British Trust for Ornithology

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A Review of Wildfowling on the Stour Estuary

Authors

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Executive Summary

1. This report reviews the data on waterbirds, wildfowling and other human influences on the Stour Estuary, before creating a decision-making system for reviewing wildfowling consents. The Stour information is then passed through this decision-making system to assess whether there is a need to modify the wildfowling consents on the Stour. Recommendations are made with regard to future data collection and research to aid the process.

2. WeBS Core Count and Low Tide Count data sets were analysed for each species to identify population changes and the current distribution within the Stour. Twenty-two species occur on the Stour with an average winter population of over 50. Of these, nine have declined during the last five-, 10-, 25- or all-years that there have been standard counts on the Stour.

3. The local wildfowling clubs through BASC provided wildfowling data. Data on the numbers shot is only available consistently for the last five years during which time there has been no obvious trend in the numbers shot. At a longer time scale there is anecdotal evidence which suggests that wildfowling is either stable or decreasing on the Stour.

4. A number of studies of disturbance have been undertaken on the Stour . None of these has been carried out over a sufficient timescale to detect trends, however all consider wildfowling to be at a lower level (in terms of events) than many other potentially disturbing activities.

5. A decision-making system has been produced to review the wildfowling consents on SPAs. This system follows different pathways depending on the change in wildfowling on the site and the alerts status of each species.

6. The review of wildfowling on the Stour found no evidence that the favourable conservation status of any species was being affected at present levels of wildfowling.

7. There is a need for better data on the level of wildfowling and other types of disturbance to be collected and a need to match the WeBS count units and the wildfowling units. It would also be valuable to analyse the data from the review process for all UK estuaries to shed more light on the effect of wildfowling on bird distribution and numbers.

1. INTRODUCTION

The aims of this report are:

- To investigate the current role of wildfowling in the distribution and population levels of waterbirds on the Stour Estuary.

- To assess whether under the current levels of wildfowling and refuge provision there is any evidence that the populations of waterbirds on the Stour are not being maintained in a sustainable manner.

- To use the findings from this study to produce a decision-making system for the evaluation of wildfowling and refuges on the maintenance of a favourable conservation status of SPAs.

1.1 The Stour Estuary

The Stour Estuary (Figure 1.1) is a coastal plain estuary, the channel of which forms the easternmost 20 km or so of the Suffolk-Essex border before it joins with the Orwell Estuary at Harwich Harbour, discharging to the sea between Harwich and Felixstowe. The Stour is a moderately large estuary, with an area of 2,531 ha which includes 1,340 ha of sandflats and mudflats and 297 ha of saltmarsh. The estuary is unusually regular in shape, being essentially straight but with slightly indented banks forming six principal shallow bays: Seafield, Holbrook and Erwarton on the north bank and Jacques, Copperas and Bathside on the south bank. For the purposes of this report, Copperas Bay is usefully split into two halves; the eastern half referred to as Deep Fleet and the western half as West Copperas Bay. Additionally, Bathside Bay is being gradually infilled as development takes place here and it will eventually disappear completely. At the top end of the estuary, the intertidal flats end at the road bridge of the A137, although there are grazing marshes alongside the river for a few km further upstream.

The intertidal flats are mostly muddy but are sandier towards Harwich. Water quality in the estuary is currently classified as good. The estuary is extremely rich in invertebrates and there are extensive growths of *Enteromorpha* in Erwarton and Holbrook Bays, although almost all of the *Zostera* once present has now been lost. The land around the estuary rises sharply and there is thus little room for saltmarsh development except for a narrow fringe of which over 25% is formed of *Spartina*. Notably, Copperas Wood is the only example in Essex of a natural transition from saltmarsh through to woodland.

The Stour Estuary is protected by a number of different conservation designations. The Stour and Orwell Estuaries jointly constitute a Special Protection Area (SPA) and Ramsar Site. The Stour Estuary itself lies within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty and forms part of the Suffolk River Valleys Environmentally Sensitive Area. Most of the estuary lies within the Stour Estuary Site of Special Scientific Interest and it is also a Nature Conservation Review Site and contains two Geological Conservation Review Sites. There are reserves of the Royal Society for the Protection of Birds (RSPB), Essex Wildlife Trust and Woodland Trust and part of Cattawade is National Trust land. There is also a Local Nature Reserve at Wrabness.

Although birds are of special conservation interest at the Stour Estuary (and are discussed in more detail in Section 2), there are also 20 nationally scarce plants present including Marsh Mallow *Althaea officinalis* at its only Essex site. Rare invertebrates include the RDB3 fly *Haematopota grandis* and a pRDB spider, plus 12 Notable species.

Although much of the land surrounding the Stour Estuary is rural in character, over 17,000 people live in towns that reach to within 1 km of the estuary. The anthropological influences on the site are many and varied and are discussed in more detail in Section 4 with the exception of wildfowling which is discussed in Section 3 (Buck 1997).

1.2 Wildfowling

Wildfowling is defined as "the pursuit of legally taken ducks and geese below the high-water mark with shotguns" (Kear 1990). The taking of wildfowl for food has been a human activity since before records began but from about the 19th Century onwards, wildfowling in the UK can be considered increasingly as a sport. One of the changes in the fashions of wildfowling has been the decline in punt-gunning. This involves shooting from low–lying boat out amongst the wildfowl. The stealth of the approach is paramount and when a shot is finally fired it can result in many birds being killed at once. Punt-gunning declined in the period up to the Second World War, with just five professional punt-gunners alive just before the war. The level at which punt-gunning continues today is very low. Most wildfowling in the UK these days involves the shooting of flying waterfowl at dawn or dusk.

The effect that wildfowling has on waterbird populations is unclear. This is partly due to the difficulty of acquiring accurate bag statistics but also because most of the quarry species are long-distance migrants. Since such birds spend different parts of the year in different parts of their flyways, the precise reasons for any changes in populations can be extremely difficult to determine. There are two principal ways in which wildfowling could potentially influence waterbird populations on a site, those being mortality and disturbance.

The British Association for Shooting and Conservation (BASC) estimated in 1980 that 874,000 wildfowl were shot in the UK annually by wildfowlers (Harradine 1985). Additionally, the number of birds killed does not account for birds hit and wounded but not immediately killed and retrieved. Data from North America suggests that these birds could account for an additional 25-30%. Of the birds shot by BASC members, 60% were Mallard, 20% were Teal and 14% were Wigeon, although it should be acknowledged that a large proportion of the Mallard which are taken are reared and released deliberately for shooting purposes.

Wildfowling is also a potential source of disturbance on wetlands during the autumn and winter. There are two aspects to the problem of the impact of disturbance. Firstly, does the disturbance affect the behaviour and/or distribution of a species? Secondly, does any such change have any impact on the mortality or reproductive success of the species and do such changes result in a decline in the population size (Gill & Sutherland 2000, Gill *et al.* in press). Most research investigating the effects of wildfowling has been concerned with the quarry species, principally geese and dabbling ducks, and comparatively little is known about effects on diving ducks, waders or other waterbirds. Hunting disturbance can cause temporary disruption of normal activities, alter birds' diurnal rhythms and increase escape flight distances (*i.e.* the distance at which the presence of a disturbing factor causes the birds to take flight). Disturbance can displace waterbirds from preferred feeding and roosting habitats and

increase turnover so that the carrying capacity of a site may not be reached. However, the consequences of any of these changes for population size have never been investigated. Hunting disturbance can also disrupt pair-bonds and family structures and it has been speculated that this may also affect reproductive output (Madsen & Fox 1995).

Madsen (1998a) investigated the disturbance effects of a number of different recreational activities and found that hunting (especially from mobile punts) caused the longest disruptions to the activities of waterbirds. In terms of behaviour and redistribution, Wigeon were more affected by shooting than Mute Swan or Coot. One or two mobile shooting punts reduced Wigeon numbers whereas numbers were unaffected by the presence of up to six stationary punts. Fishing boats had no effect on Wigeon abundance. Hunting, especially shooting from mobile punts, was identified as the most disturbing human activity in relation to staging waterbirds. It should be noted, however, that Danish punt-gunning differs from that practised in the UK and thus care should be taken in extrapolating the results of the Danish studies to the UK. For example, in Denmark, several wildfowlers shoot with 12-bore shot-guns from a boat, whereas in the UK, there is usually a single wildfowler in the boat with a large-bore gun.

The creation of refuges for migratory waterbirds can increase the number of birds making use of a site (Madsen 1998b). However, many studies have not been able to show that an increase has been caused by reduced disturbance and not by habitat improvement or a general increase in the overall population. In addition it is not clear whether these increases are simply due to the redistribution of birds between sites. Madsen (1998b) described the results of an experiment in which refuges and non-refuges were switched between years and showed that quarry geese and ducks redistributed according to the refuge areas but protected species did not. Additionally, some of the dabbling ducks extended their staging period into the winter and the species-richness also increased after the refuge was created. The increases could not be explained by other factors such as food-supply. The study concluded that waterbird hunting causes a displacement of quarry species and that refuge creation can be an efficient management tool to improve the conservation value and biodiversity of wetlands of importance to waterbirds. It is probably worth noting that the location of this study, on the migration route of many of these species, means that there was the potential to increase numbers of bird-days on the site, by increasing the length of the stopover period, in a way which may not be possible for sites nearer the end of a migration route. Additionally, prior to Madsen's studies, there was no significant refuge system in place in Denmark, whereas the UK has had a much better developed network of refuges for a longer period.

Another potential hazard to wildfowl from wildfowling activities has been the amount of lead shot left in the environment by shooters. Lead pellets are ingested by wildfowl along with the grit they require to help them digest their food. Lead ingestion leads to poisoning which can result in death. There may well be sub-lethal effects of lead poisoning also which are less clear (*e.g.* breeding performance could be reduced). Much of the lead in the environment used to be associated with discarded lead weights from angling. It is now illegal to supply lead angling weights and tungsten and steel alternatives are used instead.

Wildfowlers have continued to require lead shot for a longer period than anglers whilst alternatives have been developed using bismuth. Research by The Wildfowl and Wetlands Trust (WWT), Royal Society for the Protection of Birds (RSPB) and BASC found up to 300,000 pellets per hectare, with this lead remaining on the ground (Mudge 1984). However, as of 1st September 1999, it was made illegal to shoot using lead shot on SSSIs and illegal to

use lead shot anywhere against wildfowl. Lead is therefore no longer an issue in terms of wildfowling consents.

Many wildfowlers are actively involved in conservation measures. These include habitat management, wardening against poaching and the setting of bag limits. In many respects, the aims of wildfowlers and conservationists are similar; both have a desire to see sustainable populations of birds over the long term.

2. WATERBIRDS ON THE STOUR ESTUARY

In this section the methodology for assessing waterbird usage of the Stour is described (Section 2.1) and the results presented (Section 2.2) and summarised (Section 2.3).

2.1 Methods

WeBS is the monitoring scheme for non-breeding waterbirds in the UK and provides the principal data for the conservation of their populations and wetland habitats. The data collected are used to assess the size of waterbird populations, determine trends in numbers and distribution, and assess the importance of individual sites for waterbirds, in line with the requirements of international conservation Conventions and Directives. WeBS is a partnership between the British Trust for Ornithology, The Wildfowl & Wetlands Trust, Royal Society for the Protection of Birds and the Joint Nature Conservation Committee (the last on behalf of English Nature, Scottish Natural Heritage, the Countryside Council for Wales and the Environment and Heritage Service in Northern Ireland).

There is a long-running tradition of counting waterbirds at the Stour. The first counts for the estuary held in the WeBS database are for October 1960. Winter counts (October to March) were then carried out continuously from 1960 to 1972, a September count was added from 1973 onwards and April and August counts from 1988 onwards. For the purposes of this study, data were available for the period up to and including the winter 1998-99. Coverage has been very good with just a few missing months during the whole period. Count data are stored at the level of the whole site from 1960 to 1990, for the two sub-sites Stour: North Shore and Stour: South Shore from 1990 to 1993 and at the level of 10 sectors, five in Suffolk and five in Essex (Figure 2.1), from 1993 onwards. This does not mean that the precision of counts has increased, but that only in more recent years has it been feasible to computerise all of the sector-level data. Therefore, for long-term comparisons of bird numbers it is only possible to investigate the data at the level of the site. All comments made about counts for separate sectors refer to the five-year period spanning winter 1994-95 to winter 1998-99. These long-term monthly counts are now strictly termed WeBS Core Counts and allow for investigation of numbers of birds present and trends in those numbers.

Although the data at the level of the 10 WeBS Core Count sections are useful, it is not possible to determine from these data the precise roosting locations of waterbirds. In an attempt to improve the level of knowledge, actual roost sites (of waterbirds in general, not of separate species) were mapped by Suffolk Wildlife Trust and are depicted in Figure 2.2. Roosts were found on saltmarshes, on shingle banks and in fields and wet grassland. The main high water loafing areas for wildfowl are also depicted. The use of some of the field roosts is variable between years, depending upon the crops being grown that winter. Similarly, occupancy of saltmarsh roosts can vary depending upon the height of the tide. Unfortunately, it is still not possible to precisely map each species to specific roosts.

Trends in numbers are analysed by calculating indices. Indices of bird counts enable missing data to be taken into account when comparing between years. Currently the normal method of indexing these species is as described by Underhill & Prŷs-Jones (1994) which uses a log-linear Poisson generalised linear model as its base. The counts are modelled as a function of site, year and month factors and the year factor is used as a base for the index which is scaled to a value of 100 in a pre-determined year.

However, to effectively monitor population change of important bird populations, data need to be readily available at different scales to examine changes at an individual country, region or site level. This requirement led to the development of an 'alert' system for waterbirds (Atkinson & Rehfisch 2000) through which population change can be assessed across a range of spatial and temporal scales and for a variety of species. The aim of the system is to take data from the monthly waterbird counts and remove the year-to-year variation in the counts by smoothing the data to reveal the underlying trend in that species' population. The smoothed index is used to calculate population changes over five, 10 and 25-year periods and also over the entire time period during which the species was counted. Species which have undergone major population changes are flagged by issuing an alert if the population has changed (either increased or decreased) by more than 25% and a higher level of alert if the population has changed by over 50%. This method allows interpretation of the annual indices in terms of short-, medium- and long-term change in the population. Full details of the rationale behind alerts are contained in Atkinson & Rehfisch (2000).

The first report on the Alerts System for the UK (Atkinson *et al.* 2000b) was produced to cover the whole UK, the four separate countries and all SPA's. Since the Stour and Orwell form a joint SPA, separate alerts calculations were carried out for the purposes of the current study for the Stour alone. It should be noted, however, that since the SPA provides protection for birds that occur in qualifying numbers throughout its boundary, wherever they are within it, all species cited for the SPA must be given special consideration (even if the bulk of their SPA population occurs on the Orwell Estuary).

WeBS Core Counts are very effective in identifying population levels and trends. However, WeBS Core Counts on estuaries have, in general, been based around high tide distributions. Although important in themselves, roost sites are usually secondary in importance to the manner in which waterbirds make use of a site for feeding. Therefore, information gathered about these sites at high tide will only provide part of the picture. The WeBS Low Tide Counts scheme, which was initiated in the winter of 1992-93, aims to monitor, assess and regularly update information on the relative importance of intertidal feeding areas of UK estuaries for wintering waterbirds and thus to complement the information gathered by WeBS Core Counts on estuaries.

WeBS Low Tide Counts provide the crucial information needed to assess the potential effects on waterbird populations of a variety of human activities which affect the extent or value of intertidal habitats, such as dock developments, proposals for recreational activities, tidal power barrages, marinas and housing schemes. The data gathered contribute greatly to the conservation of waterbirds by providing supporting information for the establishment and management of the UK network of Ramsar sites and Special Protection Areas (SPAs), other site designations and whole estuary conservation plans. In addition, WeBS Low Tide Counts enhance our knowledge of the low water distribution of waterbirds and provide the data that highlight regional variations in habitat use. In particular, WeBS Low Tide Counts should help us to understand, predict and possibly plan for compensation for the effects of sea-level rise on the UK's internationally important estuarine waterbird populations.

The scheme provides information on the numbers of waterbirds feeding on subdivisions of the intertidal habitat within estuaries. Given the extra work that WeBS Low Tide Counts entail, often to the same counters that carry out the Core Counts, WeBS aims to cover most individual estuaries at low tide about once every six years, although on some sites more frequent counts are made. Co-ordinated counts of feeding and roosting waterbirds are made

by volunteers each month between November and February on pre-established subdivisions of the intertidal habitat in the period two hours either side of low tide. On the Stour Estuary, WeBS Low Tide Counts were carried out during the winters of 1996-97 and 1999-00, with a total of 40 subdivisions being used (Figure 2.3).

Finally, it should be noted that waterbird populations on estuaries are not at all static entities. The great majority of the estuarine birds present outside the breeding season migrate elsewhere to breed. There are some birds which winter on the site and some that pass through in the spring and/or autumn. Some may be present for part of the winter and then may move to other sites later in the winter. Cold weather on the other side of the North Sea can cause many birds to cross to UK estuaries, but cold weather in eastern England can likewise cause movements further west and south. Not only are there movements of birds within the estuary but there is also acknowledged to be considerable interchange between the Stour and the adjacent sites of the Orwell Estuary and Hamford Water, the latter situated about five miles to the south.

2.2 Species Accounts

The following species accounts discuss the population (including national and international significance), distribution and trends in numbers of all non-breeding wildfowl and waders occurring on the Stour Estuary in numbers of over 50 birds, with the data also summarised in Table 2.1. Trends are also discussed in relation to the equivalent trends for England and for the whole UK. Gulls are not included since the datasets on this group are not yet well enough developed to discuss them meaningfully. In the species accounts, the term five-year peak mean is used regularly. This is defined as the mean of the peak counts from each of the last five years, which for the purposes of the current study are the years 1994-95 to 1998-99. WeBS defines a year as running from April to March.

Great Crested Grebe *Podiceps cristatus*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 243 birds representing 2.4% of the UK population. Both Core and Low Tide Counts show the species to be present fairly evenly along the length of the site. This species generally favours the major water channels within estuaries.

Great Crested Grebes increased by 158% over the whole period since 1982 although there has been a small decline more recently. At the level of England and the UK the species has increased by about 50% over the whole period with numbers levelling off more recently.

Cormorant *Phalacrocorax carbo*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 146 birds representing 1.1% of the UK population. During Core Counts, birds are widespread though with higher numbers at Deep Fleet and Seafield Bays. Although widespread at low tide, somewhat lower numbers are noted, perhaps partly due to birds feeding more actively (and thus being underwater and occupying the more distant parts of the central channel) and partly due to birds leaving the site to feed along adjacent parts of the coast.

Cormorants increased over the period 1986 to 1998 for which data were available. However, there has been a decline in recent years, triggering a 10-year site alert. At the level of England and in the UK, Cormorants have increased more substantially and have not shown the same evidence of recent decline. There is a suggestion, therefore, that Cormorants are not doing so well at the Stour as they are elsewhere and, although not in serious decline, the species should be kept under review.

Mute Swan *Cygnus olor*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 276 birds representing 1.1% of the UK population. During Core Counts, Mute Swans are highly concentrated at the upper end of the estuary around Manningtree. However, although numbers are roughly similar during low tide counts, the species is much more widely distributed then throughout the site (although the upper estuary is still favoured).

