Species Action Plan

The Swallowtail
Papilio machaon

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The Action Plan was prepared in consultation with the following organisations in the hope that they will participate in the actions outlined: Broads Authority, RSPB (Norfolk), Norfolk Wildlife Trust, Keele University, the University of East Anglia, the National Trust, English Nature, MAFF and the NRA.

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Butterfly Conservation (the British Butterfly Conservation Society) has an overriding objective to ensure a future for butterflies, moths and their habitats. In order to achieve this objective its aims are to:

- raise public awareness of the plight of our butterflies and moths and encourage public involvement in conservation.
- halt the decline of butterflies and moths and maintain or improve the present status of threatened species.
- improve the extent and suitability of key lepidoptera habitats and the environmental quality of the countryside as a whole for all lepidoptera species.
- work with and advise other conservation groups, local bodies and agencies on techniques of land management which favour butterflies and moths and related wildlife.
- acquire and manage habitats for butterflies and moths.
- encourage the research (both at amateur and professional levels) on butterflies and moths.
- support and encourage butterfly and moth conservation world-wide.

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Summary

• The Swallowtail, *Papilio machaon* is listed in the British Red Data Book as vulnerable, and is protected under the Wildlife and Countryside Act 1981. *Papilio machaon britannicus* is a subspecies endemic to Britain.

• The British Swallowtail is a specialised fenland butterfly, inhabiting fens and marshes which support vigorous growth of its sole food, Milk-Parsley, *Peucedanum palustre*. Over the last 10-20 years, conservation management in its only surviving localities in the Norfolk Broads has increased the breeding habitat for this species. As a result the Swallowtail now appears to be under no immediate threat, and a medium priority has been assigned to the implementation of this plan.

• The major threats to the butterfly in the UK are the drying out of fens either by natural processes, such as peat formation, or as a result of human activities (e.g. water abstraction) with resultant invasion by woody plants reducing the areas of open fen vegetation - the maintenance of a stable market for Sedge and Reed is thus important as are the financial resources for conservation management work. The generally higher water tables in fen habitat during autumn/winter for prolonged periods (due to the rise in sea level and lack of flood control) and increased salinity of the Broads are also threats to the Swallowtail in the UK.

• The major objectives of this plan are to maintain existing colonies of the Swallowtail; enhance existing habitat and increase the butterfly's range within historical boundaries.

• The broad objectives of the plan will be achieved by promoting appropriate management that will restore and maintain open fen habitat. This should allow the species to spread and increase naturally within the Norfolk Broads. The range of the Swallowtail in the UK will be extended outside the Broads by conducting strategic re-introductions into restored habitats if suitable locations can be identified. Further research on the Swallowtail and its requirements will be supported including research into habitat management techniques, the ecology and distribution of its parasitoids and simple and definitive procedures for monitoring the butterfly. The Action Plan, the recent success in the conservation of the Swallowtail and measures needed build on this success will be publicised.

• The Action Plan embodies the idea that all actions within it should be compatible with management of fen habitat as a whole, supporting such documents as the Broads Plan, and the Broads Fen Management Strategy.

• The Action Plan covers the next ten years, will be monitored annually and reviewed in the year 2000 or as the situation demands.

Part 1 Overview

1.1 PRIORITY STATEMENT

The Swallowtail, *Papilio machaon* is listed as Vulnerable in the British Red Data Book of Insects (Shirt 1987). The subspecies *Papilio machaon britannicus* is endemic to Britain. Over the last 10-20 years conservation management in the Broads has increased breeding habitat for this species. In consequence the butterfly appears to holding its own and increasing in several areas. As a result the Swallowtail is under no immediate threat and **medium** priority should be afforded to conservation action to maintain and increase the number of colonies of this unique and rare butterfly in the UK.

1.2 BROAD OBJECTIVES

1. To maintain existing colonies and enhance existing habitat.

2. To increase the range of the Swallowtail within historical boundaries.

3. To integrate management for the Swallowtail within the Broads Plan, Broads Fen Management Strategy and other such strategic conservation plans.

