects it was certainly one of the site managers considerations and desired outcomes.

The project began in 1983 when English Nature purchased the land. Since then more than 1600m of new dyke have been excavated.

- In 1986 560m of dyke were excavated and of this length 360m were colonised by *Stratiotes aloides* within 2 years and subsequently used by Norfolk Hawkers.
- In 1996 a further 550m of new dykes were excavated, of which 200m were colonised by *S aloides* by the following summer. These ditches were also visited by Norfolk Hawkers
- In late 1998, another 560m of new dyke were excavated and again 330m were colonised by *S aloides* by the following summer, with a corresponding increase in use by Norfolk Hawkers.

It appears that it has been difficult to assess how beneficial this scheme has been for the conservation of the Norfolk Hawker as the increase in numbers has been difficult to quantify. However, since 1986, 890m of the newly excavated dykes have been colonised by Water Soldier and all of these have been used by breeding Norfolk Hawkers. These new stretches have increased the suitable breeding habitat by approximately 30% and consequently a significant increase in numbers has been assumed¹³.

Within the best practice guidelines cattle grazing has been used on the site to keep the dyke edges open. In addition maintenance is carried out to the usual prescription of mechanical clearance of one side only on a five year rotation.

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