Mute Swans have declined by more than 54% during the 33 years for which data are available, triggering an all-year alert. However, most of this decline was during the late 1960's and more recently numbers have been on the increase. At the UK and England levels, Mute Swan numbers declined during the late 60's but stabilised and have then increased since. The reason for the decline is generally attributed to discarded lead weights from angling being ingested by swans and the recovery attributed to a voluntary and then legal ban on the sale of these weights. The trends on the Stour follow the national trend, but the local recovery appears to have lagged behind the national picture to some extent. There is thus a case for continuing to monitor Mute Swan numbers on the Stour closely.

Canada Goose *Branta canadensis*

The recent five-year peak mean for this species has been 741 birds. Since Canada Goose is an introduced species no thresholds for national importance are set. However, the Stour Estuary is listed as supporting the ninth highest total of this species in the UK in the WeBS Report for 1997-98. Canada Geese are noted on Core Counts in higher numbers from Seafield Bay, Manningtree and Cattawade Marshes and in lower numbers elsewhere, with an avoidance of Jacques Bay and West Copperas Bay. Numbers of the species noted at low tide are much lower, perhaps due to many of the birds noted on Core Counts actually being present on adjacent non-tidal areas; the upper parts of the estuary are also favoured at low tide.

Throughout the UK, Canada Geese have increased greatly during the last 25 years although the increase may have slowed in recent years. Virtually no Canada Geese were noted at the Stour until 1984 and numbers have fluctuated since then. Although a 10-year alert was triggered for this species, counts of Canada Geese are prone to vary widely due to their highly clumped nature. Additionally, as an introduced species there is no conservation interest in a decline in numbers of Canada Geese.

Brent Goose *Branta bernicla*

The dark-bellied race of this species (*Branta bernicla bernicla*) occurs in nationally important numbers on the Stour, with the five-year peak mean of 2,078 birds representing 2.1% of the UK population. Brent Geese are noted widely on WeBS Core Counts around the site although the highest numbers frequent Deep Fleet and Erwarton Bays towards the mouth of the estuary. The species is also widespread at low tide and does not show the lower estuary bias.

Numbers at low tide are somewhat lower than high tide, probably due to a proportion of the flocks feeding on grazing marshes and agricultural lands adjacent to the site.

Brent Geese have increased at the Stour by 548% since 1966, a faster rate than throughout England and the UK as a whole. Although the rate of increase has slowed in recent winters, the English and UK populations have begun to decline slightly over the last 10 years and thus the Stour population remains relatively healthy.

Shelduck *Tadorna tadorna*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 2,058 birds representing 2.7% of the UK population. The species is widespread at high tide with the highest concentrations at Seafield Bay and Manningtree. Seafield Bay is again the most densely occupied area at low tide with the species widespread throughout the site. Numbers noted at high and low tide are very similar indicating little movement in and out of the site.

Over the 33 year period for which data are available, national populations increased by 76% (England) and 85% (UK), although a small decline was apparent in recent years. However, there has been essentially no change in numbers at the Stour over this period and the rate of decline over the last five years has been slightly steeper here than over the country as a whole, triggering an alert for the last five years. The species should be monitored over the coming years to see if the current trend continues.

Wigeon *Anas penelope*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 2,972 birds representing 1.1% of the UK population. The species is widespread at both high and low tide, in higher concentrations at Seafield Bay and Deep Fleet at high tide but showing more of an avoidance of Deep Fleet and the north shore between Gallister Creek and Erwarton Ness at low tide.

Numbers have declined by 66% over the last 33 years, the largest decline of any waterbird species at the Stour, triggering an alert at the all-year level. However, much of this apparent decline is due to very high numbers during the winters of 1966-67 and 1967-68. Since then, numbers have fluctuated but have been essentially stable. Over England and the UK, numbers have roughly doubled over the full period, with the population increases levelling off more recently.

Teal *Anas crecca*

The recent five-year peak mean for Teal is 333 birds, only representing about 0.2% of the UK population and thus not qualifying as occurring in nationally important numbers at the site. The numbers noted at low tide, however were somewhat higher with a mean peak of 636 birds implying that this species may be overlooked at high tide. The species occurs widely around the Stour but at both high tide and low tide is concentrated in two areas: the Deep Fleet area and the Seafield/Mistley area.

Numbers of Teal at the Stour have increased markedly over the full time period, but at roughly the same rate as that seen for the whole of England and for the UK.

Mallard *Anas platyrhynchos*

The five-year peak mean for Mallard was 503 birds, representing only a tiny proportion of the national population of this very widespread species and certainly not high enough to qualify as nationally important. The species is widespread around the Stour at both high and low tide and fairly evenly distributed around the site although with a slight concentration in Copperas Bay (Deep Fleet at high tide and West Copperas Bay at low tide).

At a national level, Mallard numbers have declined by a moderate amount over all time periods, with a national alert triggered over the last 10-year period. On the Stour, numbers today are roughly the same as during the 1960's and 1970's, but there was a much higher population present during the 1980's which has since declined, triggering alerts at the 10-year and 25-year levels. This is a slightly different pattern to the national picture. It is possible that temporary increases at the site could be connected to local releases although there is currently no information available to this study to back up this speculation.

Pintail *Anas acuta*

The species occurs in nationally important numbers on the Stour, with the five-year peak mean of 507 birds representing 1.8% of the UK population. There are two centres of population on the Stour. At high tide, Pintail are concentrated in the Deep Fleet area but at low tide appear to move a few kilometres to West Copperas Bay. Additionally, birds are present in the Manningtree/Seafield area at both high and low tide.

At the national level, Pintail have increased greatly over the 33 years under review but most of this increase was in the late 1960's and early 1970's – the population has been more stable since then. A somewhat different pattern has been noted at the Stour, with a generally stable population overall which was at a low level during the 1980's but which has recovered well during the 1990's.

Goldeneye *Bucephala clangula*

The recent five-year peak mean for Goldeneye on the Stour was 128 birds representing about 0.8% of the UK population. However, given that the Stour and Orwell estuaries represent a single joint SPA, the numbers on the SPA as a whole are sufficient to qualify as nationally important. The species favours the upper half of the estuary at both high and low tide.

Goldeneye numbers have remained fairly stable throughout the UK over the 33 years under review although have increased in England more strongly. An increase has been noted on the Stour, with recent increases greater than at the national level. There is thus no cause for concern so far as this species is concerned.

Red-breasted Merganser *Mergus serrator*

The recent five-year peak mean for the species was 56 birds representing about 0.6% of the UK population. Red-breasted Mergansers are widespread along the water channels of the Stour at both low and high tide.

The species has increased throughout the UK and even more notably in England over the 33 years under review. However, the rate of increase has been greater on the Stour than nationally.

Oystercatcher *Haematopus ostralegus*

The recent five-year peak mean for the species is 1,889 birds representing only 0.5% of the UK population. However, the Stour and Orwell Estuaries SPA qualifies as nationally important for the species when consideration is given to the numbers on the Orwell also. At high tide, the largest concentrations are at Bathside Bay, but with many also at Deep Fleet, along the outer north shore and at Seafield and Manningtree. Birds are widespread at low tide but avoid the Deep Fleet area and the uppermost reaches of the site.

Numbers of Oystercatchers have increased greatly on the Stour over the 29 years for which data are available. The increase has slowed but is still significant, with a 35% rise during the last five years. At a national level, there has been a small long-term increase with very little change in recent years.

Ringed Plover *Charadrius hiaticula*

The species occurs in nationally important numbers on the site with the five-year peak mean in winter of 413 birds representing 1.4% of the UK population. Additionally, the five-year peak mean during autumn passage is 678 birds, which also represents 1.4% of the passage population. The species is widespread in the estuary, with the highest numbers of roosting birds at Bathside Bay and Deep Fleet but a more even spread throughout the site noted at low tide.

Numbers of Ringed Plovers have shown a decline of 23% over the 29 years under review, but the decline seems to have become steeper more recently, triggering alerts at the five- and 10-year levels. Looking at the counts more closely, numbers were fairly stable throughout the 1970's but an increased population was present during the period 1984 to 1994 since when numbers have dropped back down to around the 1970's level. The recent rate of decline has been greater than that noted at the national level. The species should be investigated further.

Golden Plover *Pluvialis apricaria*

The five-year peak mean of 644 represents only about 0.3% of the UK population. At high tide, birds are concentrated at Seafield/Manningtree and in lower densities at the eastern end of the site. At low tide, the distribution is clumped with flocks occurring at Seafield/Manningtree, Jacques Bay, West Copperas Bay and the western half of Erwarton Bay.

At the national level the species is not indexed since the majority of the population occurs outside WeBS sites in the wider countryside. On the Stour, peak numbers vary greatly from year to year but have shown a general increase since 1970.

Grey Plover *Pluvialis squatarola*

The species occurs in internationally important numbers on the site with the recent five-year peak mean of 3,269 birds representing 2.2% of the East Atlantic flyway population (and 7.6%

of the UK population). Grey Plovers roost widely around the Stour at high tide, with the bulk of the population on the outer parts of the estuary and a notable gap in the distribution around Jacques Bay and West Copperas Bay. At low tide, although widespread there appears to be a re-distribution of birds with Jacques, Holbrook and West Copperas Bays the favoured feeding areas and relatively fewer on the outer sections of the estuary.

Grey Plover numbers wintering on the Stour have increased by over 1000% since 1970, about twice the rate for the country as a whole which has seen a spectacular increase. The increase has slowed recently and a 35% drop in numbers on the Stour over the last five years has been noted (compared to a 6% national drop over the same timespan), with a particularly low count in 1997 (thus triggering a five-year alert). Despite the recent decline, however, the conservation status of Grey Plover at the current time must be regarded as generally very favourable.

Lapwing *Vanellus vanellus*

The five-year peak mean of 5,491 birds represents only about 0.3% of the UK population. At high and low tide the species is widespread but favours the upper estuary.

The species is not indexed at a national level due to the majority of the population not occurring on WeBS sites. On the Stour, peak numbers have increased since 1970 by a substantial amount.

Knot *Calidris canutus*

The species occurs in internationally important numbers on the site with the recent five-year peak mean of 4,301 birds representing 1.2% of the East Atlantic flyway population (and 1.5% of the UK population). At high tide, the species is widespread but with concentrations at Deep Fleet and Manningtree/Seafield and, as noted for Grey Plover, very few at Jacques or West Copperas Bay. Both of these areas are frequented at low tide along with most of the rest of the site and the densest numbers are found at Seafield and off Mistley and Manningtree.

Knot numbers have increased greatly at the Stour over the 29 years under review, with the increase slowing more recently. Much of the increase in numbers occurred around 1990. However, nationally Knot have been undergoing a long-term decline with that continuing to date.

Dunlin *Calidris alpina*

The species occurs in internationally important numbers on the site with the recent five-year peak mean of 14,777 birds representing 1.1% of the East Atlantic flyway population (and 2.8% of the UK population). At high tide, the species is found throughout except in the West Copperas section, with the highest concentrations at Manningtree and Deep Fleet. Birds occur throughout at low tide, including West Copperas Bay.

Dunlin have experienced a moderate increase over all years although numbers have declined a little recently. This follows both the English and UK trends very closely.

Black-tailed Godwit *Limosa limosa*

The species occurs in internationally important numbers on the site with the recent five-year peak mean of 2,381 birds representing 3.4% of the East Atlantic flyway population (and 34.0% of the UK population). This is the species for which the Stour is of the greatest importance in national and international terms. At high tide, the main roosting concentration is at Manningtree and Seafield, with smaller numbers elsewhere throughout the site. An upper estuary distribution is also noted at low tide, although the species is not quite so concentrated around Manningtree but more of a movement out into Jacques Bay, the western side of Holbrook Bay and West Copperas Bay.

Black-tailed Godwits have increased at the Stour by 1450% since 1970 although the rate of increase has slowed more recently. The pattern of increase is very similar to that noted at English and UK levels. There is no conservation concern about this species at the Stour, save for the consideration that should be given such an important site for the species.

Bar-tailed Godwit *Limosa lapponica*

The recent five-year peak mean of 103 birds represents only about 0.2% of the UK population. The majority of birds roost on the outermost parts of the site at high tide but are distributed more generally through the estuary at low tide.

In contrast to a fairly stable national population, Bar-tailed Godwit numbers at the Stour have increased greatly over the period under review. Single figure counts were the norm until the 1990's since when numbers have varied each year between two and 150.

Curlew *Numenius arquata*

The species occurs in nationally important numbers on the site with the recent five-year peak mean of 1,320 birds representing 1.1% of the UK population. At high tide, the outer parts of the site at Erwarton Bay and Deep Fleet are favoured, although most parts of the site hold the species. The species is very evenly spread at low tide however.

Curlew numbers have increased by 86% since 1970, with most of the change occurring around the middle of the 1980's. The local increase is similar to that seen across the UK and England.

Redshank *Tringa totanus*

The species occurs in internationally important numbers on the site with the recent five-year peak mean of 3,012 birds representing 2.0% of the East Atlantic flyway population (and 2.7% of the UK population). Redshank are more localised at high tide than low, with most birds roosting at Manningtree/Seafield or Deep Fleet. The species is very widespread at low tide although shows a tendency towards higher densities in the upper estuary.

Redshank numbers on the Stour fluctuated during the 1970's and early 1980's but crashed in the 1985-86 winter, coinciding with a particularly severe winter (Clark & Davidson 1986). There has since been a general recovery noted, with a particularly high peak count during the 1994-95 winter. These trends have resulted in a 25-year alert having been triggered. At the UK and English level, numbers also fluctuate although the patterns of change differ.

Turnstone *Arenaria interpres*

Although the recent five-year peak mean in winter of 590 birds only represents 0.9% of the UK population, the autumn passage five-year peak mean of 738 birds represents 1.1% of the UK passage population and the site thus holds nationally important numbers. Additionally, Turnstones winter in nationally important numbers on the Stour and Orwell Estuaries SPA. Turnstones are widespread at high and low tide but appear to favour the outer half of the estuary somewhat.

Numbers of Turnstones wintering on the Stour have increased greatly and steadily over the period under review. This is in contrast to a declining or stable national picture, with a 10-year national alert having been triggered.

2.3 Summary of Waterbird Data

The Stour Estuary is an important site for non-breeding estuarine waterbirds. Over the five winters 1994-95 to 1998-99, the summed peaks of all wildfowl and wader species averaged just under 50,000 birds. Five species occur in internationally important numbers: Grey Plover, Knot, Dunlin, Black-tailed Godwit and Redshank. A further 10 species occur in nationally important numbers: Great Crested Grebe, Cormorant, Mute Swan, Brent Goose, Shelduck, Wigeon, Pintail, Ringed Plover, Curlew and Turnstone.

Over the full time period for which data are available, two species (Mute Swan and Wigeon) have declined by more than 25% compared to 15 species which have increased by more than 25%. The general picture of bird number trends is therefore positive. However, to comment on local trends in bird numbers one should also compare them to the national trends (and for the purposes of this study both UK and English trends were analysed) as well as looking at trends over different time periods. The WeBS Alerting Process allows such a set of comparisons to be made, resulting in the following observations.

- Cormorants have declined slightly in recent years against the background of a national increase.
- Mute Swans are beginning to recover from a national decline but more slowly than elsewhere.
- Shelduck have not increased in line with national populations and a recent slight national decline has been exceeded by a steeper local decline.
- Wigeon have not increased in line with national populations.
- Mallard have declined in recent years in line with a national decrease.
- Ringed Plover have declined recently.
- Grey Plover have declined recently and, although still very much more numerous than 30 years ago, should be monitored carefully given the importance of the site for the species.

- Redshank numbers have fluctuated but have shown a general recovery from a population crash in the mid-1980's.

3. WILDFOWLING ON THE STOUR ESTUARY

3.1 Wildfowling Clubs

Wildfowling has long been practised on the Stour Estuary but detailed information about its level and scope is only available for recent years. Most wildfowling is now overseen by the British Association for Shooting and Conservation (BASC) and there are four BASC-affiliated wildfowling clubs on the Stour, operating through management plans approved by the respective landowners including the Crown Estate through which each club has a lease of foreshore shooting (and in accordance with the Joint Group on Wildfowling and Conservation's Tidal Land's Wildfowling Lease Application Procedure). There is also a single individual local wildfowler operating under a Crown Estate Local General Agreement.

It is worth stating here that the General Agreement was between BASC and The Crown and related initially to the question of armed trespass, giving BASC members permission to carry firearms on Crown foreshore. To bring The Crown's shooting rights into active and accountable management, The Crown established a leasing process to both wildfowling and conservation whereby leases were given subject to the development and acceptability of a management plan (to be agreed with English Nature). The wildfowling objective was to change from the General Agreement to leases and the General Agreement has now ceased. At a local level, however, a Local General Agreement is in place on a yearly basis. On areas where a Local General Agreement applied, shooting is effectively consented, but with the clear proviso that this is subject to review and the determination of any conflicting lease applications.

Details of the shooting activities of the four BASC-affiliated clubs on the Stour, plus of the individual wildfowler, have been made available for the purposes of this study and form the basis for the descriptions below. The location of the clubs' activities are illustrated in Figure 3.1. The abbreviations given to the clubs will be used throughout the current report for ease of reference.

The Grove Shooting Club (GSC)

The Grove Shooting Club (GSC), formed in 1984, has a membership limited to 25 plus juniors. Interests of the club include clay pigeon shooting and pigeon control as well as wildfowling.

The wildfowling site location comprises the foreshore on the northern side of the inner Stour estuary, running from a point to the south of the factory at Cattawade to a point just beyond Stutton Ness. The foreshore consists primarily of extensive mud flats dissected in parts by creeks and channels, much of which is unsafe to approach due to the depth of mud. There are two fairly extensive areas of saltmarsh fringing the foreshore at the Brantham works and at Stutton Mill house.

The management of shooting over this area of foreshore limits the shooting to four sections, with visits restricted to an average of one per week by two guns in each section. Marker posts indicate the limits of each section. In order to provide the wildfowl and wader populations of the area with safe and undisturbed roosting and feeding sites, and also to protect the interests of neighbouring landowners, several sections of foreshore have been set aside as unshot refuges.

Visits are usually restricted to no longer than two hours, mainly occurring at dawn and dusk. This is in order to reduce disturbance to make for good wildfowling. Weather conditions greatly influence the success of wildfowling, at its best in this area during prevailing south/south westerly winds. These onshore winds further reduce disturbance by carrying the sound of shot away from the foreshore.

Anglian Wildfowlers Association (AWA)

The vast majority of the lease area – the area generally known as 'Holbrook Bay' – is mud with a very small amount of saltmarsh; the latter is slowly decreasing in extent year by year, and is seldom more than a few yards wide. Vast areas of the mud are of a soft nature and this restricts access for wildfowling. The majority of wildfowling takes place from the western extreme of the lease up to 'Holbrook Creek' and outwards towards the centre of the river as far as the first large creek running east to west. Infrequent visits are made to the east side of Holbrook Creek.