1.3 LEGAL STATUS

This species is listed on Schedule 5 of the Wildlife and Countryside Act, 1981. Implications of this legislation in the UK are given in Appendix 1.

Table 1 The Status and Level of Biological Knowledge

Population	**-size**	**Possibly one large meta? population covering the Broads area, plus re-establishment attempt at Wicken Fen. Population on private land in Suffolk.**
	-trend, numbers	**Not well known, probably increasing in recent years.**
	-trend, range	**Tending to increase as habitat is extended by conservation effort.**
Knowledge of	**-status**	**Fair.**
	-trends	**Population at Woodbastick Fen has been monitored for 20 years. Information on other sites is patchy.**
	-conservation requirements	**Fairly well known.**

Part 2 Biological Assessment

2.1 INTRODUCTION

The species *Papilio machaon* is divided into several recognisable subspecies. The resident British Swallowtail is a separate sub-species *Papilio machaon britannicus*. It has undergone a dramatic decline during the last century, and is confined to the few surviving remnants of once extensive areas of undrained fens and marshes. In contrast to its continental conspecifics, which exploit a variety of habitat types and a diverse array of larval food plants (Wiklund, 1974b), *P. machaon britannicus* is a specialised fenland butterfly (Dempster, 1995). It inhabits fens and marshes which support vigorous growth of its sole food plant, Milk-Parsley *Peucedanum palustre*, itself a rare and locally distributed species.

2.2 ECOLOGY

In Britain, *P. machaon britannicus* occurs in the fens and marshes around the Norfolk Broads, mainly in the Bure, Ant and Thurne valleys and the Mid-Yare. The adult butterfly is on the wing from late May to mid-July and the females lay most of their eggs on large-sized flowering plants which project above the surrounding vegetation (Dempster *et al*., 1976). Eggs are spherical, conspicuous and pale straw-coloured at first, but as they develop they darken through brown and plum-coloured to black. They hatch in about two weeks to produce a larva which is black with a broad white band across the middle. At this stage, it looks very much like a bird's dropping. After the second moult, the larvae completely change their appearance, to become bright green, with black and orange rings. When disturbed, the larvae erect a bright orange osmaterium from behind the head, which emits a pungent smell, usually described as resembling that of pineapples. As they develop, the larvae tend to move to the top of the plant and feed on the developing flower heads. They have five larval instars, and by late July they are fully grown and leave their food plant to pupate, low down on the vegetation. Most pupae go through the winter and emerge as adults in the following May, but in some years a few may produce a partial second generation of adults in August These produce eggs and caterpillars in August and September, but it is doubtful whether many develop successfully before the onset of winter. Pupal diapause is determined by day length during the larval period, so there tends to be a larger second generation in early years.

Adult males are usually the first to appear and they are often seen patrolling round a prominent feature such as a bush or tree in the Reed and Sedge beds in which they occur. Pairing takes place early in the day on which the female has emerged and the two may remain together for several hours. The females then skim low over the vegetation in search of oviposition sites. Both sexes show a preference for feeding on pink or mauve flowers; Ragged-Robin (*Lychnis flos-cuculi*), Meadow Thistle (*Cirsium dissectum*) and Marsh Thistle (*Cirsium palustre*) being particularly favoured nectar sources. The

butterflies sometimes congregate on more open ground at the edge of the fens where these plants are more plentiful (Emmet and Heath, 1990).

The fen habitat suitable for *P. machaon britannicus* is a transitory one and not a climax vegetation. As the natural succession from open water continues the accretion of material gradually creates drier and drier conditions in which woody species such as Willows (*Salix* sp.), Alder (*Alnus glutinosa*) and other wetland shrubs can become established, accelerating the drying out process. This eventually leads to suitable conditions for larger trees such as Oaks (*Quercus* sps) to take root and as these outlive other species they come to dominate. Thus open water, given time, will eventually turn to forest. The continued existence of *P. machaon britannicus* in its fenland habitats is thus dependent on appropriate management of fen areas. In addition nectar sources may also be important as they help to concentrate the adults for mating.