Almost all wildfowling visits are made at dawn or dusk, with most no more than one hour duration. Infrequent visits are made at times of very favourable wind conditions during daylight hours. A few punt-gunning trips are made in a season, of somewhat longer duration than shoulder gunning trips, with very occasional shots.

Club membership decreased slowly over the past 20 years but has remained fairly constant for the last 10 years at between 35-50. Numbers of wildfowlers regularly using Holbrook Bay have decreased since a lease was secured on the River Deben. The club in the past has exercised voluntary wildfowling bans during hard weather.

Little Oakley & District Wildfowlers Association (LODWA)

LODWA has the sporting lease on the saltmarsh at Shore Farm on the south bank of the River Stour. This lease is with the owner of the freehold of that land. The Crown Estate Commissioners granted a lease of sporting rights to LODWA relating to the foreshore and bed of the River Stour adjacent to Shore Farm. The Crown lease covers an area of approximately 50 ha. A refuge area was created at the eastern end of the Crown leased area. This no shooting area created a buffer zone with the adjacent RSPB reserve at Copperas Bay. The saltmarsh habitat consists of a mixture of high saltmarsh at the landward end and lower saltmarsh at the seaward end levelling out to a small sand beach and then the mudflat. The western end runs to gravel but the remaining mud is glutinous and difficult if not impossible in places to shoot from.

LODWA placed controls on the level of shooting on both the saltmarsh and the Crown mud at 14 days per month. This allows for a theoretical maximum of 68 days per year. A limit of two wildfowlers at any time is also enforced. In practice wildfowling on the site is carried on at a very low level. The majority is morning or evening flight with the occasional tide or moon flight. Any wildfowling success on the site would coincide with a strong onshore wind with the tide covering the mudflats.

The site is also visited by a small number of local punt-gunners from the club. Again this is infrequent, averaging some four visits and two shots per season. The sport of punt-gunning has traditionally been carried out on the River Stour by local people and this tradition carries on with a small number of members of LODWA.

Braintree Wildfowlers Association (BWA)

The Braintree Wildfowling Club was formed in 1960 and covers the inner south shore of the Stour from New Mistley to Jacques Bay. It has the capability of holding up to 37 full members, although the current membership is around 20. The Club has been shooting on the River Stour for over 30 years and there are not thought to have been any altercations with any other parties. A few years ago members of the Club attended a local village meeting to explain exactly what the Club's wildfowling entailed and to alleviate any concerns the villagers may have had.

Wildfowling on the Stour is a very important part of the BWA. It has taken the Club members (past and present) over 20 years to acquire the lease from the Crown. They have held this lease for three years, during which time they report that they have not encountered any problems.

The Club has two totally unshot refuge areas and has also restricted shooting to within 100 m of the mean high water mark. These measures ensure minimum disturbance for wildfowl and waders using the outer mudflats.

Individual Wildfowler Under Local General Agreement (ILGA)

Mr "T C" lives in Harkstead, has been wildfowling on Crown foreshore in Suffolk since the 1960's, and primarily shoots on the eastern shore of Holbrook Bay. His wildfowling visits are typically one to two hours long during morning and evening flight time. He uses a silenced shotgun.

3.2 Wildfowling Data from the Clubs

Details of the shooting activity of the four affiliated clubs on the estuary, collected as a condition of their respective Crown foreshore leases, have been made available for the purposes of this study. Efforts have been made recently by BASC to standardise the data collected by wildfowling clubs around the country, whether or not they hold Crown leases. This is to ensure that they are both comparable and that they contain the key data needed to address aspects such as sustainability and the fulfilment of national and international requirements for the monitoring of waterfowl harvest. Although good progress is reported to have been made, the data available from the clubs and the individual wildfowler over the past five years on the Stour are somewhat variable.

It was not possible for BASC to give information on the precise locations of shooting or on the numbers of shots fired (as requested), simply because these were not required by the Crown under the terms of the individual club shooting leases. Details on the actual times of day of shooting also were not available and information was restricted to either a.m. or p.m.

Partly because of these aspects the wildfowling clubs were somewhat apprehensive about providing these data as they realise the difficulties involved in interpreting them. Therefore, considerable care should be taken in the interpretation of this information. It should also be understood that the wildfowling data were made available for the purposes of this review only and can be used otherwise only with the prior written permission of BASC.

The shooting data provided by the clubs, *via* BASC, are summarised in Table 3.1. The table lists the winters for which data are available for each club, the number of visits made to each club's area, the percentage of visits recording no kills and details of the numbers of each species recorded as killed by the clubs. Due to the variable coverage (*i.e.* between one and five winters of data per club), Table 3.2 lists estimated bag sizes scaled for coverage, making the assumption that wildfowling intensity and success rates were the same in non-recorded years as in those years from which data were available.

The principal observations resulting from the data are discussed below.

Distribution of visits

Wildfowlers in total make approximately 200 visits to the Stour Estuary per winter, during the period between 1st September and 20th February. The frequency of visits tails off noticeably throughout the winter (Figure 3.2). However, this monthly distribution is biased heavily by the relatively large number of visits made by the AWA. This club alone makes almost half the total number of visits and when combined with the visits made by ILGA, about 62% of wildfowling visits are made to Holbrook Bay. Seafield Bay is the next most visited area, followed by Jacques Bay and then West Copperas Bay. Over 80% of recorded visits were made to the inner half of the north bank. Where recorded, 38% of visits were made in the morning (likely to have been mostly at dawn) and 62% were in the afternoon (likely to have been mostly at dusk).

Hunting success rate

Overall, approximately 57% of visits recorded no kills, although this varied greatly between clubs. For example, 66% of visits made by AWA members resulted in no kills whereas only 13% of visits by GSC members failed to result in a bird being shot. The hunting success varied so greatly between clubs that there was likely to be some biasing factor. Two possibilities are:

- the terrain and thus type of wildfowling differs between clubs, resulting in a difference in actual success.

- the precise method of the recording of wildfowling differs between clubs, resulting in a difference in recorded success.

Hunting bag size

The estimated bag (*i.e.* by scaling for differences in coverage between years) was about 285 birds per year. Although the number of visits by the AWA was the highest, the GSC killed a higher number of birds. Interestingly, the ILGA covering Holbrook Bay also recorded a relatively low level of success, perhaps implying that wildfowling in Holbrook Bay is more difficult in nature. Additionally, the bag size did not vary noticeably between the years for which data were available (Table 3.3).

Species composition

Four species accounted for 96% of the total bag: in descending numerical order these were Wigeon (35%), Mallard (25%), Teal (23%) and Canada Goose (13%). The other species

recorded as killed were Greylag Goose, Gadwall, Pintail, Shoveler, Tufted Duck and Woodcock. The species breakdown for each club differed somewhat. For example, AWA shot mostly Wigeon and Mallard, but Pintail notably formed 10% of their bag whereas very few geese were shot by the club.

Punt-gunning by LODWA

LODWA usefully provided some further details of their wildfowling activities by describing in more detail the results of their recent punt-gunning trips. [N.B. There was also apparently some punt-gunning by AWA but no further details are available.]

LODWA made 68 visits during the five winters 1994-95 to 1998-99, of which 21 visits involved punt-gunning (31%). Of these visits, 57% (12/21) of punt-gunning visits recorded no kills, compared to 60% (28/47) of non-punt visits, leading to an overall no-kill rate of 59%. However, punt-gunning trips recorded 3.2 kills per visit, compared with 0.8 kills per visit for non-punt visits. The main differences in species compositions of the bags was that all the Teal killed by LODWA were from standard wildfowling activities whereas all of the Canada Geese killed were from punt-gunning.

Usefully, information was provided on the number of actual shots made on each punt-gunning visit. During the 12 visits where no birds were killed, no shots were fired. The other nine visits involved one shot each, each killing multiple birds (with a maximum of 14 Wigeon). Unfortunately, there are no comparable data for the number of shots made on non-punt-gunning visits so the relative level of disturbance of each type of wildfowling cannot be gauged.

3.3 Wildfowling Data From Other Sources

In addition to the wildfowling data received from wildfowling clubs, *via* BASC, a number of other sources of wildfowling data exist. These are summarised below.

1997-98 Wildfowler Survey (Larkin *et al.* 1998)

A survey of wildfowling activities was undertaken on the Stour Estuary during the 1997-98 shooting season, in order to ascertain the level of shooting, both legal and illegal. Survey periods occurred approximately four times per month when high tide coincided with dawn or dusk, especially at weekends. Attempts were also made to be present on the estuary during full moons.

A total of 26 visits were made for the purposes of the survey with wildfowling activities recorded on six occasions (with two supplementary observations in addition). The only birds recorded killed were two Canada Geese on one occasion. Supplementary data from the study are the counts of numbers of shots fired, of interest since there were no other data available to this study. On 26th October 1997, nine shots were fired between 0645 and 0710 by a single wildfowler using a hide and decoy ducks on saltmarsh. On 8th November 1997, 16 shots were heard between 1650 and 1710 but the number of shooters was unknown, as was the success rate.

Three of the shooting events were noted at Seafield Bay, an area shot over by the GSC. The club was only able to provide summary statistics for the 1997-98 season and so comparisons

were not possible. Four instances were in the Erwarton Bay/Johnny All Alone Creek area. This is an area not covered by any of the clubs providing data and so may have referred to illegal shooting. The shooting on 26th October 1997 was in the area shot over by BWA. This club has not provided any data from the 1997-98 season.

The conclusion of this study was that "it appears that shooting on the Stour Estuary was quite limited during the 1997-98 season." A comparison with BASC's own data, however, doesn't suggest that the wildfowling pressure that season was unusually light and the low number of records was probably more to do with the methodology and number of visits made. A much more intensive survey would be required to independently record many of the instances of shooting.

Report on Usage and Disturbance Survey of The Stour Estuary: 1992-93

A study was undertaken for a post-graduate diploma in conservation management by Dave O'Hara at Otley College, in conjunction with the RSPB, during the period July 1992 to July 1993. The main object of the survey was to document types and extent of human use of the estuary, both to provide an information resource and as a baseline from which to judge future change.

All types of activities and disturbance were recorded, and are further detailed below in Section 4. However, as far as wildfowling is concerned, it was "very little recorded, but more probably goes on around dawn and dusk". Records were from Jacques Bay, Holbrook Bay and Erwarton Bay but numbers of records were few, no dates were given and no useful conclusions can be drawn from the report.

WeBS count forms

WeBS count forms include a "Disturbance" section. Counters are asked to record any "Activity" occurring at the site, and furthermore to say whether or not that activity was disturbing birds. The section is optional but has been completed well for both the Low Tide and Core Counts on the Stour Estuary. "Shooters" are characterised as code 5. It should be noted that “shooters” does not necessarily refer specifically to wildfowlers and, importantly, that "disturbing the birds" is a purely subjective assessment with no clear definition.

During WeBS Low Tide Counts in winter 1996-97, shooting was noted on three occasions, in sections 19, 20 (both in the western part of Jacques Bay) and section 36 (to the east of Holbrook Bay). In none of these cases was the shooting identified as "disturbing the birds".

During winter 1999-00, shooting was again noted on three occasions, in sections 1 (Bathside Bay), 15 and 17 (both Jacques Bay). The shooting in Bathside Bay was considered to be disturbing birds.

During WeBS Core Counts over the five-year period 1994-95 to 1998-99, "shooting" was noted on 11 occasions (out of a total of 439 visits), with the shooting considered to be disturbing the birds on nine of these occasions. Shooting was noted from Jacques Bay (five times), Stutton-Holbrook Bay West (twice), Holbrook Bay East (twice), West Copperas Bay (once) and Seafield Bay (once).

3.4 Summary of Wildfowling Data

The data collected concerning wildfowling activities on the Stour enable the following general conclusions to be drawn.

Wildfowling takes place between 1st September and 20th February each winter. The number of visits per month declines noticeably throughout the winter, although this observation was strongly affected by the visits of the AWA. Where recorded, 38% of visits were made in the morning (likely to have been mostly at dawn) and 62% were in the afternoon (likely to have been mostly at dusk).

Wildfowling in the Stour shows a distinct bias towards the upper half of the estuary. About 62% of wildfowling visits were made to Holbrook Bay and when combined with Seafield Bay, over 80% of recorded visits were made to the inner half of the north shore of the estuary. Jacques Bay and West Copperas Bay were also visited but less frequently. Without access to any data on the number of shots fired per visit, it is not possible to describe the relative levels of disturbance due to wildfowling, harmful or otherwise. Although one could perhaps make the assumption that the amount of wildfowling disturbance is proportional to the number of visits made, this might not necessarily be the case (birds becoming habituated to shooting might actually mean that the opposite could be true).

The waterbird species killed by wildfowlers were Wigeon (35%), Mallard (25%), Teal (23%), Canada Goose (13%), Pintail (2%), Greylag Goose (1%), Gadwall, Shoveler, Tufted Duck and Woodcock (last four less than 1% each). The proportions of each species in the bag varied between clubs. The estimated bag was about 285 birds per year. The number of birds killed varied between parts of the estuary, with 46% from Seafield Bay, 28% Holbrook Bay, 19% Jacques Bay and 7% from West Copperas Bay. There was no recorded shooting from Erwarton Bay by the BASC-affiliated clubs but shooting was noted here by two independent surveys. Additionally, LODWA noted that its members had dealt with three cases of illegal shooting in its area over the last five years and BWA noted that its members assisted in the general wardening of the area partly to prevent poaching. Therefore, the figure of 285 kills per year should be treated as a minimum, although the actual total is unlikely to be substantially higher. Additionally, it is noted that there are no available data on the numbers of birds injured but not recovered by wildfowlers.

Success rates and kill rates differed between clubs. One reason for this could be that the nature of hunting on different parts of the estuary results in a higher actual successful rate. The other possibility is that differences in recording methods, particularly in recording visits with no kills, leads to apparently different success rates. It would be useful for BASC to look into this for their own monitoring purposes.

The general conclusion, however, concerning wildfowling data is that there are not sufficient long-term data to enable trends in wildfowling intensity to be judged and there is not sufficient detail in the data recorded to make it possible to assess the disturbance caused by wildfowling. Anecdotal evidence suggests that wildfowling occurs at a relatively low intensity on the Stour and that no clear trends in intensity have been noted over the last 20 years and no between-year trends have been noted from the five-year dataset provided by the wildfowling clubs.

4. OTHER ACTIVITIES AND POTENTIAL SOURCES OF DISTURBANCE TO WATERBIRDS ON THE STOUR ESTUARY

The Stour Estuary is subject to many different human-related activities, many of which have the potential to influence bird numbers and/or distribution. The precise impact of these many different factors is very difficult to characterise and outside the scope of this study. However, an outline of the occurrence and intensity of potential disturbing factors is desirable in order to consider wildfowling in the correct context. A number of sources of disturbance information have been consulted:

- WeBS Core Counts and WeBS Low Tide Counts (these schemes also provide some information concerning raptors at the site)
- University of East Anglia study on the effect of recreational disturbance on the distribution of Black-tailed Godwits (Gill *et al.* 1998)
- Report on Usage and Disturbance Survey of The Stour Estuary (O'Hara 1994)
- 1997-98 Baitdigger Survey (Babbs & Ravenscroft 1998)
- An inventory of UK estuaries, Volume 5, Eastern England (Buck 1997)
- Additional anecdotal information provided by the local wildfowling clubs.

The information from these sources is summarised in this section. Note that WeBS Activity and Disturbance data are also summarised in Table 4.1.

Walkers and dogs

Walkers occur along most of the shoreline. The presence of walkers is much higher in summer than in winter and the south-western quarter of the estuary is the most frequented area. Many of the wildfowling clubs commented anecdotally on an apparent increase in walkers during recent years. AWA noted that an apparent increase had been noted "since construction of a public car park at Lower Holbrook and footbridges across dykes at Markwells Farm End." Dogs are anecdotally singled out as an important disturbance factor. WeBS counters noted walkers as the most frequent activity, with disturbance caused by them on 32% of occasions. Dogs were noted with over 50% of walkers and were considered a disturbing factor on 36% of occasions. WeBS noted walkers fairly evenly throughout although fewer were noted around Deep Fleet. Dogs were also noted throughout with Bathside Bay the most frequented section.

Boats and other watersports

River craft were noted as the major "usage" on the estuary by O'Hara (1994), comprising 81% of recorded activities (of which 96% were recreational craft, mostly yachts and dinghies, and 4% were commercial). Distributional information was only available for the summer months (although one of the wildfowling clubs noted that moorings continued to be used to a degree during the winter months), when the highest numbers of yachts and dinghies were moored in the south-west corner of the estuary and smaller numbers along the north shore. Little change had been noted between a previous survey in 1988 and the 1992/93 survey.

Water-skiing is limited to 250 ha in the mid-estuary. Sailboards and jetskis are also present on the estuary. WeBS counters considered unpowered boats to cause disturbance on 38% of occasions, powered boats on 47% of occasions and windsurfers on 64% of occasions. Boats were found fairly evenly throughout the site by WeBS counters but windsurfers were mostly present at Jacques Bay.

Fishing and bait-digging

Both leisure and commercial fishing occurs on the estuary but there is little available data. However, more effort has been made to document bait-digging, with a dedicated survey carried out in 1997-98. The usage survey (O'Hara 1994) noted that bait-digging is three times as intensive during the summer as in the winter, and that about 80% occurs in Jacques Bay with the other 20% in the Stutton to Holbrook West section. Anecdotal information noted bait-digging in all parts of the estuary and wildfowling clubs considered bait-digging to be a disturbing factor and, according to one correspondent, "out of control" in Holbrook Bay. During the 1997-98 Baitdigger counts, the estuary was visited on 13 dates between 11/9 and 22/2 and numbers of baitdiggers in each section on each date were noted. The composite total showed that the worst area was in the Wrabness area on the south shore, between Sluice Rill and Shore Farm. The rest of the south shore was very little visited by baitdiggers. Most of the north shore was dug over but at lower levels than at Wrabness, with the shore between Holbrook and Erwarton Bays the next most favoured area. WeBS Counters noted anglers on 51 occasions with 33% of these causing disturbance and bait-diggers on 12 occasions but with 67% of these causing disturbance. Not surprisingly, angling was mostly a feature of Core Counts and bait-digging noted on Low Tide Counts. The greater number of Core Counts which have taken place explains the relatively low number of bait-digger observations compared to angling. Angling was mostly recorded at Bathside and Jacques Bays.

Development and industry

Industry is most obvious around the major port of Harwich, with a new dock under development at Bathside Bay. Smaller docks are present at Mistley and Parkeston Quay and dredging and maintenance of shipping channels occurs. There are also chemical works at the top end of the estuary at Cattawade. A high level of water abstraction has caused concerns in the recent past. There used to be untreated sewage discharges to the Harwich foreshore but now the discharge is from near Parkeston into the mouth of Stour following secondary treatment.

In 1989 there were several proposals involved with the development at Bathside Bay; these included a marina, land-claim for housing, capital dredging and a road scheme. There was also a proposal to build on associated land. By 1993 the proposals at Bathside Bay were underway apart from the marina, and the proposal to build a jetty at Parkeston had been fulfilled (Buck 1997).

Miscellaneous

Cyclists, horse-riding and four-wheel drive vehicles have been reported. Horse-riders were only noted three times by WeBS, not causing disturbance on any of these occasions. Vehicles were noted six times by WeBS with two of these observations linked to disturbance. Beach recreation occurs at Wrabness, with beach huts which continue to be used to a degree during the winter months.

Several of the wildfowling clubs noted that game shooting occurs on neighbouring farms during the winter months. Additionally, gas-guns are used on farmland to deter flocks of Brent Geese from crops. Both of these have to be considered a potential disturbing factor but no detailed data are available. WeBS counters noted "Shooters" on 17 occasions, with 59% of these occurrences considered disturbing, but these will have included both wildfowling and other shooting.

Finally, military helicopters regularly overfly the estuary at low level which is considered by one club to be “the greatest disturbance to waterfowl” and occurs both during the day and night. WeBS counters noted aircraft (of all types) on 25 occasions with 44% of these considered disturbing. Additionally, weapons training of military cadets takes place close to the site and under the Stour to Alton Water flightline.

Raptors

Raptors are recorded by WeBS counters (both Core and Low Tide counts) in the same way as with other disturbance types, *i.e.* whether they were present and whether they were thought to be causing disturbance. Overall, 151 observations of raptors were made, of which the majority were of Sparrowhawk (disturbing the birds on 32% of occasions) or Kestrel (disturbing the birds on only 3% of occasions). Smaller numbers of sightings were made of Peregrine, Merlin, Short-eared Owl and “Other Raptor” - the identity of the latter is not readily determinable from the WeBS database but most likely referred to Osprey.

Raptor presence was notably higher along the north shore than the south, with Erwarton Bay responsible for about a quarter of observations. Raptor observations by WeBS counters are difficult to quantify since different observers will be differentially likely to note or notice raptors during a survey which is not primarily aimed at looking for raptors. However, there is a suggestion from the data that the frequency of raptor observations is inversely proportional to the anthropogenic disturbance factors.

UEA studies of disturbance on the Stour Estuary

The effect of recreational disturbance on the distribution of Black-tailed Godwits on the Suffolk and Essex estuaries, including the Stour, was the subject of a three-year RSPB-funded study carried out by the University of East Anglia (Gill *et al.* 1998). This study quantified the prey types selected by the godwits on these estuaries and then related over-winter depletion of the food supplies by the godwits to levels of recreational activity. This showed that at three different spatial scales (patches of mud, large mudflats and entire estuaries), human activity did not reduce the use made of the food supply by the godwits. Wildfowling was not included in the sources of disturbance in this study, because it was so rarely encountered.

Summary

There is a wide variety of activities occurring around the estuary, most of which are thought to cause some disturbance to waterbirds. Walkers are widespread and frequent, more numerous in the summer months, and about half are accompanied by dogs. However, dogs are not considered to be noticeably more disturbing than people alone. Boats are numerous, with powered boats considered more disturbing than unpowered boats and the occasional windsurfers even more so, relative to the number of observations. Boats are widespread but

with greater numbers moored in the south-west quarter of the site. Angling occurs at a low level but bait-digging at low tide may be more of a problem, being considered the most disturbing activity relative to the number of observations. Bait-digging is most concentrated in Jacques Bay. The other particularly disturbing anthropogenic factor appears to be overflying by military helicopters. However, UEA studies suggested that human activity in general did not reduce the use made of food supplies by Black-tailed Godwits. Kestrel and Sparrowhawk were the most frequently recorded raptor species but whereas Kestrels very seldom caused disturbance, Sparrowhawks were thought to do so approximately one-third of the time.

5. THE EFFECTS OF WILDFOWLING ON WATERBIRDS USING THE STOUR ESTUARY

The numbers of each waterbird species wintering on the Stour Estuary may have increased, declined or remained stable, but the reasons for population changes are not straightforward to assign. Although wildfowling on the Stour could cause a decline in numbers of a species on the Stour, one also needs to consider both:

- other factors operating at the level of the Stour (e.g. habitat change, disturbance from bait-diggers, changes in raptor predation, etc.)

- factors operating elsewhere on the flyway (e.g. altered conditions on breeding grounds, hunting elsewhere on the flyway, habitat destruction at critical migration staging posts, etc.)

On the Stour Estuary, wildfowling could affect populations either through mortality or disturbance. However, it should be noted that no sensible analyses can be undertaken in this study to assess the precise relationship between wildfowling and waterbird populations because:

- there are too few years of wildfowling data available (a maximum of five years and only one year for some parts of the site)

- the wildfowling data do not include information on the number of shots fired or the duration of the time on site, both of which may be important factors in terms of disturbance.

The following comments will therefore be discursive in nature and aim to look for possible areas of concern. The species of most interest are:

- those undergoing declines, particularly if there is a decline relative to their national populations
- those for which the site is particularly important
- quarry species.

Cormorant

The recent wintering population of about 150 Cormorants on the Stour represents 1.1% of the UK population. An increase since the mid-1980's was at a slower rate than nationally and a small decline has been noted recently. Cormorants are not quarry species. However, the species is currently very unpopular with angling interests as a perceived threat to fish stocks. It is possible, therefore, that illegal persecution on the site may be affecting the numbers, although there is no evidence available. On the other hand, Cormorants have been noted as moving inland in recent winters, perhaps due to declining stocks of sea-fish or perhaps due to an increase in the number of well-stocked inland lakes. It is therefore not straightforward to determine whether trends in Cormorant numbers on the Stour are due to local factors or not. The species is widespread at both high and low tide, although with roosting concentrations at West Copperas and Seafield Bays. Cormorants are not so dependent on saltmarsh for high tide roosts, being able to utilise sand-bars and islands. Although wildfowling may cause some disturbance to particular roosting sites, it seems unlikely that this would be a limiting factor

over the estuary as a whole. Investigation into the factors determining the population of this species should concentrate on estuarine fish stocks, movements of birds between the site and other feeding areas and levels of illegal persecution.

Mute Swan

The recent wintering population of about 276 birds represents about 1.0% of the UK population. Mute Swans declined on the Stour in the late 1960's but have shown a recent increase. The trends follow those at the national level but the recovery has been slower and thus numbers may be being suppressed at the site. The reason for the decline and recovery at the national level are generally considered to be the use and later cessation of lead weights in angling. A change in the timing of moving away from the use of lead for angling at the local level could therefore bear investigation.

Mute Swan is not a quarry species although some illegal shooting does occur throughout the UK, principally by vandals at the nest. The species is also particularly prone to disturbance of nesting attempts. WeBS counts reveal that Mute Swans at the Stour are highly concentrated at the upper end of the estuary at high tide but somewhat more widespread at low tide. In some areas, feeding of swans by the public can lead to flocks gathering and this certainly occurs at Manningtree at high tide. Given the location of the swans it is unlikely that disturbance from wildfowling activities has a major impact on the population wintering on the site. However, given that wildfowlers have made use of lead shot, the higher the intensity of shooting was at the site, the greater the potential risk was to swans of lead poisoning. Since no long-term wildfowling data are available, nor do the data collected record the number of shots fired on each wildfowling visit, it is not possible to assess the level of the risk of lead poisoning over the years. However, given the recent ban on the use of lead shot this problem should decline over time and lead is therefore no longer relevant to the wildfowling consents process.

Shelduck

The recent wintering population of over 2,000 birds represents 2.7% of the UK population. The population on the Stour has remained essentially stable, with a recent decline in numbers. This compares unfavourably with substantial national increases and a smaller recent decline.

Shelduck are not a quarry species. At both low and high tide, the species is widespread but with the highest concentrations at Seafield Bay, an area which is shot over by wildfowlers. The intensity of shooting is apparently not so great as to deter birds from Seafield. However, without a long-term wildfowling dataset it is not possible to assess whether variations in intensity of wildfowling disturbance over the years could affect the numbers of birds present. Other potential factors affecting Shelduck numbers could be food-supply within the estuary, conditions at breeding sites and other disturbances such as bait-diggers, dog-walkers and boats.

Wigeon

Almost 3,000 Wigeon have been wintering on the Stour in recent years, representing 1.1% of the UK population. Numbers were much higher during the winters of 1966-67 and 1967-68 but dropped sharply and since then have fluctuated without any long-term trend. However, over the UK as a whole, numbers have doubled over the same period and, therefore, it

appears that Wigeon are not present in such high numbers at the Stour as might be expected. This could be due either to local factors (such as food supplies, roost site availability, wildfowling, etc.) or to a shift in the population with numbers rising rapidly on other sites. One possible explanation for the lack of a recent increase in numbers could be that birds have been "diverted" by the nearby reservoir of Alton Water. WeBS data for Alton Water are sparse before 1990 but there does appear to have been an increased population of Wigeon at the reservoir during the 1990's, with a recent five-year peak mean of 705 birds. Another noteworthy observation is that the species has taken to feeding extensively in winter-sown cereals (Anglian Wildfowlers Association pers. comm.)

Wigeon is the species most frequently shot by wildfowlers on the Stour Estuary representing 35% of the bag or probably at least 100 birds per year recently (*i.e.* about 3% of the recent five-year peak mean recorded by WeBS Core Counts). Even allowing for a small amount of illegal shooting and injured birds it seems unlikely that more than 5% of wintering Wigeon have been shot at the site during recent winters, especially given that WeBS cannot take into account turnover throughout the winter. Disturbance is also a possible factor affecting Wigeon numbers. The species is widespread throughout the site but high tide concentrations occur at Seafield Bay and Deep Fleet, with somewhat lower numbers in the outer estuary at low tide (although it is possible that birds may be moving onto adjacent fields to feed). Shooting is concentrated towards the upper end of the estuary.

There is no evidence of wildfowling suppressing numbers of Wigeon at the Stour but the existing dataset is not sufficient in detail or time-span to say so with any certainty. Since wildfowling pressure appears to be highest in the autumn around the time Wigeon first arrive for the winter, it is possible that birds could be deterred from settling in the numbers they otherwise would were it not for hunting disturbance, although there is no evidence for this. One would ideally design large scale experiments to attempt to answer a question such as this.

Mallard

About 500 Mallard have wintered on the Stour in recent years, representing only a very small proportion of the national population. Numbers increased sharply in the late 1970's, remained at a high level during much of the 1980's before declining again from about 1988 and are now at a similar level to that recorded in the early 1970's once more. At the national level, Mallard numbers have declined by a moderate amount over all time periods, with a national alert triggered over the last 10-year period.

Mallard are one of the principal quarry species for wildfowlers on the Stour, with the wildfowlers' statistics suggesting that a minimum of 71 Mallard are killed each year, although the actual number is likely to be slightly higher due to injured birds and illegal shooting. This suggests that wildfowlers kill at least 14% of Mallard each winter. The actual percentages are, however, likely to be lower due to turnover of birds throughout the winter. If one assumes similar degrees of turnover between species (an assumption for which there is no actual evidence), it is more likely that wildfowling has an effect on wintering numbers of Mallard than on Wigeon. However, whether or not there is a significant effect is another matter. It may well be that the killed birds form part of the "doomed surplus" and the loss of these birds has no effect on the overall population. The matter is further complicated by the fact that varying numbers of Mallard are released each year into the wider countryside for shooting purposes. Without more detailed datasets on long-term shooting intensity (as well as

Mallard releases), it is not possible to say whether or not wildfowling is suppressing numbers of Mallard at the site.

Ringed Plover

Over 400 Ringed Plover winter on the Stour Estuary and a peak of nearly 700 are present during passage periods although turnover means that, for passage periods in particular, much higher numbers will be involved. Both winter and passage counts represent about 1.4% of their respective national populations. Ringed Plovers have declined at the Stour at a faster rate than the national decline. A higher population was present during 1984 to 1994 since when numbers have declined.

Ringed Plover is not a quarry species. Possible reasons for declines are, therefore, factors on the breeding grounds (in particular, sandy beaches and dunes may be suffering increasing disturbance from beach recreation interests) or elsewhere on the flyway, or reduced carrying capacity on the Stour due to reduced food or increased disturbance or predation. The highest numbers of roosting birds occur at Bathside Bay and Deep Fleet but there is a more even spread throughout the site noted at low tide. This pattern of roosting could imply an avoidance of the more frequently shot-over inner parts of the estuary. However, without a long-term wildfowling dataset it is not possible to say whether this is the case or not.

Grey Plover

Over 3,200 Grey Plovers have wintered on the Stour Estuary in recent years, representing 2.2% of the East Atlantic flyway population (and 7.6% of the UK population). The site is thus an extremely important one for the species. Numbers wintering on the Stour have increased by over 1000% since 1970, about twice the rate for the country as a whole which has itself seen a spectacular increase. The increase has slowed recently and a 35% drop in numbers on the Stour over the last five years has been noted (compared to a 6% national drop over the same timespan), thus triggering a five-year alert.

Grey Plover is not a quarry species. Therefore, if wildfowling is affecting the species it will be through the effects of disturbance. Grey Plovers roost widely around the Stour at high tide, with the bulk of the population on the outer parts of the estuary and a notable gap in the distribution around Jacques Bay and West Copperas Bay. At low tide, although widespread there appears to be a re-distribution of birds with Jacques, Holbrook and West Copperas Bays the favoured feeding areas and relatively fewer on the outer sections of the estuary. This pattern of roosting could imply an avoidance of the more frequently shot-over inner parts of the estuary. However, without a long-term wildfowling dataset it is not possible to say whether this is the case or not.

Redshank

Approximately 3,000 Redshank currently winter on the Stour Estuary, representing 2.0% of the East Atlantic flyway population. The numbers on the Stour have been characterised by fluctuations through the 1970's, a crash in the mid 1980's which probably resulted from severe weather (Clark & Davidson 1986) an increase to their highest recorded levels in 1994 and then a steady decline to about a third of the peak value. Fluctuations are also noted at the national level but the pattern is not exactly the same.

Redshank is not a quarry species. Any possible effects of wildfowling would therefore be through disturbance. At low tide, Redshank are extremely widespread although with higher densities in the upper parts of the estuary. A similar pattern is observed from many other sites covered by the WeBS Low Tide Count scheme, including the nearby sites of the Orwell and Deben Estuaries, and is presumed to be related to the muddier substrates present in the more upstream reaches of an estuary providing more favourable feeding conditions for the species. As the tide rises, Redshank at the Stour become much more localised in roosts, with the majority roosting at either the top end of the estuary around Seafield Bay and Manningtree or at Deep Fleet further east.

Given that wildfowling intensity is greater on the inner estuary, it is possible that wildfowling disturbs both feeding and roosting birds. Birds do continue to feed and roost there in high numbers, however, and so wildfowling is not at such a level as to deter birds completely. However, without a long-term wildfowling dataset it is impossible to relate trends in numbers since 1970 to wildfowling intensity. Similarly, other factors such as bait-digging, dog-walkers, helicopters, boats and raptors may disturb birds but without a long-term dataset no conclusions about effects on the population can be drawn. The only recommendation concerning this species should be to identify fully the important roosting locations (not just the Core Count sectors of the estuary) and to investigate any potential problems around these roosts. The most likely problem areas are the GSC's non-refuge sectors which may support important roosts of Redshank along the fringing saltmarsh.

Other internationally important species

Black-tailed Godwit, Knot and Dunlin (in addition to Grey Plover and Redshank) all occur in internationally important numbers on the Stour. All currently have favourable population trends relative to their national populations. None of them are quarry species and it could be argued that wildfowling disturbance cannot be affecting them. However, given their importance at the site, it is worth briefly reviewing the three species in case future decisions affect them.

All three species occur widely throughout the site at high and low tide. At high tide, Knot and Dunlin have concentrations at Deep Fleet and Manningtree/Seafield and the latter upper estuary area is also frequented by roosting Black-tailed Godwits. None of these species roost in appreciable numbers in Jacques Bay or West Copperas Bay. At low tide, however, some redistribution occurs with Black-tailed Godwits spreading out downstream and Knot and Dunlin occurring throughout. Jacques Bay and West Copperas Bay, avoided at high tide, are both utilised at low tide. This would suggest either a lack of suitable roosts or excessive shore-based disturbance in these sections. It is known (Section 4) that Jacques Bay is the area most frequented by bait-diggers. However, since the area is relatively avoided at high tide not low tide then bait-diggers are unlikely to be cause.

Other quarry species

In addition to Wigeon and Mallard, two other species are frequently shot by wildfowlers. Teal numbers (23% of the bag) are not thought to be in decline at the Stour. However, compared with Wigeon, the numbers of Teal and Mallard shot appear to be relatively high in comparison to their estuarine populations. The wildfowlers' statistics suggest a minimum of 66 Teal are killed each year, although the actual number is likely to be slightly higher due to injured birds and illegal shooting. The five-year peak mean for the species is 333 birds,

suggesting that wildfowlers kill at least 20% of Teal each winter (compared to 3% of the Wigeon and 14% of the Mallard). As discussed above, the actual percentages are, however, likely to be lower due to turnover of birds throughout the winter. Again, if one assumes similar degrees of turnover between species, it is more likely that wildfowling has a effect on wintering Teal than on Wigeon or Mallard. However, whether or not there is a significant effect is another matter. It may well be that the killed birds form part of the "doomed surplus" and the loss of these birds has no effect on the overall population. The matter is further complicated by the fact that Teal are notoriously difficult to count at sites where saltmarsh exists and the totals recorded by WeBS Low Tide Counts were somewhat higher than those from the Core Counts. Without more detailed datasets on long-term shooting intensity, it is not possible to say whether or not wildfowling is suppressing numbers of Teal at the site.

Canada Geese comprise 13% of the bag at the Stour. However, given that this species is non-native, increasing and often legally "controlled", any downwards effects on its population level are of little concern in a conservation sense.

6. THE EFFECT OF NO-SHOOTING REFUGES ON WATERBIRDS USING THE STOUR ESTUARY

The Stour Estuary is arbitrarily divided into a number of different zones, on which differing permissions for wildfowling and conservation exist (Figure 3.1). Moving clockwise around the site from Harwich, Bathside Bay is designated an unshot area. Most of Deep Fleet and West Copperas Bay is owned by the RSPB. From Strandlands to East Grove, the RSPB rent the lease including the sporting rights. West to the corner of the saltmarsh, the lease of sporting rights is held by LODWA, who also have a long term lease of the salting above high water. From here westwards into the easternmost parts of Jacques Bay the shore is crown land. For about 100 m of Jacques Bay the lease is held by Wrabness Nature Reserve. BWA hold the shooting lease for the flats west of here throughout the rest of Jacques Bay. Within this zone, two sections comprising roughly half of the area have been designated as a refuge by the club, including a section around Nether Hall and the westernmost ½ km.

On the north shore, the lease of sporting rights for Seafield Bay and the shore to just east of Stutton Ness is held by the GSC. Within this area, three small sections are designated as refuges by the club. To the east, the western third of Holbrook Bay is crown land under a Local General Agreement. The lease of sporting rights for the central parts of Holbrook Bay are held by the AWA. A little east of Gallister Creek, the shore becomes crown land under Local General Agreement again as far as Erwarton Ness. In Erwarton Bay, the lease for the western half is held by the RSPB who also hold the freehold for the eastern half.

It is possible to examine whether the location of existing refuges has a relationship with the distribution of waterbirds recorded by WeBS Core and Low Tide Counts, by overlaying the bird distributions with the refuge areas using a GIS package such as ArcView. The results of such an investigation are as follows.