A study of the butterfly in Norfolk over 4 years (Dempster *et al.*, 1976) showed that egg mortality is generally low, and mainly due to infertility. However, survival of the young larvae was always poor, with mortalities of between 30 and 80%. This was due mainly to predation by arthropods, particularly spiders. Birds especially the Reed *Bunting (Emberiza schoenicius*) replaced arthropods as the main predators of large larvae. The late instar larvae frequently run out of food on one plant, and have to move to another to complete their development. In most breeding habitats, other Milk-Parsley plants can be found within a few metres, so this does not pose a problem. Pupal numbers were always low and they were difficult to find among dense vegetation, so that little is known about their mortality rates. Predation in the pupal stage appears to be mainly from small mammals. While in diapause, pupae can survive submersion under water for long periods but once they have started developing in spring, flooding may cause high mortalities, as may frost (Emmet and Heath, 1990).

In Britain, *P. machaon britannicus* is parasitised by a specific ichneumonid parasitoid, *Trogus lapidator*. *T. lapidator* is represented in N. Europe (including Britain) by a rather distinctively coloured (=paler wings than the typical subspecies *lapidator* from S.Europe) subspecies *panzeri* (=*coerulator* auctt.). The parasitoid is entirely restricted to the Swallowtail in Britain and is itself a very rare species in Britain and in need of conservation (Shaw, 1978). Specimens of *T. lapidator* have been collected from Norfolk including Barton Turf and Horsey Mere. It used to be very common at Wicken Fen (where it must now necessarily be extinct). The parasitoid hatches as an adult from the host pupa, but it actually oviposits into the host as a larva (probably it can do this earlier than the final instar, but it is not directly known). This means that the presence of the parasitoid can be ascertained by collecting the host as a late stage larva.

Dempster *et al.* (1976) made a study of museum Swallowtail adult specimens taken between 1880 and 1940 at Wicken Fen and on the Norfolk Broads and found that those from Wicken had developed a longer wing relative to body size and a narrower thorax relative to body length than those from Norfolk. They concluded that natural selection had resulted in the establishment of a race at Wicken with reduced mobility, suited to the

restricted habitat following its isolation. The same authors have found that the Norfolk populations now consist of smaller-winged individuals than occurred in 1920, an adaptation coincident with the fragmentation of the Norfolk habitat (Dempster *et al*, 1976, Dempster 1991).

2.3 DISTRIBUTION AND POPULATION

The Swallowtail is a widespread butterfly, found throughout the Holarctic, including Europe, temperate Asia to Japan, and in North America (Dempster 1995). The subspecies *britannicus* is now confined to the fens around the Norfolk Broads. The strongest populations are situated in the Ant, Thurne and Bure valleys and the Mid Yare. Many of these are on nature reserves or SSSIs and appear to be secure.

Although *P.m. britannicus* is now confined to the fens around the Norfolk Broads (see figure 1), it formerly occurred throughout the extensive East Anglian fens south of the Wash, and it probably also occurred in the marshes around the rivers Thames and Lea; in the Somerset Levels; and possibly as far north as Beverley in Yorkshire (Heath *et al*., 1984). The past distribution of *britannicus* is made more difficult to unravel, because the European subspecies, *gorganus*, is a regular immigrant to southern England, and early records of *P.machaon* failed to distinguish between the two forms. In the past, *P.m. gorganus* appears to have been resident on the downs in the southern counties of England, during periods with exceptionally warm summers. Thomas and Lewington (1991) list three such periods as 1857-69 near Deal (Kent), 1918-26 near Hythe and during the mid-1940s in Kent, Dorset and South Hampshire, but suggest that odd individual sightings are made in perhaps 1 in 3 years. Most larvae have been found on Carrot (*Daucus carota*), Rue (*Ruta* graveolus) or Fennel (*Foeniculum vulgare*).