There is very little evidence that the low tide feeding distributions of waterbirds at the Stour Estuary (in both 1996-97 and 1999-00) are influenced by the existence or otherwise of no-shooting refuges. This is perhaps not surprising given that most wildfowling occurs around high tide and also at dawn or dusk. Very few WeBS Low Tide Counts at the Stour began before 0800 and most ended before 1400. Of the priority species identified above as displaying unfavourable population trends, Wigeon and Mallard were found widely over shooting areas as were Shelduck which particularly favoured Seafield Bay where shooting rights exist. Ringed Plover in 1996-97 perhaps displayed a preference for refuge areas in the western parts of Holbrook Bay compared to elsewhere in the inner estuary but this pattern was not repeated during 1999-2000. Grey Plover and Redshank were very widespread. Mute Swans were concentrated between Seafield and Mistley but probably favoured the river channel, which would be less likely to be shot over anyway. Cormorants were widespread.

It would be more expected for a relationship to exist between high tide distribution and shooting activities. The WeBS Core Counts are carried out around high tide on the Stour and the results of these counts can also be overlain on the refuge boundaries. Unfortunately, the level at which WeBS Core Count data are collected (*i.e.* the ten sectors depicted in Figure 2.1) is at too coarse a scale to compare usefully with no-shooting refuges. For example, the Jacques Bay WeBS Core Count sector contains six different wildfowling/refuge zones. Therefore, it is not really feasible to attempt to investigate any relationships.

Some further information was provided as to the precise locations of the principal roost locations around the estuary. However, this was for all species combined and not at the level of separate species. From this information, it would appear that the majority of roost locations are not within shooting areas (some are within refuges, others within fields away from the estuary). The main exceptions are roosts within saltmarsh at Cattawade works (TM112328) which is a shooting area for GSC, roosts within Jacques Bay at Nether Hall (TM138317) and in the saltmarsh east of here at TM150316, both of which are within the shooting areas of BSC, and the roost in the saltmarsh at Shore Farm (TM179324) which is shot over by LODWA. It has been noted in the species accounts above that Jacques Bay and West Copperas Bay (which includes the Shore Farm roost) are somewhat avoided by a number of species (particularly Grey Plover, Knot and Dunlin) at high tide which move in to feed there at low tide. It is possible, therefore, that high tide roosts in this part of the estuary are under-utilised due to wildfowling. However, it was also noted that Jacques and West Copperas Bays received fewer wildfowling visits than Seafield and Holbrook Bays and that the number of kills was fewer here. Additionally, bait-digging was also more common in Jacques Bay, which may also be a factor in depressing roosting numbers here although this activity tends to occur mostly at low tide.

7. A DECISION-MAKING SYSTEM FOR THE REVIEW OF WILDFOWLING CONSENTS

This section produces a decision-making system for future reviews of wildfowling consents from the experience gained in gathering the data from the Stour Estuary. This system is then tested using the Stour information in Sections 8 and 9 and recommendations for the future are presented in Section 10.

7.1 General Considerations

In order to ensure that all parties find the decision-making process acceptable, there are a number of factors that should be borne in mind. The whole process starts from the pragmatic stance that since wildfowling has been practised for decades as a traditional activity any modifications to consents should only occur if there is reasonable evidence that it is adversely affecting the favourable conservation status of a species within the SPA. The process needs to be easily understandable by all and should not be unnecessarily onerous, thus the process should clearly identify at an early stage those species where there is no reason to investigate whether wildfowling is affecting the population of the estuary. In addition, it is extremely important that the system should have clear outcomes which will be understood by all and have a clear timescale for the next review. Throughout, we ask a series of questions, "is there evidence for ….?" If the answer is "no" then this means precisely what it says, *i.e.* "there is no evidence". It does not imply, however, that there either is or is not a problem, simply a lack of evidence either way.

In order to produce the system we have focused on the identification of the status of each species within the site as the first step in the process and then produced three flow charts to be followed depending on whether wildfowling on the site is increasing, stable or decreasing. Data from the Stour have then been used as a worked example, to show how the system would work. In addition, two fictitious species have been created, one a quarry species and the other a non-quarry species, both of which are strongly declining on the site to investigate how the decision-making system would respond in these scenarios.

7.2 The Use of Alerts in the Review of Consents

Figure 7.1 shows the possible combinations of alerts that could be produced for the site and for the UK as a whole. We have split these alerts into four groups. Group A is for all instances where both the local and the UK population is either stable or increasing, thus the species will have a favourable conservation status on the site and in the UK as a whole. Group B groups those species which are either stable or increasing on the local site, but in decline nationally. Clearly, caution needs to be exercised for these species. Group C is for those species which are either stable or increasing at the UK level, but are decreasing at the local scale. This group are the most likely to have been affected by local factors within the site, rather than as a result of national population change. Finally, Group D covers all those species which are declining both locally and nationally. Here it is likely that factors outside the site are the main cause of population decline.

It should be noted that in the context of using alerts in the review of consents, a "stable population" is defined as one which has changed over a given time period by between +25% and –25%. An increasing population has increased over a given time period by 25% or more. A decreasing population has decreased over a given time period 25% or more.

The alerts system produces alerts at five-, 10-, 25- and all-year scenarios. We propose that the highest-level alert should be used in all cases. Thus, if a species has been increasing at the local site over the last 25 years and all years, but there is evidence for a greater than 25% decrease in the most recent five years, this should be used to investigate whether wildfowling could be a contributory factory. Both the highest level site alert and national alert should be used, even if these do not refer to the same time period. Each of these categories is then used in the flow diagram that relates to the wildfowling pressure on the site.

7.3 The Decision-Making System

When each species has been placed in a category, the next stage in the process is to assess the level of wildfowling. As wildfowling has been a traditional activity throughout the UK it is, in general, not possible to compare the bird numbers and distribution during years when there is no wildfowling with years when wildfowling has occurred. It may, however, be possible to compare sites where wildfowling occurs with sites where it does not. If this approach were used with paired sites (chosen according to their characteristics and geographical location) insight into the effects of wildfowling might be obtained. Comparisons of distribution during the shooting season with that outside it may show changes, but it is difficult to separate the effects due to changes in prey availability and migratory habits from those potentially due to wildfowling. Therefore, the measure that we have used as a starting point relates to the change in wildfowling activity over the period for which the alerts have been produced. Three scenarios have been produced depending on whether wildfowling is decreasing (Figure 7.2), stable (Figure 7.3) or increasing (Figure 7.4). It should be noted, however, that hard data to determine trends in wildfowling intensity will seldom be available (during this current review) and that the decision over whether wildfowling is increasing, stable or decreasing is likely to be largely based on anecdotal evidence.

7.4 Explanation of the System

7.4.1 Definitions

The following decision-making system has been produced using the following definitions for key phrases:

Alert

The Alerts referred to here are those produced by Atkinson *et al.* (2000b) and use five categories,
Increasing by 50% or more
Increasing by between 25% and 50%
Stable (this means population has increased or decreased by less than 25%)
Decreasing by between 25% and 50%
Decreasing by 50% or more

Birds shot

This is taken to include the numbers shot by wildfowling clubs, illegal shooting and any birds shot but not retrieved. Thus the returns from the clubs would be expected to be minima.

Evidence for

Throughout, this means that there is evidence for something. If however there is no evidence for, it does not mean that it is not true, just that it has not been shown whether it occurs or not.

Favourable conservation status

This is taken to be as defined in Article 1.i of the Habitats Directive

- "the population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats; and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis."

In effect this is taken to be a stable or increasing population for the purpose of this report.

Wildfowling - increasing, stable or decreasing

At present there is not a clear definition of what constitutes the level of wildfowling as the important factors could be the number of birds shot (see above), the number of shots or the number of visits. For the purpose of this study it is assumed that the number of birds shot is linearly related to both the number of shots and the number of visits. Furthermore, it is assumed that if the distribution of shooting within the site changes (e.g. increasing in one part but decreasing by a matching amount in another part), then the two parts of the estuary should be considered separately.

7.4.2 Group A

All wildfowling scenarios

In all three scenarios (increasing, stable or decreasing levels of wildfowling) species in Group A, *i.e.* those that are increasing or stable on the site and increasing or stable at the national level, would be considered in the same way. For these species, it is considered that no action is required in terms of changing the level of consent from the existing, but that a timescale should be set for the next review so that all parties are clear when this will occur. In normal circumstances we would propose that this should be in six years time, as part of the SPA review procedure. The only exception to this would be if there was expected to be an extremely large increase in the level of wildfowling. In the current situation with wildfowling and conservation within Britain, this is considered sufficiently unlikely not to be formally considered. If it did occur, the flow chart for Group B should be followed.

7.4.3 Group B

Wildfowling decreasing or stable

For species in alerts Group B, if wildfowling is either stable or decreasing on the site it cannot currently be having a negative effect on the maintenance of the conservation status of the species within the site, as the local population is either increasing or stable. If, however, there is a strong decline at the UK level, it would be prudent to identify sites elsewhere where

the species is declining and investigate why the species is doing better on the site being reviewed. This may yield valuable conservation information, although this is not necessary for the review of wildfowling itself on the site. The timescale for the next review of wildfowling consents should be set, which would normally be in six years in line with the SPA review process.

Wildfowling increasing

If however, wildfowling is increasing on the site, then a different approach is needed for Group B. First, the location of the sites where the increase in wildfowling is occurring needs to be identified, be this an increase in usage of a wildfowling area or the use of an area previously not shot over by wildfowlers. If there is no significant overlap between sites with declining birds and sites with increasing levels of wildfowling, then it is necessary to look elsewhere for reasons of population decline and there is no reason to control the increase in wildfowling. If, however, there is significant overlap in both space and time between wildfowling and the species, then it is necessary to investigate whether there is evidence that the species is adversely affected by wildfowling. If there is not, there is no reason not to allow the increase in wildfowling to continue. If there is evidence that the species is adversely affected by wildfowling, then it is necessary to assess whether this increase is likely to affect the conservation status on the estuary. Only if this is likely to occur, would it be necessary to consult the wildfowling clubs with a view to altering the consents, either by changing refuge areas or timing of wildfowling to mitigate against the likely negative effect on the conservation status. A period needs to be set for a review of any measure which would normally be at the time of the next SPA review.

7.4.4 Groups C and D

Alerts Groups C and D will go through the same part of each of the three flow charts. However, the presumption with species in Group C would be that local factors were most likely to be involved in the decline, whereas for Group D factors throughout the range of the species (possibly including the local site) would be most likely to be the cause. This presumption should be used as an initial guide rather than a certainty. The first stage in the process for these two groups is the same in all three cases. The periods of population decline need to be identified through a more detailed inspection of the count data. First, the number of bird months per winter should be plotted over time and, if necessary, an investigation as to whether there is a change in the timing of arrival or departure of the species should be made. It would be quite possible in certain circumstances (e.g. with the effects of climate change) that the same number of birds could be wintering on the site. However, they could be arriving later and leaving earlier, resulting in a decline in the number of bird-months. In addition, all changes known to have occurred on the site should be documented.

Wildfowling decreasing

Under this scenario the presumption should be that it is highly unlikely that wildfowling is leading to the population decline. Therefore, the first investigation should be to see whether there is evidence of habitat change, change in disturbance, severe weather, pollution or other known changes on the site. If there is no evidence of such changes, then the issue of wildfowling needs to be considered further. However, if there are changes the next step is to investigate whether there is evidence from studies elsewhere or direct evidence on the site that these changes are the cause of the decline in bird numbers. If these changes are

considered not likely to affect the population, then it is necessary to investigate wildfowling further. If these other issues are considered to be the cause, then investigations should be undertaken to see if it is possible to reduce the effect through voluntary agreement or regulation. If this is possible, then any voluntary control or regulation should have a set review period to assess its effectiveness. If these factors cannot be controlled by regulation or voluntary agreement, it is worth considering whether changes to the status of refuges or their location within the site would be likely to be beneficial to the species. Only if this is found likely to be the case would consideration be given to changing the status or the location of refuges. The timescale for the review of the effectiveness of these changes would need to be decided at the same time as their implementation.

If possible causes of the declines have not been identified at various points in this process, then the spatial and temporal overlap between hunting and species distribution should be investigated, together with any evidence for any changes in bird distribution. This will assess any evidence that birds are actively moving away from hunted areas. It should be noted that current data for wildfowling and waterbirds (*i.e.* WeBS Counts) are seldom collected at the same spatial scales and so this question should be interpreted with caution. If this is not the case, then it is important to investigate whether there are other causes of decline elsewhere in the range, or if there is a change in the distribution within the UK of the species concerned. If there is evidence of temporal and spatial overlap, the long-term population trends should be investigated. If there have been periods of substantial increase (e.g. for a period of over five years) at the present level or a higher level of wildfowling then it is unlikely that the cause of the decline is related to wildfowling and other factors should be looked for. If there has been no period of sustained population increase at similar or higher levels of wildfowling then the next step is to investigate whether there is any evidence from elsewhere that the species distribution is affected by hunting. Only if there is evidence for this should the wildfowling clubs be consulted with a view to modification of the consents to reduce the spatial and temporal overlap in hunting: this could either be done by changing the location of refuges or agreeing periods of the day, the tidal cycle, or of the season, when certain areas would not be used for wildfowling. Any changes that were made should be made at the same time as setting a timescale for the detailed reviewing of their effectiveness and decisions made as to the data that would be needed for such a review.

Wildfowling stable

If wildfowling is stable then the same flow chart needs to be followed. There is, however, no presumption of whether or not wildfowling is a contributing factor to any species declines.

Wildfowling increasing

There are slight modifications to the decision-making system if wildfowling is increasing. After identifying the periods of population decline a different scenario is required, depending on whether the species is a quarry species or a non-quarry species. If the species is a quarry species, an assessment is needed as to whether the number of birds shot has increased to a level that could account for any local decline. We do not propose that a detailed survival analysis should be undertaken at this point, but an approximate assessment of the percentage of the peak winter population shot each year should be made. This is likely to give only a rough guide as the numbers shot will not include any illegal shooting and, conversely, the peak winter count is likely to underestimate the total number of birds using the site as it does not account for turnover.

Clearly, if wildfowling is at such a level that it seems likely that it is impacting on the population of a quarry species, then the wildfowling clubs need to be consulted over the need for measures to ensure the favourable conservation status of the species on the estuary in future. Any resulting modifications to wildfowling resulting should be undertaken with a time scale set for reviewing the effectiveness of the change. If the hunting pressure is not considered likely to affect the species directly, then the flow chart should be followed as before. If the species is a non-quarry species, then it is necessary to begin by assessing whether there is evidence of habitat change, disturbance etc., that could be possible causes for the decline and follow the flow chart from this point.

8. CASE STUDY APPLYING THE DECISION-MAKING SYSTEM TO THE STOUR ESTUARY

Section 3 of this report reviewed the information on wildfowling on the Stour Estuary. Consistent wildfowling records were only available for the last five years. This section is undertaken using this information and Section 10 will identify modifications or additions to these data that would enable the decision-making system to work more efficiently in future. During this period there was no clear trend in the wildfowling bag suggesting a stable situation. In the longer term, anecdotal information suggests that, if anything, wildfowling has decreased during the period for which we have waterbird count data. Following the precautionary principle, wildfowling will be categorised as stable.

Table 2.1 reported on alerts for the Stour Estuary and for the UK for all those species regularly occurring on the site. Table 8.1 summarises this information into the categories of alert previously explained. Of the 22 species with data that are considered, 11 are assigned to Category A, *i.e.* both the populations on the Stour and throughout the UK are either stable or increasing. No further action is needed (Position 1 on Figure 7.3), irrespective of the wildfowling intensity. The situation for these species should next be reviewed in six years time as part of the SPA review process.

Group B

Two species, Knot and Turnstone, fall into Category B. Both species are doing well on the Stour, increasing by over 50% over the last 25 years. Nationally, Knot has declined over all years. This decline is considered to be the result of bad weather on the Arctic breeding grounds in the 1970s, which is known to have caused substantial mortality amongst adult birds (Atkinson *et al.* 2000a). Turnstone populations nationally have been stable at five-, 25- and all-year time scales, but have shown a decline over the last 10 years. This is because there was a steady increase in Turnstone up to the late 1980s and then there has been a slow decline since. The national index is now at a similar level to that in the early 1970s. Turnstone concentrate mainly in the outer portion of the estuary, away from the main wildfowling areas, hence there is no reason for considering this species further (Position 2).

Knot distribution is concentrated in the upper part of the estuary, an area where wildfowling does occur. However, as the species has increased substantially on the estuary over the last 25 years and the reason for the national decline in the 1970s is understood, there is no reason to consider this species further.

Review of the status of these species should be undertaken again in six years time.

Groups C and D

There are eight species for which there have been periods of decline on the Stour which have not been matched by periods of decline nationally and are assigned to Category C. Additionally, there is one species, Mallard, for which there has been a decline on the estuary as well as at the national level over the past 10 years and Mallard is thus assigned to Category D. The Underhill indices and smoothed indices (as discussed in Section 2.1) for these nine species are shown in Figure 8.1; each is considered in turn below.

Cormorant

This species triggers a 10-year alert. Cormorant numbers on the Stour are quite variable between years, with index values since 1987 varying between 97 and 214. However, since 1992 index values have varied between 97 and 159 suggesting that there has been a generally lower population using the site. Analysis of ringing information has shown that Cormorants are now more likely to winter inland within Britain and this shift inland could have contributed to the reduction in numbers using the Stour. There is no available evidence for habitat change or other obvious factor for the decline.

There is little spatial and temporal overlap between wildfowling and the species distribution as Cormorants are mainly present in the main channels rather than close to the shore where wildfowling occurs. It is therefore necessary to investigate whether the causes of the decline could lie elsewhere within the range. Cormorants are known to have increased substantially, wintering on inland waterbodies in recent times (Wernham *et al.* 1997), and it is possible that this move might have accounted for the decrease in numbers on the Stour in recent years (Position 4). There is no reason to change wildfowling consents in light of the change in the Cormorant population. The status of the species should be reviewed during the next SPA review procedure in six years time.

Mute Swan

There is evidence that the numbers of Mute Swans have decreased since the start of counting on the Stour in the late 1960s. Their decline coincided with the closure of a brewery in the upper estuary (where the swans were concentrated). The reduction in discharges from this brewery may have been reason for much of this decline. Since the mid 1970s, however, the numbers have been stable or slowly increased in line with the UK population. Mute Swans were known to be adversely affected by the ingestion of lead from angling weights and picking up spent shot in wetlands. Lead shot is no longer used in wetland sites such as the Stour, so wildfowling will not be contributing to an increase in the amount of lead available for swans to ingest in the future. It appears, therefore, that action already taken may have already led to a stabilisation and then signs of recovery in the Mute Swan population on the Stour, so no further action needs to be taken at the present time (Position 5). The situation should be reviewed in six years time as part of the next SPA review.

Canada Goose

There is a 10-year alert for this species showing a decline of more than 50%. However, over a longer time-scale Canada Geese have increased dramatically. The species was virtually absent from the estuary until 1984 and since then numbers have varied dramatically between years. This variability is likely to be due, in part at least, to the fact that the species is only loosely associated with the estuary as a site and is likely to be spending much of the time in flocks on nearby farmland or waterbodies, thus accounting for the great variability in counts. As an introduced species, Canada Geese are not considered of conservation significance. Indeed, there have been efforts in parts of the UK to reduce the numbers of Canada Geese. It is therefore inappropriate to consider this species in relation to wildfowling consents.

Shelduck

Shelduck numbers have varied substantially between years on the Stour and a five-year alert has been triggered. This is largely as a result of higher numbers than normal in the period around five years ago, rather than low numbers on the Stour at the present time. There is no available evidence that there is substantial habitat change, or other change, which has caused the recent return to former levels. There is considerable overlap between wildfowling and Shelduck distribution as the species is concentrated in the upper portion of the estuary. However, there is no evidence that the recent reversion to former levels is as a result of an increase in wildfowling pressure in this area (largely because there are insufficient wildfowling data available). Recent declines within the UK as a whole mean that the species should be kept under review (Position 4). There is no evidence currently available with regard to this species which would require a change in wildfowling consents on the Stour Estuary.

Wigeon

Wigeon have declined by more than 50% on the Stour since the start of counting in the mid-1960s, triggering an alert for all years. However, this alert is triggered solely because of the exceptionally high numbers present in the winters of 1966/67 and 1967/68. Since then numbers have been essentially stable. There is no available evidence of a substantial change in the environment of the Stour that could have led to this population change after the 1967/68 winter. There is considerable overlap between Wigeon distribution and wildfowling as this is the most shot species by wildfowlers within the estuary. Since the population is essentially stable on the Stour and increasing in Britain as a whole, there is no reason to change wildfowling consents (Position 4). The situation should be reviewed at the next SPA review in six years time.

Mallard

This is the only species to be assigned to Category D, *i.e.* declining both on the Stour and nationally. The population in Britain as a whole remained essentially stable during the 1970s, increasing during the 1980s and declining again during the 1990s, which triggered a 10-year national alert. The pattern on the Stour is broadly similar, although there was a much higher population in the 1980s than either before or since. Substantial numbers of Mallard are reared in captivity and released by wildfowling clubs throughout Britain. In the 1980s it was suggested that this may be as high as 400,000 birds per year, while some 700,000 were shot annually in Britain (Owen *et al.* 1986). Data from the wildfowling clubs on the Stour suggest that the annual take of Mallard is about 14% of the birds which winter on the estuary. There is no clear explanation for the decline in the wintering population of Mallard either on the Stour or nationally. Possible reasons could be a decline in the numbers of Mallard from overseas coming to Britain or a decline in the level of releases from UK wildfowling clubs. At present there are no data available to refute or support these hypotheses.

There is clearly considerable overlap in the distribution of Mallard and wildfowling on the estuary as they are a target species for wildfowlers. There is no available evidence of substantial changes in their distribution as a result of wildfowling, largely because of a lack of a long-term wildfowling dataset. Mallard populations on the Stour increased considerably in the late 1970s and 1980s when wildfowling pressure was considered to have been at a higher or similar level to the present time. It is therefore necessary to investigate possible

causes for the decline at a wider scale within Britain, although this is not relevant for reviewing wildfowling consents on the Stour (Position 4). The situation regarding this species should be reviewed in six years time, at the time of the next SPA review.

Ringed Plover

Ringed Plover populations on the Stour have always been highly variable between years. This is probably due, in part, to the difficulty of counting Ringed Plover, particularly in winter, as they are a highly cryptic species when roosting and are also often lost within large flocks of species like Dunlin. The general pattern for Ringed Plover, however, is of a fairly stable population in the 1970s, increasing through the 1980s and then declining back to a level similar to the 1970s in recent years. There is considerable concern that increasing recreational use of beaches where Ringed Plover breed all around the North Sea, may be leading to a population decline in the species. Such factors occur outside the wildfowling season and would not be related to wildfowling in any way. The main Stour populations of Ringed Plover occur in Bathside Bay and Deep Fleet, where wildfowling does not occur. Furthermore, Ringed Plovers increased substantially during the 1980s when wildfowling is considered to have been at a higher or similar level to the present time. There is no available evidence to suggest that the decline in Ringed Plover on the Stour is related to wildfowling (Position 4), hence the species should be reviewed at the time of the next SPA review in six years time.

Grey Plover

Grey Plover is in Category C due to the decline that has occurred in the last five years on the Stour. However, Grey Plover have gone through a dramatic increase throughout this century and the alert has been triggered by a drop of some 35% in the last five years. This has occurred at a time when the national population has also dropped, albeit by a lesser amount. The population is still, however, in the order of 10 times higher than the population in the early 1970s. There is no available evidence for habitat change or other effects within the estuary to have caused this recent decline. There is considerable overlap between Grey Plover distribution and wildfowling. There is no available evidence, however, to suggest that the latter has caused the decline. Grey Plover are susceptible to the effects of severe weather and so it would be prudent to discuss with the wildfowling clubs their policy of voluntary bans on wildfowling in severe weather (Position 3). The situation for this species should be reviewed in six years time at the time of the next SPA review.

Redshank

There has been a decline in Redshank numbers on the Stour over the last 25 years, triggering an alert for a reduction of over 25% in the population. However, closer inspection of the figures reveals that this decline occurred between the 1985/86 winter and the 1986/87 winter, when the population declined by two thirds. This decline was almost certainly the direct results of a period of severe weather in early 1986 (Clark & Davidson 1986). The population has slowly recovered over the following eight years. However, in 1994 the population suddenly increased three-fold for one year only. These birds may have been displaced temporarily from another estuary for reasons that are not clear. There is no available evidence to suggest that wildfowling consents should be modified. It does, however, highlight the reasons why the wildfowling clubs undertake a period of voluntary restraint if there is more than a week of severe weather in winter. This only becomes statutory after two weeks of

severe weather. These actions help reduce any disturbance to the birds to a minimum during a period when they are under extreme stress. It would be prudent to discuss with wildfowling clubs their policy with respect to voluntary wildfowling bans during severe weather (Position 3).

Summary

Applying the decision-making system to the Stour data has produced clear results. There are no species for which, at the present time, there is evidence that they may be declining as a direct result of wildfowling. There is, therefore, no reason to require modifications to the level of wildfowling or the level of refuge provision with the Stour.

There are two species that have been in decline on the Stour, Grey Plover and Redshank, which are particularly susceptible to the effects of severe weather. One of these, the Redshank, went through a population crash on the Stour as a direct result of a period of severe weather. Many wildfowling clubs introduced a voluntary ban after one week of freezing temperatures within Britain. In areas where these species occur in substantial numbers, it will be prudent to bring this information to the attention of the wildfowling clubs, with a view to ensuring that they following these best-practice guidelines.

9. INVESTIGATION OF THE DECISION-MAKING SYSTEM USING A SCENARIO INVOLVING FICTITIOUS SPECIES

In this section we briefly look at three species which are completely fictitious. We have used the Stour as a real site although this in no way implies that we would expect, or otherwise, to find these effects with current wildfowling practice on the Stour. We will assume that in the mid-1980s a new wildfowling club was formed which increased three-fold the level of wildfowling on the inner parts of the estuary. Figure 9.1 shows the decline that occurs in all three species during the mid-1980s. This decline is occurring at about the same time as the change in wildfowling intensity. Therefore, there is a clear reason for investigating the situation further. Figure 9.2 gives the population level throughout the winter in the 1970s for all species and compares this with that found in the 1990s.

Species A, in the 1990s, clearly uses the site for less time and we could postulate that this would be because a new reservoir was built nearby where a large number of the birds relocated, only occurring on the estuary in mid-winter, when the inland site was unsuitable. Species B and C, however, show a similar pattern of occurrence through the winter, but at a reduced population level. These two species could be being adversely affected by wildfowling. The distribution of the two species is given in Figures 9.3 and 9.4. Species C, shown in 9.3, shows no change in distribution between wildfowling and non-wildfowling areas. The only change is in the numbers across the whole estuary between the two time periods. Figure 9.4 shows a different pattern, with a similar distribution between the 1970s and the 1990s in the outer portion of the estuary, but those birds that remain in the inner estuary are largely concentrated in the refuge areas. Under this scenario there is good reason to investigate whether the change in wildfowling has indeed led to the decline. A sensible approach to investigating this would be to set up additional refuge areas and to monitor over the next two to three years to see, firstly, whether the new refuge area was occupied by an increased numbers of birds and, secondly, whether the number of birds on the estuary as a whole increased. This would therefore be in Position 7 on the wildfowling increasing scenario (Figure 7.4).

10. RECOMMENDATIONS

It is proposed that to implement the present system for reviewing wildfowling consents every attempt should be made to ensure that the following information is gathered in a standardised manner.

1. To assess whether wildfowling on a site is stable, increasing or decreasing BASC will need to collect standardised information on wildfowling intensity from all relevant sites. This will comprise information on the exact location of wildfowling on a site, date, time, conditions (such as on-shore winds), the number of shots fired as an index of activity, the species shot, the bag size and the age and sex ratios of the bag. An assessment of the number of birds that are shot but not retrieved would be useful but difficult at least in part because wildfowling is a crepuscular activity.

2. To assess the level of overlap between wildfowling and waterbird distributions every attempt should be made to ensure that the waterbird count data collected from the relevant sites are collected at the finest spatial scale possible and that they match closely the refuge and wildfowling areas.

3. To assess whether habitat change, recreational disturbance, pollution, weather or any factors are leading to any observed changes in waterbird numbers and distributions information on these parameters should be collected in a standardised manner from all relevant sites. There are obvious sources for weather data (British Atmospheric Data Centre) and pollution (Environment Agency) but there is no source for systematically collected disturbance information. WeBS disturbance data are far from ideal as they only relate to the day-time period and furthermore it is not compulsory for the WeBS counter to record these data.

It is proposed that further developments in alerting methodology be applied to the issue once they have been adequately tested:

4. Future assessments of the significance of changing waterbird populations on a site should be made at various spatial scales. First, if possible, the waterbird trends ought to be described for sections where wildfowling takes place and compared to those on the rest of the estuary. Second, the waterbird trends on the site should be compared to the trends occurring at the regional (e.g. East Anglia, "Greater Thames") and the national (UK or England) scales. Recent work has shown that there are strong regional differences in the population trends of waterbirds that occur in individual river catchments (Austin *et al*. in press).

5. It is suggested that once the testing of the significance of differences between smoothed GAMs indices has been further developed that this ought to be carried out as standard. This will make it possible to determine in a statistically rigorous manner whether there is a significant difference between two sets of indices (*eg* site indices and regional indices).

Finally, there remains a great deal of uncertainty as to the relative levels of tolerance of various waterbird species to disturbance (Davidson & Rothwell 1993) and more specifically to wildfowling. Whereas the behaviour of individual species changes with the ending of the wildfowling season (*eg* Holloway 1997) it is sometimes difficult to separate any contribution

of wildfowling to this behaviour from other factors such as time of the year. Additionally, it is not clear to what extent, if any, disturbance affects over-winter survival of waterbirds.

To help ensure that future assessments of wildfowling consents are carried out as swiftly and efficiently as possible it is suggested that:

1. A database containing all relevant data is held in one place (Points 1-3 above).

2. Any new relevant information on the impact of disturbance is reviewed at regular intervals (this can be done efficiently by maintaining copies of all relevant papers as they are produced).

3. The species that are most likely to be affected by wildfowling disturbance or mortality at the population level are identified and ranked. Non-intensive analyses on a single site are unlikely to detect any such effects but it may be possible to detect them using broad-scale data. The UK's estuaries (or sub-sites) could be categorised according to their level of wildfowling. Pairs of estuaries with similar geographical and broad morphological characteristics would be selected, each pair comprising an estuary with wildfowling and one without (or with relatively little). The population trends on these paired sites would then be compared for each species to determine if there is any evidence that certain species are affected by wildfowling. This should make it possible to rank species according to their possible vulnerability to wildfowling. This would help interpret any observed population trends on SPAs where wildfowling occurs, for if the population declines are happening equally for species affected by wildfowling and those not affected by wildfowling, wildfowling is unlikely to be the primary cause for the declines.

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Species	5YPM	%Nat	%Int	LT-2YPM	Stour only alerts				UK alerts			
					5 yr	10 yr	25 yr	All yr	5 yr	10 yr	25 yr	All yr
Great Crested Grebe	243	2.4		192		+	n.a.	++			na	++
Cormorant	146	1.1		70		-	n.a.	++		+	na	++
Mute Swan	276	1.1		182	++			--		+	++	++
Canada Goose	741	n.a.		105	n.a.	--	++	++			++	++
Brent Goose	2078	2.1		1646		+	++	++			++	++
Shelduck	2058	2.7		2299	-						+	++
Wigeon	2972	1.1		3183			+	--		+	++	++
Teal	333	0.2		636	+		++	++			++	++
Mallard	503	0.1		433		--	-			-		
Pintail	507	1.8		674		++		++				++
Goldeneye	128	0.8		156	++	++	++	++				++
Red-breasted Merganser	56	0.6		73	++	++	++	++			++	++
Oystercatcher	1889	0.5		1210	+	++	++	++			+	+
Ringed Plover (winter)	413	1.4		201	--	--	+					
Ringed Plover (passage)	678	1.4		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Golden Plover	644	0.3		1883	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Grey Plover	3269	7.6	2.2	2680	-	+	++	++			++	++
Lapwing	5491	0.3		4146	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Knot	4301	1.5	1.2	6766		++	++	++				-
Dunlin	14777	2.8	1.1	15787								+
Black-tailed Godwit	2381	34.0	3.4	1962		++	++	++	+	++	++	++
Bar-tailed Godwit	103	0.2		70	++	++	++	++				
Curlew	1320	1.1		949		+	++	++				++
Redshank	3012	2.7	2.0	2465		++	-	+				++
Turnstone (winter)	590	0.9		411	+	+	++	++		-		
Turnstone (passage)	738	1.1		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

5YPM = the mean of the peak WeBS Core Counts from each of the last five years
LT-2YPM = the mean of the peak WeBS Low Tide Counts from the 1996-97 and 1999-00 winters
n.a. = alert cannot be calculated from the available data
++ = increase >50%
+ = 25% < increase < 50%
! = 25% < decrease < 50%
!! = decrease > 50%

Table 2.1 Summary of WeBS data for the Stour Estuary.

Club	Area	Winters' data (P=summary only)					No. of visits over 5 years	% no birds shot	Number shot over five years										
		1995-96	*1996-97*	*1997-98*	*1998-99*	*1999-00*			*Greylag Goose*	*Canada Goose*	*Wigeon*	*Gadwall*	*Teal*	*Mallard*	*Pintail*	*Shoveler*	*Tufted Duck*	*Woodcock*	*Total birds*
Anglian	Holbrook Bay	Y	Y	Y	Y	Y	478	66	1	13	153	1	21	59	27	1	2		278
Braintree	Jacques Bay				Y	Y	47	23			43		55	11					109
Grove	Seafield	Y	P	P	P	Y	187	13	5	105	176		144	220	1	2			653
Little Oakley	Copperas	Y	Y	Y	Y	Y	68	59	5	26	36		17	18				1	103
Indiv. LGA	Holbrook Bay					Y	28	54	2	7	6		2	6					23
Totals							**808**	**57**	**13**	**151**	**414**	**1**	**239**	**314**	**28**	**3**	**2**	**1**	**1166**

Table 3.1 Summary of wildfowling bag data.

Club	Mean no. of visits scaled for coverage	Mean no. shot per year scaled for coverage										
		Greylag Goose	*Canada Goose*	*Wigeon*	*Gadwall*	*Teal*	*Mallard*	*Pintail*	*Shoveler*	*Tufted Duck*	*Woodcock*	*Total birds*
Anglian	95.6	0.2	2.6	30.6	0.2	4.2	11.8	5.4	0.2	0.4		55.6
Braintree	23.6			21.6		27.6	5.6					54.8
Grove	37.4	1.0	21.0	35.2		28.8	44.0	0.2	0.4			130.6
Little Oakley	13.6	1.0	5.2	7.2		3.4	3.6				0.2	20.6
Indiv. LGA	28.0	2.0	7.0	6.0		2.0	6.0					23.0
Estimated bag per year	198.2	4.2	35.8	100.6	0.2	66.0	71.0	5.6	0.6	0.4	0.2	284.6
% of bag		1	13	35	0	23	25	2	0	0	0	

Table 3.2 Estimated bag sizes per year.

	1995/96	1996/97	1997/98	1998/99	1999/00	Total
Canada Goose	34	15	38	21	36	144
Wigeon	68	86	60	115	36	365
Teal	51	46	25	34	26	182
Mallard	43	38	85	67	64	297
Others	7	4	9	14	12	46
Total	203	189	217	251	174	1034

Figures refer to the three clubs AWA, LODWA and GSA
(since only these three provided all five years of data)

Table 3.3 Wildfowling bag size each year.

Activity Name	WeBS Core Counts		WeBS Low Tide Counts		% of visits recording an activity which were considered to "disturb" the birds
	Activity noted	Disturbance noted	Activity noted	Disturbance noted	
Walkers	263	87	27	5	32
Dogs	152	58	19	3	36
Horse riders	3	0	0	0	0
Anglers	49	15	2	2	33
Shooters	11	9	6	1	59
Bait-diggers	2	0	10	8	67
Unpowered boats	71	25	6	4	38
Powered boats	53	25	2	1	47
Vehicles	6	2	0	0	33
Windsurfers	11	7	0	0	64
Aircraft	15	10	10	1	44
Other	33	21	1	0	62
Total	669	259	83	25	38

Table 4.1 Summary of WeBS activity and "disturbance" data. Note that "disturbance" is a subjective assessment.

Species	Stour only alerts				UK alerts				Alert category			
	5 yr	10 yr	25 yr	All yr	5 yr	10 yr	25 yr	All yr	A	B	C	D
Great Crested Grebe		+	n.a.	++			n.a.	++	T			
Cormorant		-	n.a.	++		+	n.a.	++			T	
Mute Swan	++			--		+	++	++			T	
Canada Goose	n.a.	--	++	++			++	++			T	
Brent Goose		+	++	++			++	++	T			
Shelduck	-						+	++			T	
Wigeon			+	--		+	++	++			T	
Teal	+		++	++			++	++	T			
Mallard		--	-			-						T
Pintail		++		++				++	T			
Goldeneye	++	++	++	++				++	T			
Red-breasted Merganser	++	++	++	++			++	++	T			
Oystercatcher	+	++	++	++			+	+	T			
Ringed Plover	--	--	+								T	
Grey Plover	-	+	++	++			++	++			T	
Knot		++	++	++				-		T		
Dunlin								+	T			
Black-tailed Godwit		++	++	++	+	++	++	++	T			
Bar-tailed Godwit	++	++	++	++					T			
Curlew		+	++	++				++	T			
Redshank		++	-	+				++			T	
Turnstone	+	+	++	++		-				T		

n.a. = alert cannot be calculated from the available data

++ = increase >50%
+ = 25% < increase < 50%
! = 25% < decrease < 50%
!! = decrease > 50%

Table 8.1 Categories of alerts for the review of wildfowling consents for the Stour Estuary.