The distribution of the British subspecies depends on that of Milk-Parsley, its exclusive food plant; this is nationally scarce and locally distributed in Britain, though it may be found in abundance in the areas of mixed herbaceous vegetation around the Norfolk Broads. This area was dug over extensively with shallow excavations for peat during mediaeval times. These diggings led to the formation of turf pools and helped maintain moist conditions and open fen vegetation. The situation was also helped by the crops produced in these areas: “Marsh Hay”, a mixture of plants that was cut annually as fodder and bedding for livestock; and the Common Reed (*Phragmites australis*) and Saw-Sedge (*Cladium mariscus*) for the roofing of buildings. Reed would be cut traditionally every other year, and Sedge every three or four years, with areas being carefully managed to maintain a dominance of each type of crop. This regular cutting and removal of material (assisted by a little tinkering with water levels to hold water on and off the crops at the appropriate times of the year) prevented the build up of vegetation and consequent drying out of the habitat. These regularly mown areas were far from a monoculture such as we see in a modern cornfield. Many other plants would flourish amongst the crop species,

particularly in mowing fens and sedge beds, with a plentiful flowering of nectar and an abundance of Milk Parsley (West, 1993).

The regular mowing of hundreds of hectares of fen vegetation, the removal of crops by boat, and the maintenance of the dyke system, would have kept large numbers of men employed. However, many of those who left to fight in the First World War never returned, and because of this, and a decline in the demand for some crops, particularly Marsh Hay (there were over 13000 horse cab-drivers in London in 1900, but only 700 by 1918), the number of men working on the fens never regained its former level. As a result, large areas of fenland became subject, often for the first time for many centuries, to the effects of unchecked succession, and in consequence began to be invaded by Sallows (Salix sp.) and other woody species. Nevertheless, a few landowners continued to manage their fens in the customary way. Many of those still working on the fens left at the outbreak of the Second World War, and most mown areas were abandoned, at least temporarily. There has however been a strong and continuing demand from thatchers for Reed and Saw-sedge since the War, and these crops continue to be harvested in many places. The Swallowtail no doubt occurred throughout fenland until many parts were converted to intensive agriculture, or became subject to vegetational succession.

The Swallowtail persisted at Wicken Fen Nature Reserve, Cambridgeshire until the early 1950s. Its collapse at Wicken was rapid and is thought to have been caused by a reduction in the area of suitable habitat and the partial drying out of the fen (Dempster & Hall, 1980, Dempster 1995). Over many years the traditional harvesting of the Sedge crop declined and as a result the neglected areas were invaded by carr woodland. Then in World War 2 the adjacent Burwell Fen was taken into cultivation and ceased to be fen habitat. The draining of the surrounding land for agriculture resulted in the lowering of the water table and shrinkage of the soil, matters being made worse by wind erosion. In consequence, Wicken Fen now stands as an island of ground significantly higher than the arable land surrounding it. This has made it increasingly difficult to maintain the water level in the fen itself. The more restricted and drier habitat has resulted in a reduction of the quantity and impairment of the quality of the essential Milk-Parsley. However, conservation measures have recently improved the quality of the fen habitat and an attempt has been made to re-establish the species (see below).

2.4 LIMITING FACTORS

Historical

Past decline caused by the drainage and agricultural improvement of the fens.

Drying out of remaining fen with resultant invasion by woody plants reducing the area of open fen vegetation.

Decline in the Reed and Saw-sedge markets.

Current and Possible Future Limiting Factors

Continual agricultural improvement of the fens.

Habitats throughout the range of the butterfly are becoming drier, either by natural processes, such as peat formation, or as a result of human activities: maintenance of a high water level is asserted to sustain sufficient quality and quantity of the food plant.

Practical management of the sites in Norfolk. Lack of knowledge about certain aspects of the Swallowtail's ecology is a limitation to designing management, together with practical "know how" to implement appropriate management.

Excess nitrates and phosphates in surface and ground water may cause deterioration of fen vegetation, but the problem may be decreasing.

Maintenance of stable markets for Sedge and Reed.

Lack of resources to extend habitat and manage "Marsh Hay" in traditional fashion.

Area of potential fen habitat is ultimate limiting factor.

Tidal influence and flooding regimes.

2.5 RESUME OF CONSERVATION TO DATE

Ecological Studies

Much of the early ecological studies on the Swallowtail were carried out by Dr Jack Dempster and co-workers. (Dempster *et al.*, 1976; Dempster & Hall, 1980). They concluded that the butterfly's status depended largely on the performance of its food plant and that this, in turn, depended on the wetness of the fen habitats that they inhabit. Over the last 15 years little further research has been carried out on the detailed ecology of the British Swallowtail. Conservation work has instead concentrated on habitat restoration and monitoring, and attempts at establishment of the butterfly at Wicken Fen.

The Broads

Currently over half of the Broadland Fen is mature willow scrub. This amounts to 3,000 hectares within a total 5,300 hectares of fen vegetation. The spread of willow scrub has led to the loss and fragmentation of the Swallowtail's habitat and has been occurring during the past 100 years over much of the Norfolk Broads (Ellis, 1965) with the process

accelerating alarmingly over the past fifty years. The Swallowtail reached an all time low in the 1970s despite dedicated management work by various conservation bodies to maintain the suitability of their reserves for this insect. Funds were always desperately short and manpower limited in what was, and always will be a very labour intensive job. The demand for Reed and Sedge had slowed to a trickle, and with the consequent decline in commercial cropping an even greater burden fell upon conservationists to keep the fens cut and managed.

It was finally accepted by the Local Authorities, commercial interests, the navigation authority, and conservation bodies that drastic action was needed if the area was not to reach the stage where its decline would be irreversible. The result after much discussion was the formation of a new body "The Broads Authority" in 1978, whose work eventually led to the whole area achieving the same status as a National Park, with the resultant flow of additional funds from central government to conserve the area. Increased funding of conservation organisations, an adult work experience scheme and mechanisation of management regimes have all helped to address the many Broadland problems head on.

Most recently, a Broads Plan was produced by the Broads Authority in 1993. It is an attempt to address the differing demands on the Broads and was produced as the result of many hours of discussion by people with specialist knowledge and specialist interest in the Broads. This is not only concerned with conserving and enhancing the natural beauty of the Broads but also in controlling its development so that patterns of commercial use do not diminish its quality.

The Broads Authority, working in partnership with English Nature, is committed not only to halting the decline of open fens but to restoring all the open fen which has been recently lost to scrub. As well as considerable resources being channelled into fen management, the Broads Authority and English Nature has embarked on the preparation of a fen management strategy. This is a co-ordinated approach involving land owners and managers to put into practice a long-term management plan for the whole of the fens. The first stage was to set up a three-year botanical survey to analyse and map the fen resource, and to collate historical records and management. This information together with results from management trials and information on the distribution of birds, invertebrates and mammals is intended to provide a database to help define conservation priorities. In addition much of the Broads has been designated as an Environmentally Sensitive Area, which is a cornerstone in maintaining and enhancing the distinctive Broads grazing marsh landscapes through grants and incentives to landowners.

On many sites in Norfolk (e.g. the Bure Marshes NNR, Norfolk Wildlife Trust reserves, Strumpshaw Fen owned by the RSPB and Reedham Marshes in the Ant Valley owned by the Broads Authority), areas of scrub have been cleared and the area of open fen vegetation has been increased by regular cutting. In consequence the Swallowtail appears to be have increased substantially in several areas. The main evidence for this comes from the Bure Marshes, the one site covered by the Butterfly Monitoring Scheme (Pollard & Yates, 1994) and the periodic recording of adults and larvae that occurs on many of the

owned and managed reserves throughout the Broads. It would appear that wherever open fenland is restored the Swallowtail is able to move and breed there [C.Doarks (English Nature), M. Shardlow, (RSPB) *pers.comm.*]. Many of the areas where the Swallowtail occurs are already protected (e.g. by SSSI designation and management agreements). A research programme on the genetic variation of the Swallowtail in the Broads is also being planned by Andrew Pullin at Keele University. Following discussion whilst formulating this Action Plan, efforts are also being made to standardise and co-ordinate the recording and monitoring of the Swallowtail (see Actions 13-15).