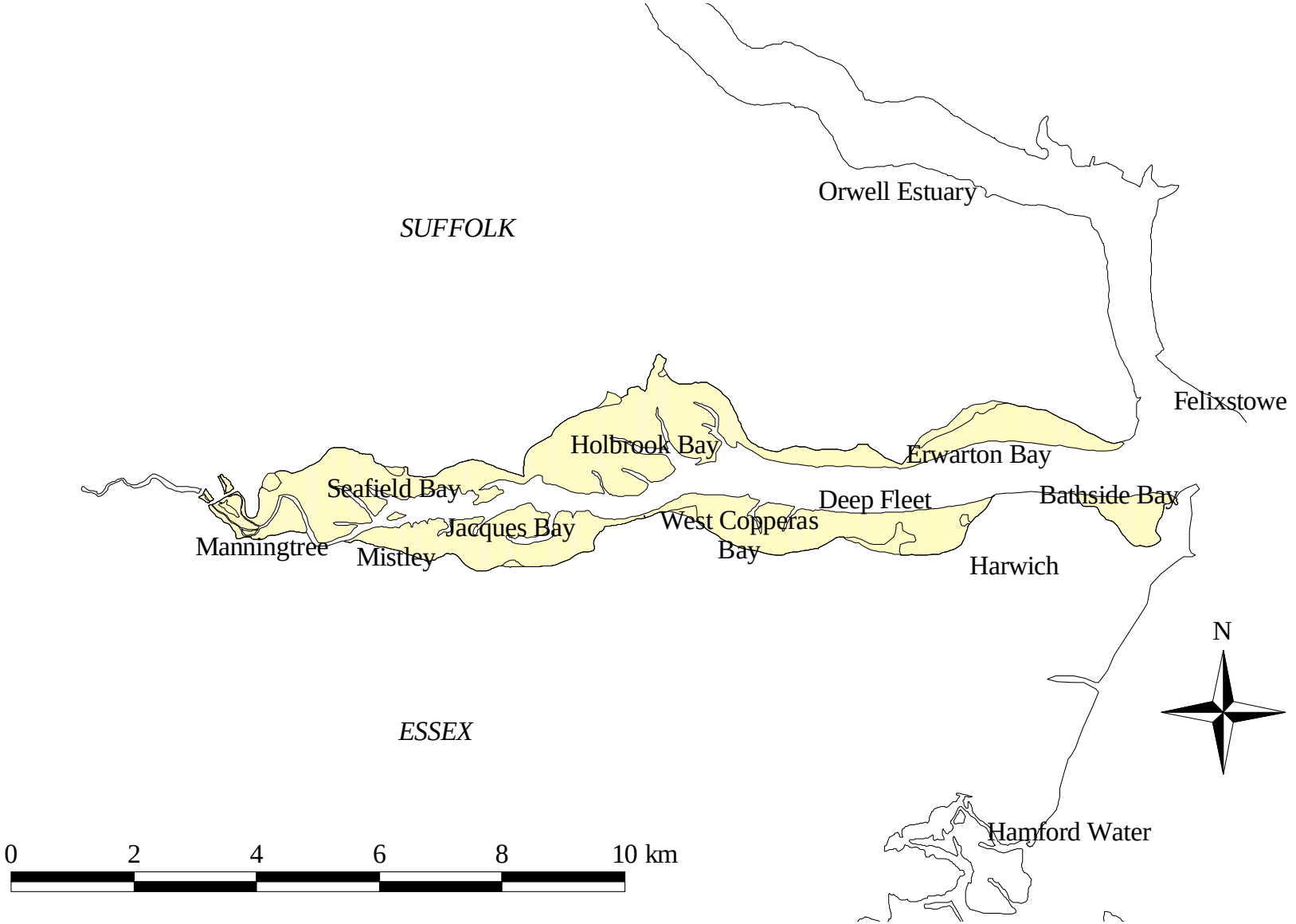


Figure 1.1 General map of the Stour Estuary.

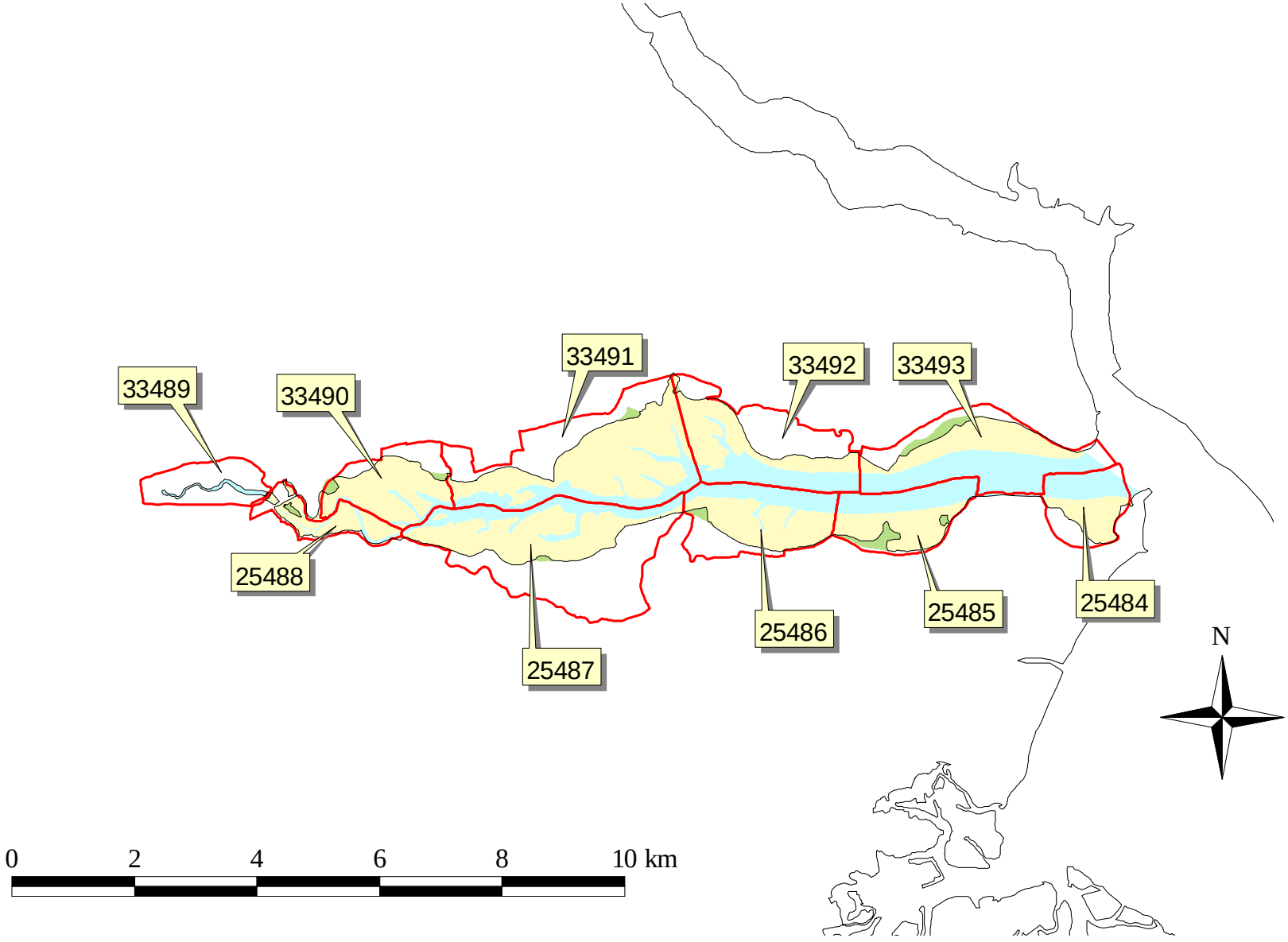


Figure 2.1 Map of WeBS Core Count sectors on the Stour Estuary.

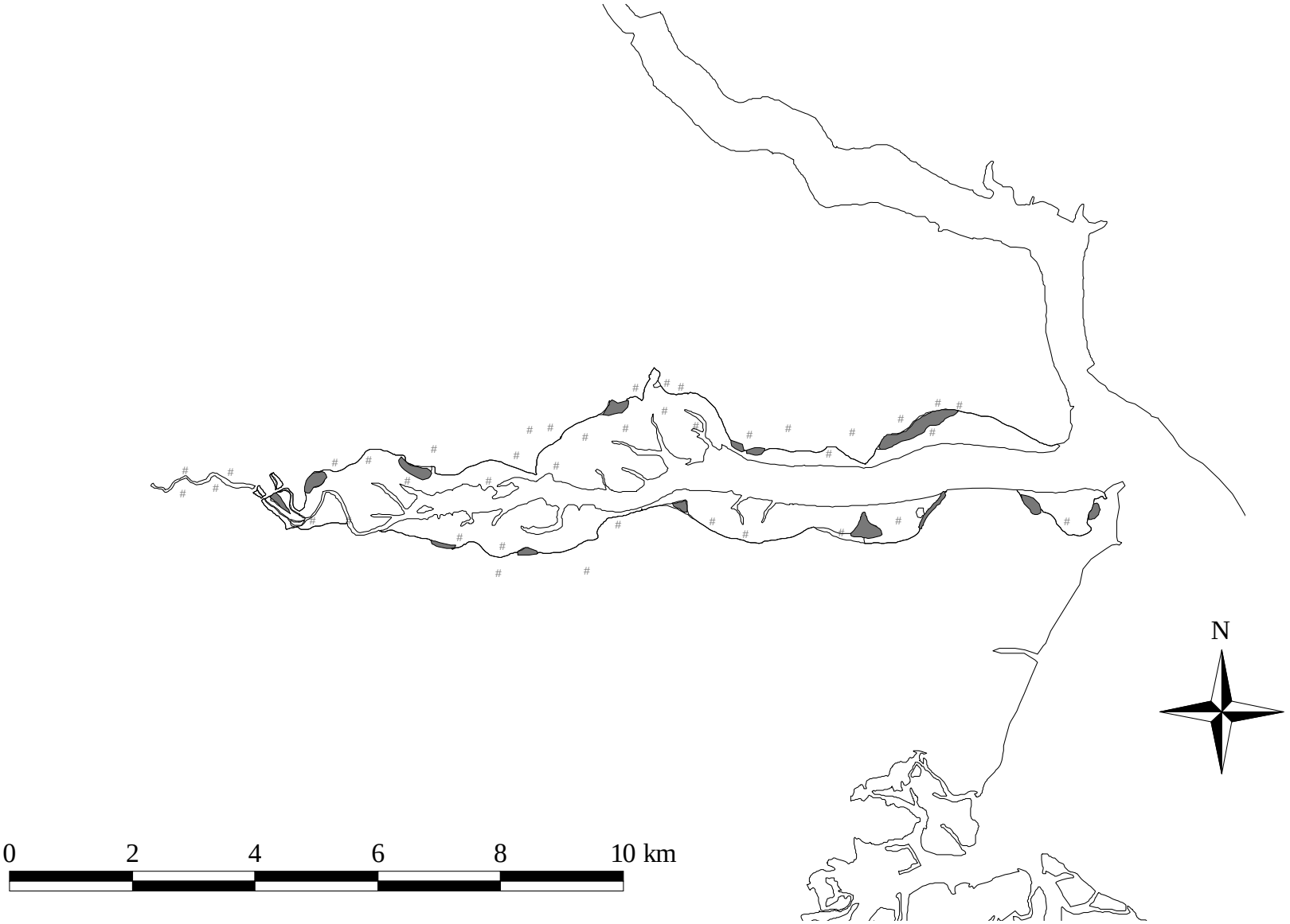


Figure 2.2 Map of actual waterbird roost locations on the Stour Estuary.

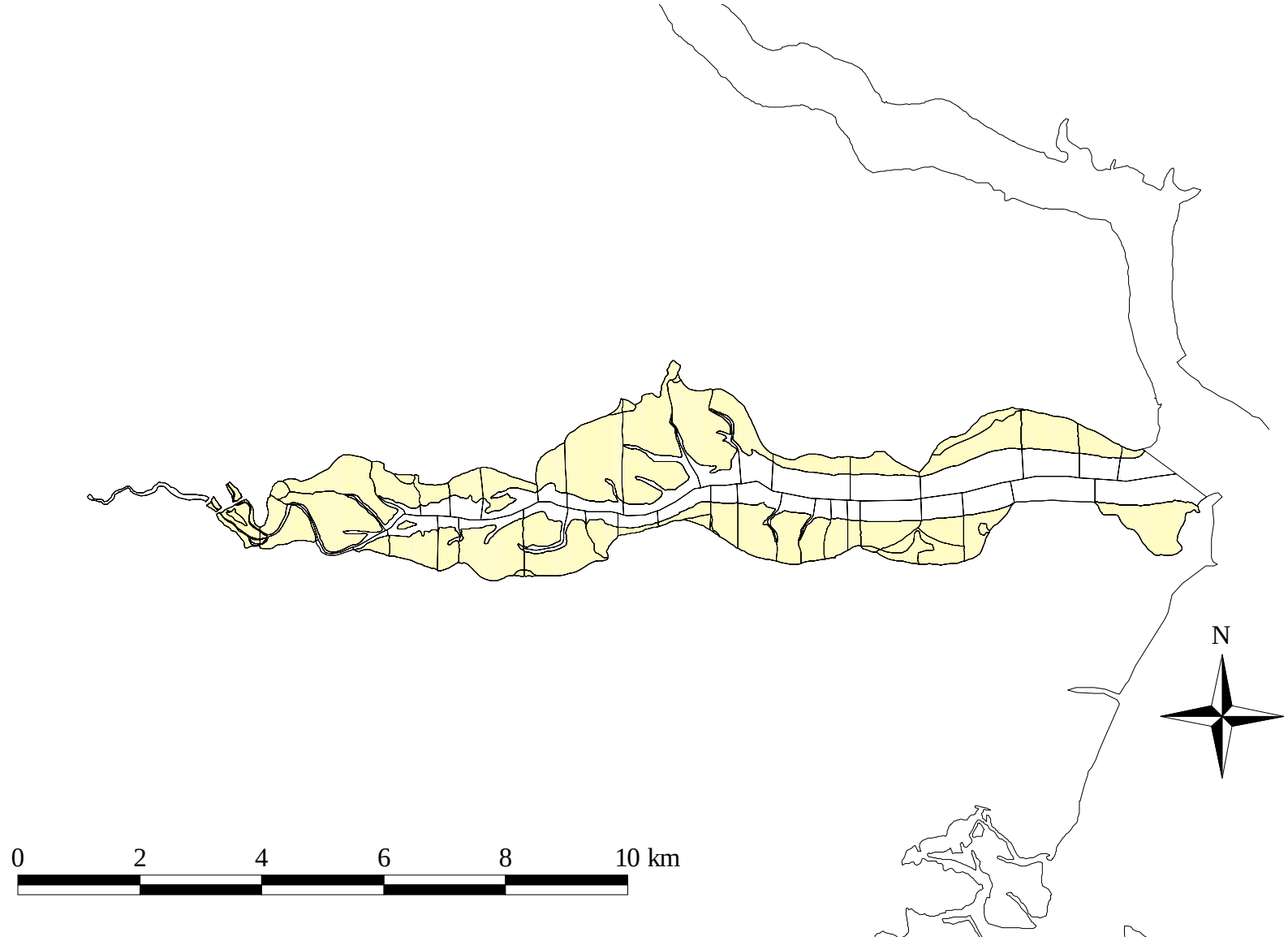


Figure 2.3 Map of WeBS Low Tide Count sectors on the Stour Estuary.

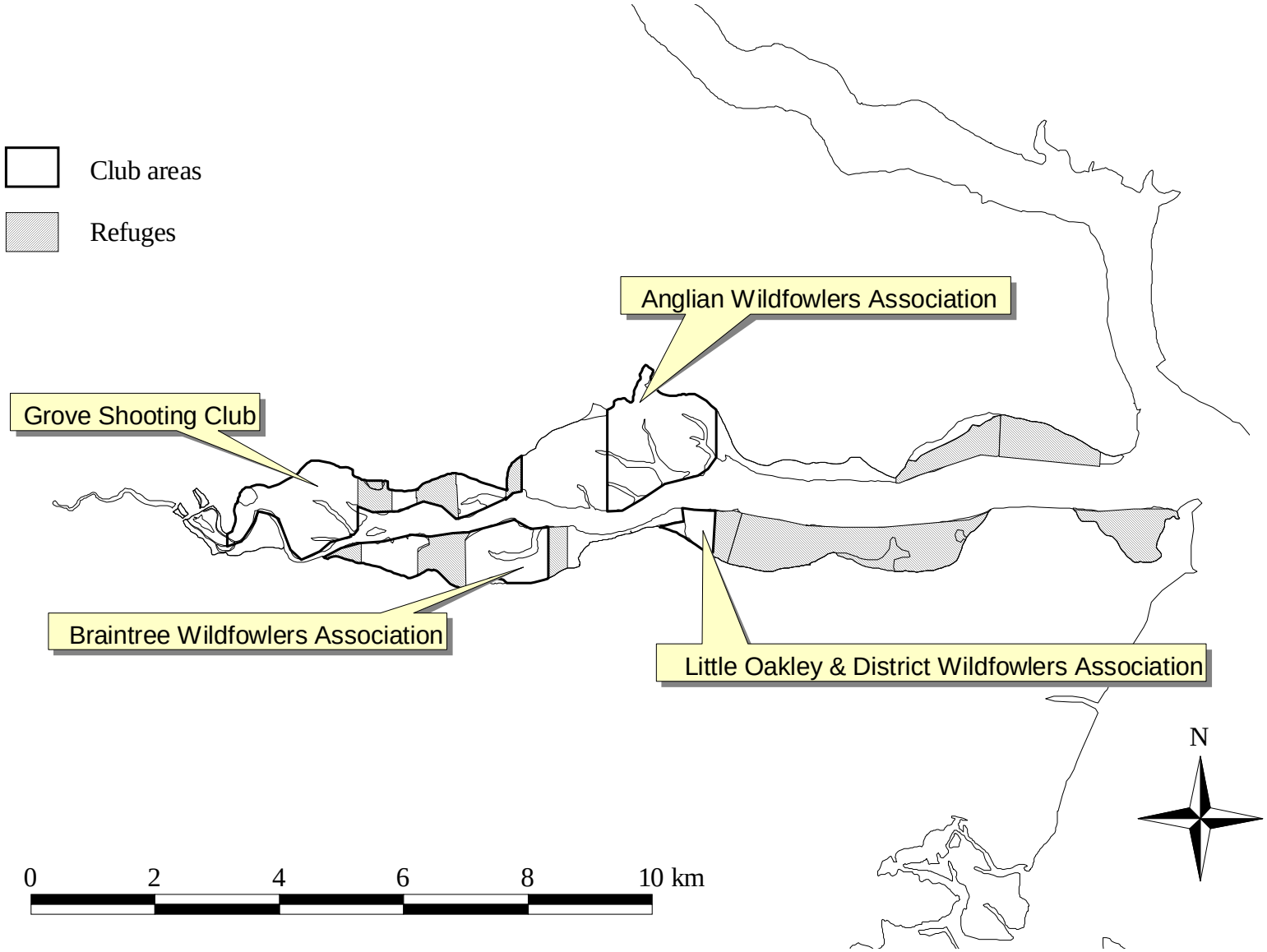


Figure 3.1 Map of wildfowling clubs' areas and refuges.