Wicken Fen

There have been repeated attempts to re-establish the Swallowtail at Wicken Fen (owned by the National Trust), all of which have failed. These include an attempt that was made in 1975 (Dempster and Hall, 1980). Initially the butterfly's numbers increased, but an exceptional drought in 1976 led to a crash in numbers, from which the population failed to recover, and the butterfly went extinct again in 1979. The precise effects of the 1976 drought on the butterfly are not known. Large numbers of adults were recorded in that year but they laid very few eggs. Many females must have died without laying, which suggests that either they failed to mate or that their food supply was reduced by the hot, dry conditions. Both of these possibilities are feasible, since difficulties can be experienced in pairing Swallowtails in dry conditions in a glasshouse (Dempster and Hall, 1980), and it is known that nectar can become too viscous to allow insects to feed in very dry weather (Dempster 1995).

At the time of the last reintroduction attempt, the area of suitable habitat on the fen had been enlarged to about 24ha, by clearing the carr and by repeated cutting. The distribution of the Milk-Parsley was by then very patchy and the plants tended to be smaller and shorter-lived than those on the Broads. Since 1971, the numbers of established Milk-Parsley plants at Wicken have been monitored during the autumn of most years. Between 1971 and the mid-1980s, there was a consistent decline in the numbers on the fen with its distribution becoming more and more clumped. In addition the plant declined most on the higher, drier end of the fen (Dempster, 1995).

Between 1988 and 1990, considerable effort was made by the National Trust to construct and waterproof the banks that surround Wicken Fen, and as a result the reserve is now far wetter, in spite of the series of very dry years that have occurred since then. This has had an immediate and dramatic effect on the Milk-Parsley population, so that the decline that had taken place over the previous 18 years has been totally reversed (Dempster 1995). As a result another attempt at re-establishing the Swallowtail at Wicken was made in 1994, with the support of Butterfly Conservation and English Nature.

Currently genetic research is being carried out to test the theory that the Swallowtail exists as one large population or metapopulation in the Broads. This is being done by measuring the relatedness of individuals within and among sites (J.Cameron & A.S. Pullin, Keele University).

Parasitoid Studies

Monitoring for the specific parasitoid *T. lapidator* is made very difficult by the legislation protecting the Swallowtail from being collected even in its earlier stages. However since *T lapidator* may not be the only parasitoid of the Swallowtail, and so little is known about its distribution and elementary ecology (e.g. exactly at which larval stage the eggs are deposited), removal of *P. machaon britannicus* larvae by local licensees should be encouraged. The licensees could rear the larvae to adult stage and release the adults but retain any parasitoid adults for identification. Once enough parasitoid adults had been seen to be sure that they were the same species, monitoring could revert to a basis of releasing all live stock (i.e. parasitoids too, retaining only pupal cases from which they emerged). As *T. lapidator* may not be the only parasitoid, young as well as older larvae should be collected. Provided the instar was noted for each larva, this would eventually provide data on the host instars selected for oviposition by *T. lapidator*). Dr Mark Shaw of the National Museums of Scotland has agreed to help with parasitoid identification and advice.

Part 3 Actions and Work Programme **Organisation(s) primarily responsible**

This section has been divided into the standard headings Policy and Legislative; Site Safeguard and Acquisition; Land Management; Species Protection and Licensing; Advisory; International; Future Research and Monitoring; Communications and Publicity; Review. Actions are given a low, medium or high priority. The lead organisation(s) concerned for each action is/are named.

3.1 POLICY AND LEGISLATIVE

Action 1 PRIORITY: HIGH

Promote beneficial land management on existing habitats and potential habitats (e.g. by including appropriate prescriptions on nature reserves and in ESAs). **MAFF, BA, NRA**

3.2 SITE SAFEGUARD AND ACQUISITION

Action 2 PRIORITY: LOW

Safeguard all suitable Swallowtail habitats and re-establishment sites by e.g. SSSI designation, management agreements as appropriate. **EN, BA**

Action 3 PRIORITY: HIGH

Continue to support the policies in the Broads Plan. **All**

3.3 LAND MANAGEMENT

Action 4 PRIORITY: HIGH

Continue appropriate management of existing open fen and extend this habitat by clearance of willow scrub, maintaining high water tables and reducing fluctuation in water levels (where possible) under the control of land managers etc. **All**

Action 5 PRIORITY: MEDIUM

Encourage the restoration of suitable breeding habitats within former range.	**BC, BA**

Action 6 PRIORITY: HIGH

Integrate management for the Swallowtail with that for fen habitat as a whole.	**EN, BA**

3.4 SPECIES MANAGEMENT AND PROTECTION

Action 7 PRIORITY: MEDIUM

Conduct strategic reintroductions into suitably restored habitats (NB outside Broads only). Within the Broads, the Swallowtail should be allowed to expand naturally.	**BC, EN**

Action 8 PRIORITY: LOW

Enforce legislation to prevent collection of the Swallowtail.	**EN**

Action 9 PRIORITY: LOW

Arrange appropriate wardening at all existing and future reintroduction sites to prevent illegal collecting or accidental disturbance and to help with monitoring.	**All**

3.5 ADVISORY

Action 10 PRIORITY: MEDIUM

Continue to advise and liaise with site owners/managers on practical habitat management for the Swallowtail and the fenland habitat.	**BA, EN (BC)**

3.6 INTERNATIONAL

No actions proposed.

3.7 FUTURE RESEARCH, SURVEY AND MONITORING

Action 11 PRIORITY: MEDIUM

Improve information on the requirements of the Swallowtail and appropriate habitat management techniques.	**BC, EN**

Action 12 PRIORITY: MEDIUM

Monitor three sites on the Broads for larval counts, including parasitoid investigations (See Action 16 also).	**BC, EN, RSPB, BA, UEA**

Action 13 PRIORITY: MEDIUM

Monitor and co-ordinate recording of the Swallowtail on the Broads.	**BC**

Action 14 PRIORITY: HIGH

Devise and publicise simple and definitive procedures for monitoring the Swallowtail.	**UEA, BC**

Action 15 PRIORITY: HIGH

Survey for the specific parasitoid and investigate the feasibility of re-establishment if it has become extinct locally.	**BC, UEA**

Action 16 PRIORITY: MEDIUM

Investigate the extent of interchange of individuals between the Norfolk populations and the effects of habitat loss and isolation of colonies on genetic variation and population viability.	**BC, EN, KU**

Action 17 PRIORITY: LOW

Identify potentially suitable, unoccupied habitat and evaluate their suitability for re-establishing viable populations of the Swallowtail.	**BC**

3.8 COMMUNICATIONS AND PUBLICITY

Action 18 PRIORITY: HIGH

Publicise this Action Plan, the recent success in the conservation of the Swallowtail and measures needed to continue to improve the butterfly's UK status.	**All**

3.9 REVIEW

Action 19 PRIORITY: MEDIUM

Monitor the Action Plan annually and review in 5 years.	**BC and All**

Key to abbreviations
All - All organisations below
BA - Broads Authority
BC - Butterfly Conservation
EN - English Nature
ESA - Environmentally Sensitive Area
KU - Keele University
MAFF - Ministry of Agriculture, Fisheries and Food
NT - National Trust
NRA - National Rivers Authority
RSPB - Royal Society for the Protection of Birds
UEA - University of East Anglia
WTs - Wildlife Trusts

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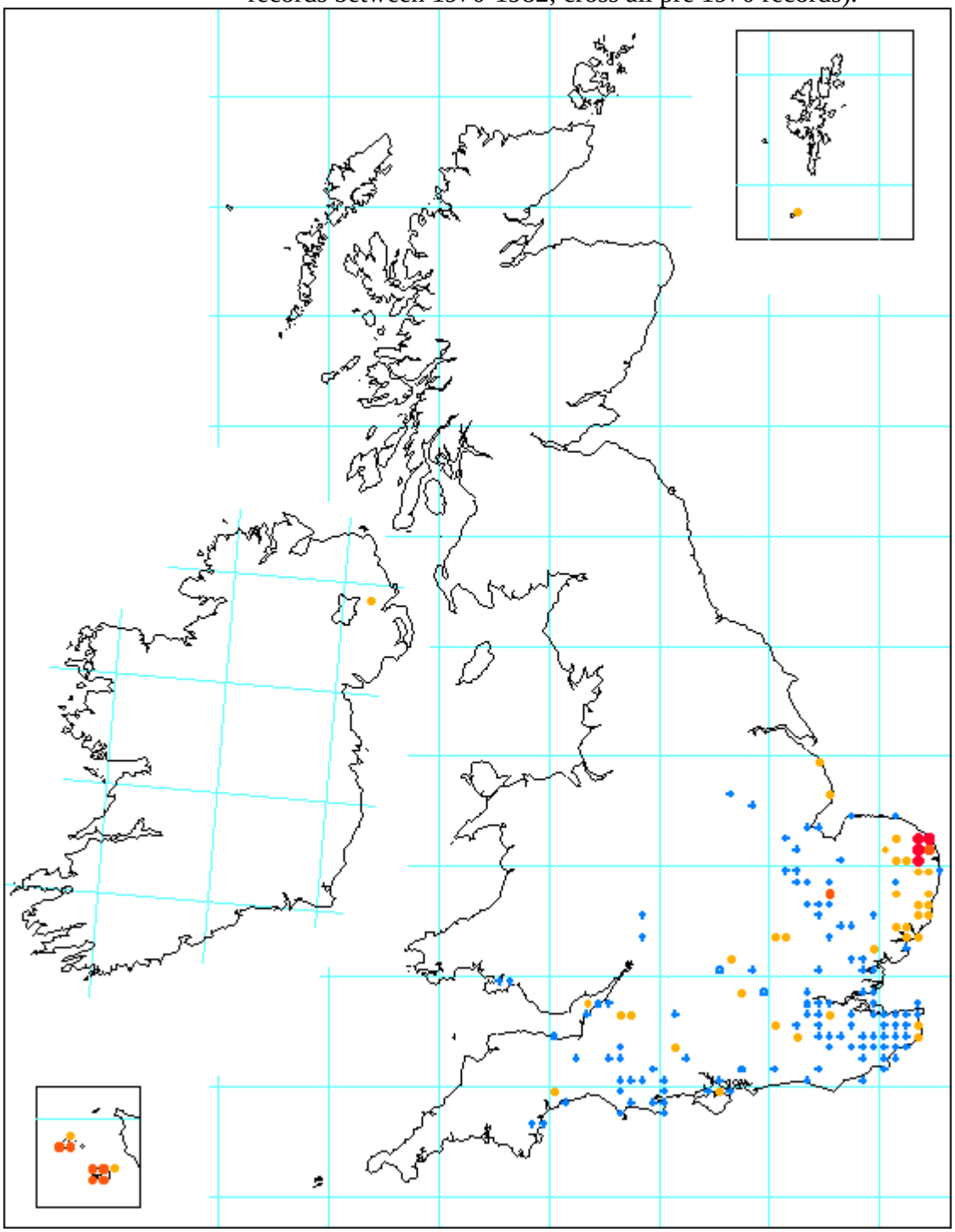
Appendix 1 **The Current Distribution of the Swallowtail in the UK.**

Butterflies for the New Millennium project (2001). Copyright of Butterfly Conservation/Biological Records Centre.
(Dark full spot all records from 1995-1999; pale circles are single sightings of the migrant *P. machaon gorganus*; open circles all records between 1970-1982; cross all pre 1970 records).



Appendix 2

Implications of the Wildlife and Countryside Act 1981 in the UK

The Wildlife and Countryside Act 1981 gives limited protection to the Swallowtail butterfly.

Under this Act it is a criminal offence if any person:

- intentionally kills, injures or takes a specimen from the wild (this, in effect prohibits collecting for any purpose).
- has in their possession or control any live or dead wild specimen or any part of or anything derived from such specimen.
- sells, offers or exposes for sale, or has their possession or transports for the purpose of sale, any live or dead specimen (the object is to prevent trading).

Ova, larva and pupa as well as mature insects are covered by the Act. It is presumed in law that the specimen in question comes from the wild, unless the contrary is shown.

Licences

English Nature may grant a licence for collecting or possession which otherwise would be an offence. Licences may only be granted for certain purposes relating to scientific research, education, conservation or introductions to particular areas.