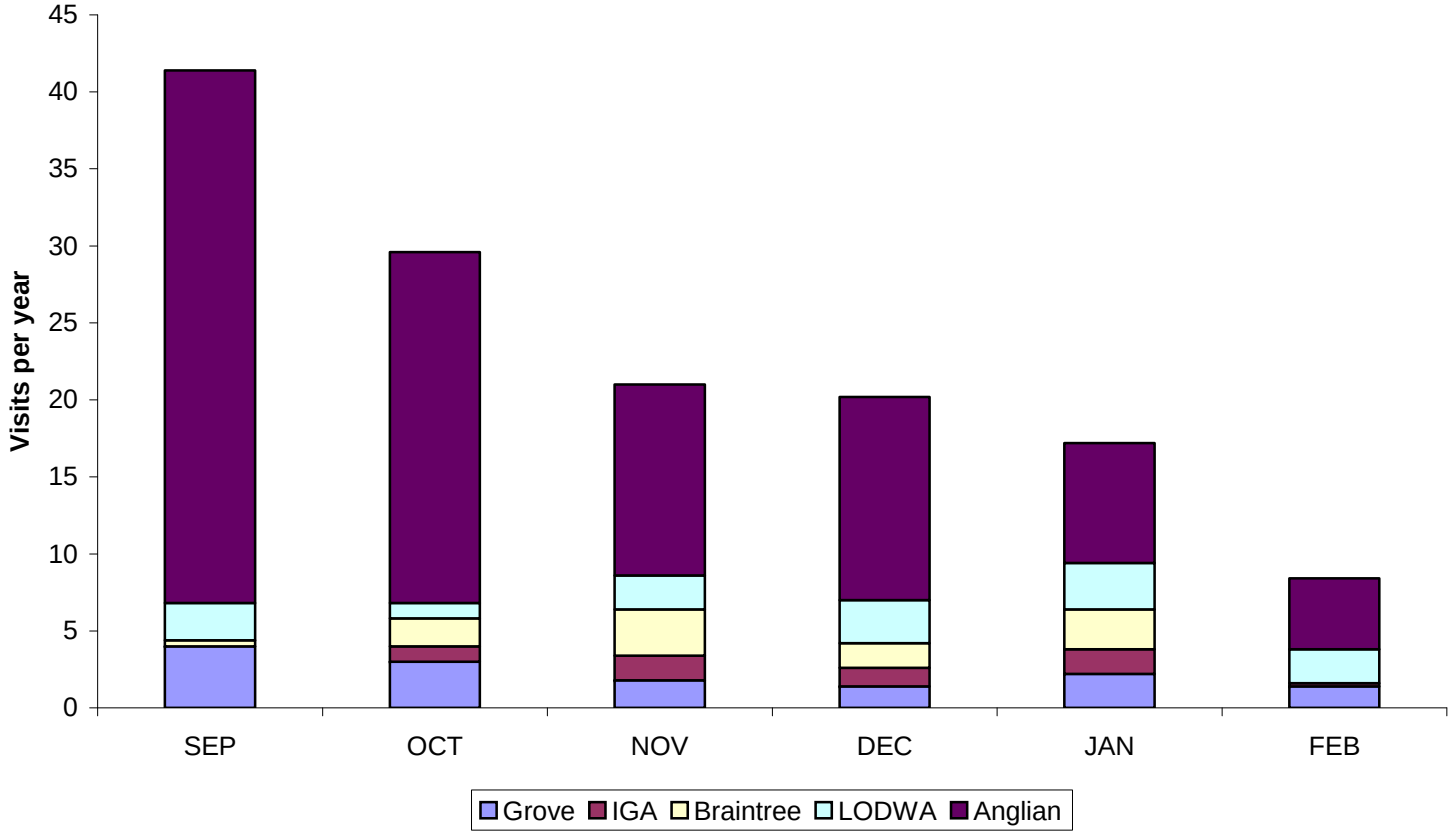


Figure 3.2 Frequency of wildfowling visits by month.

		National alerts	
		Increasing > +25% / Stable -25% to +25%	Decreasing < -25%
Site alerts	Increasing > +25% / Stable -25% to +25%	A	B
	Decreasing < -25%	C	D

Figure 7.1 Combinations of site and national alerts for use in decision-making.

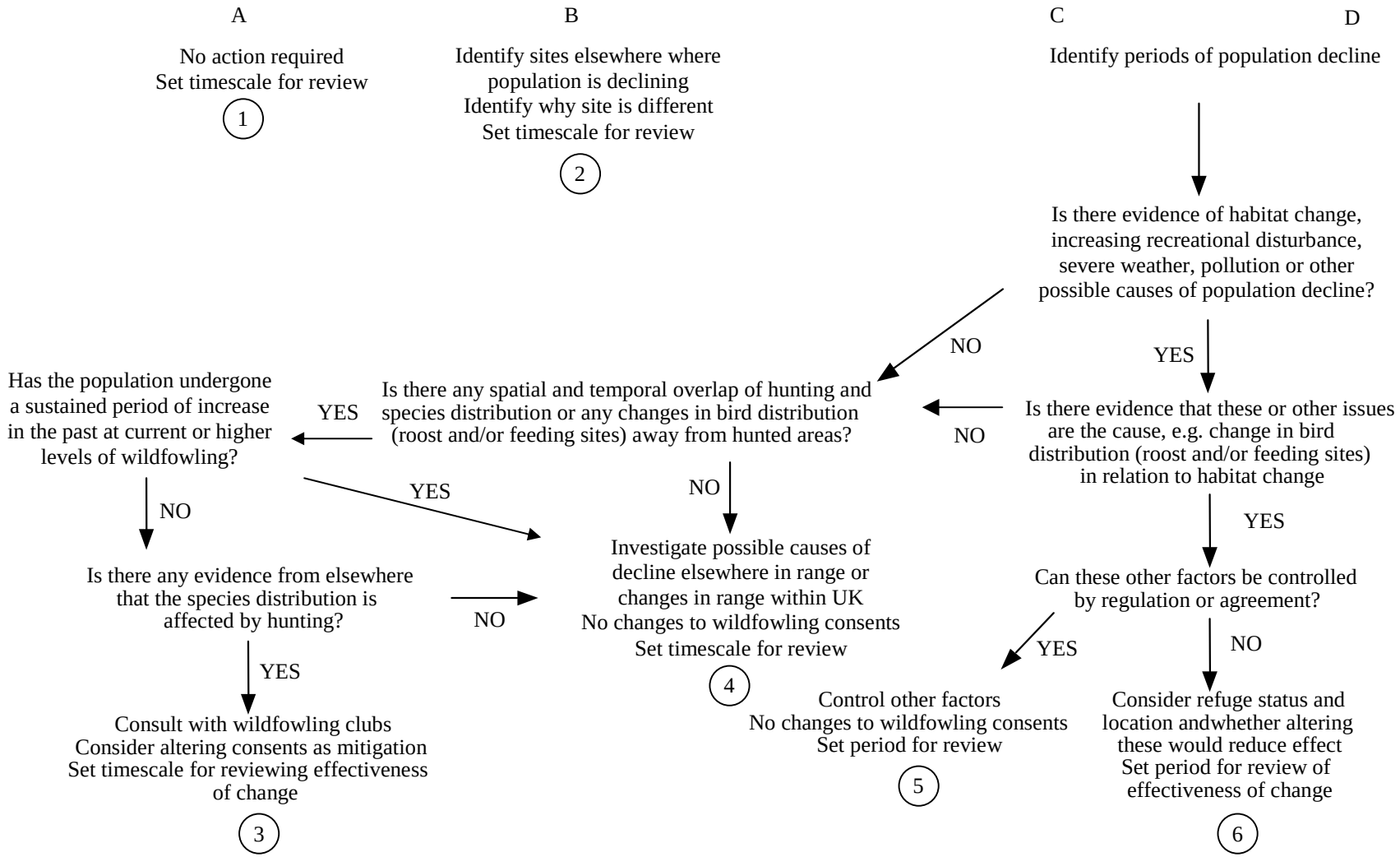


Figure 7.2 The decision-making system for a decreasing wildfowling scenario.

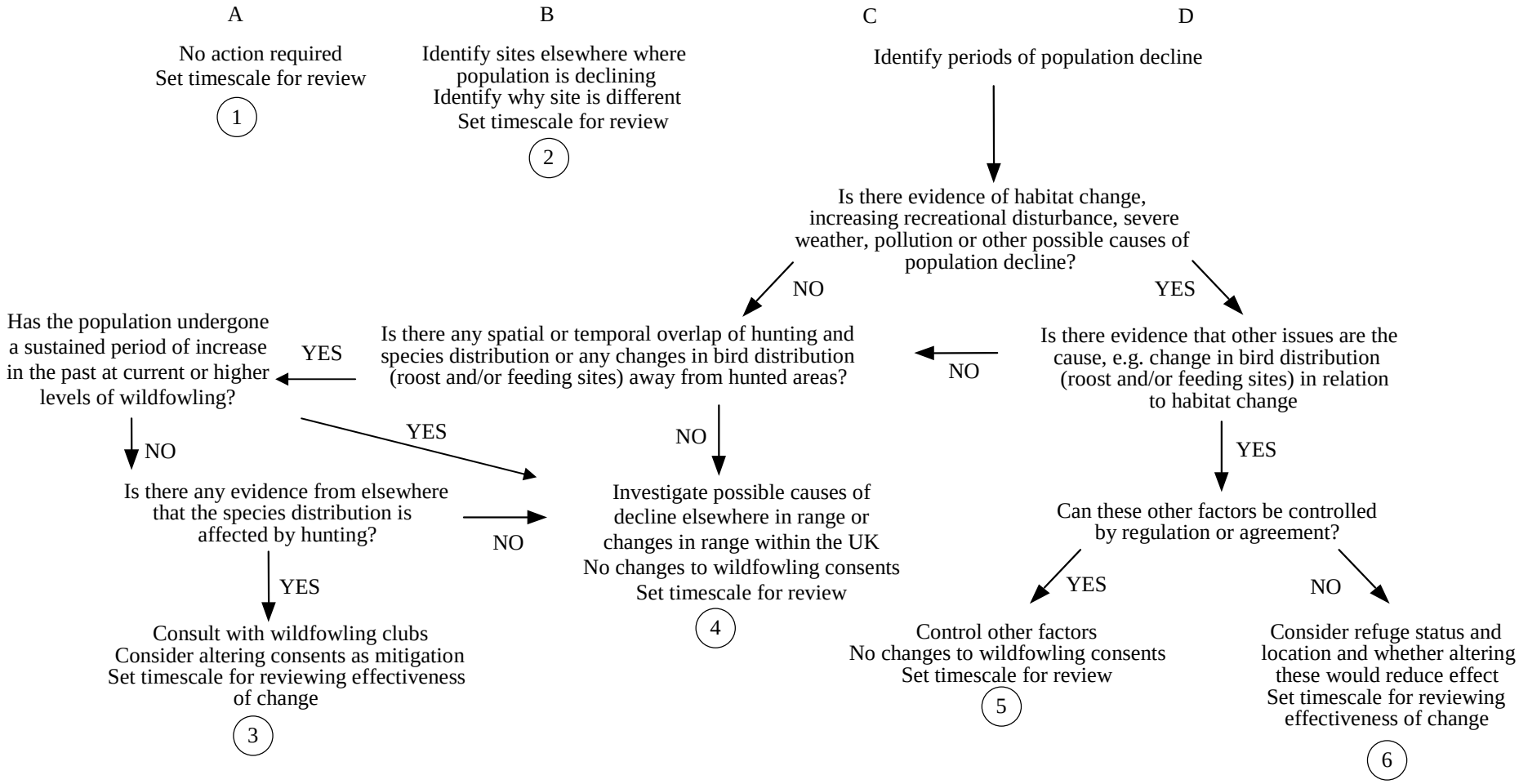


Figure 7.3 The decision-making system for a stable wildfowling scenario.

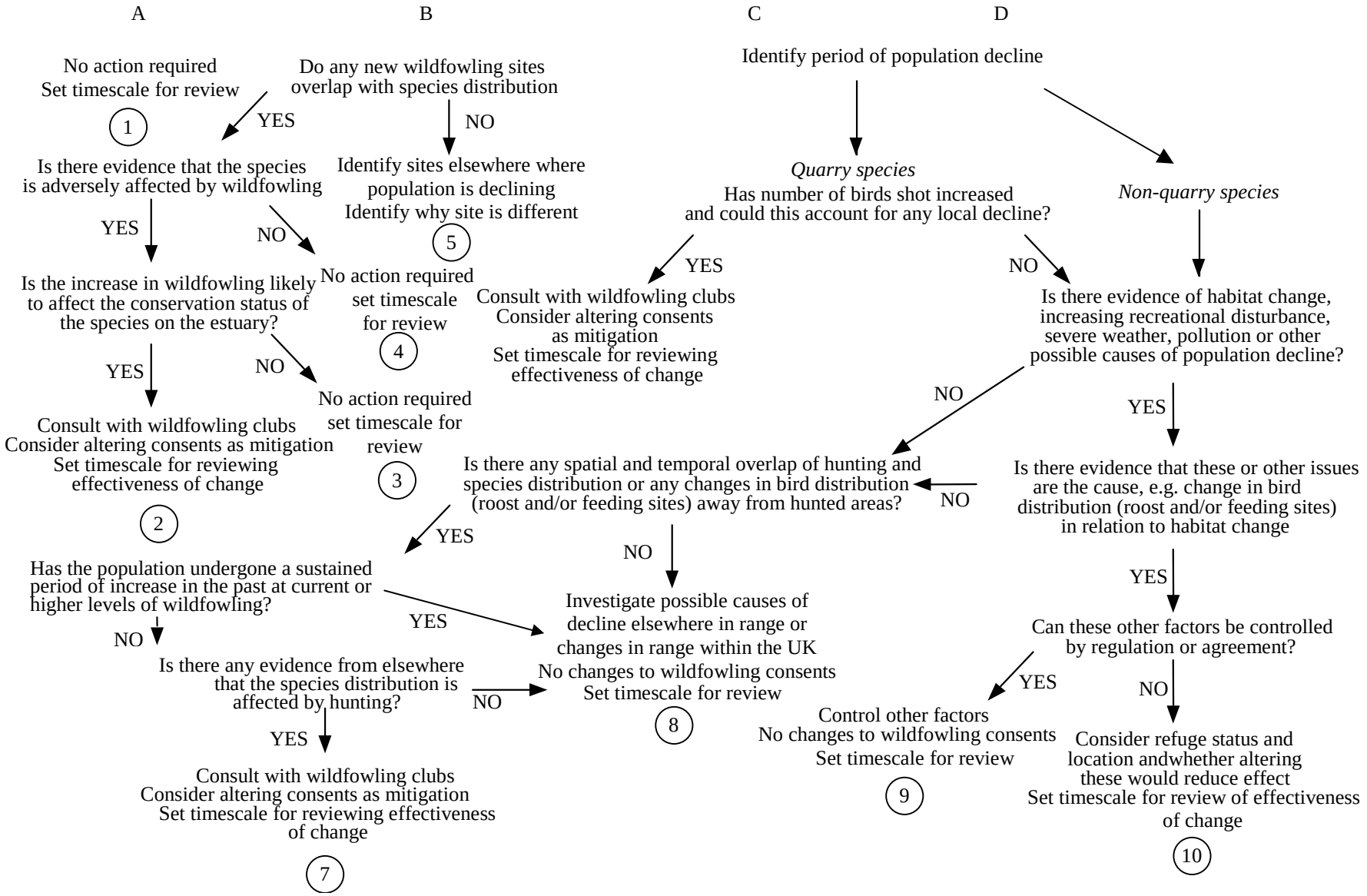
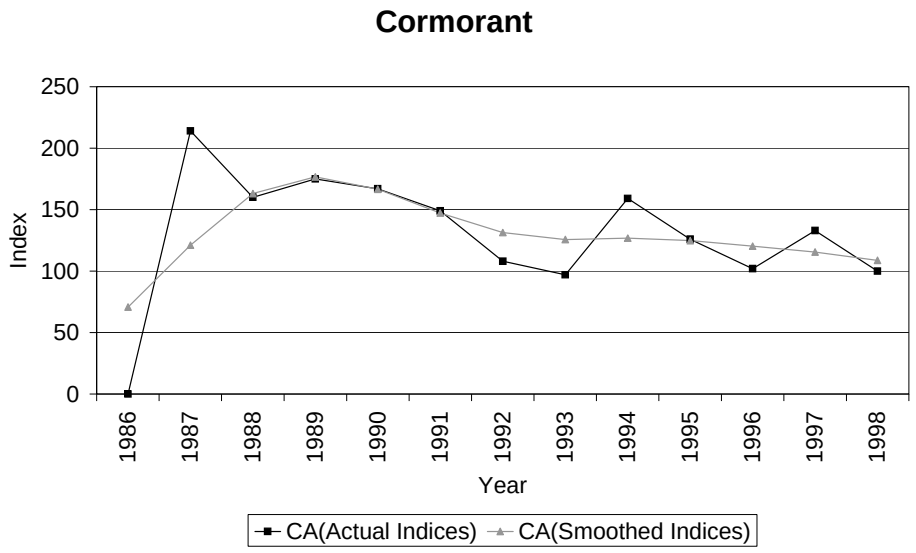
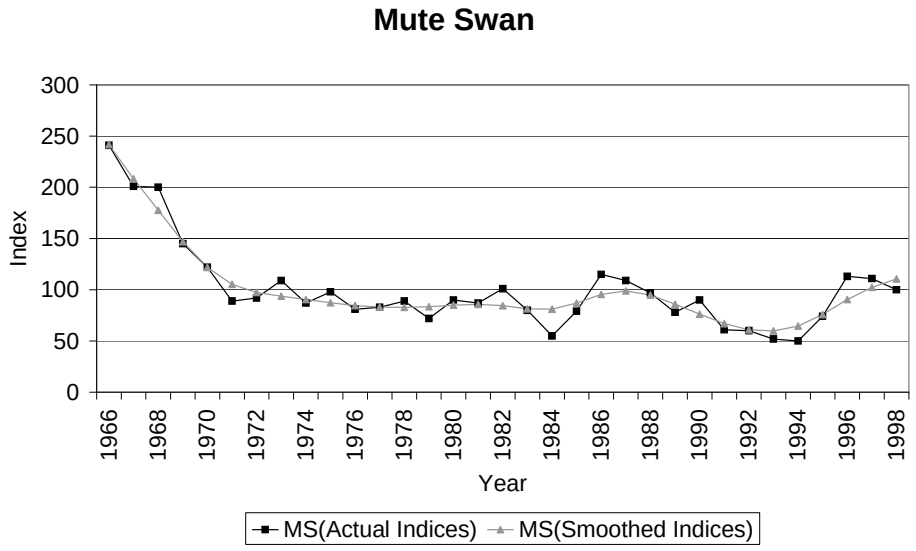


Figure 7.4 The decision-making system for an increasing wildfowling scenario.





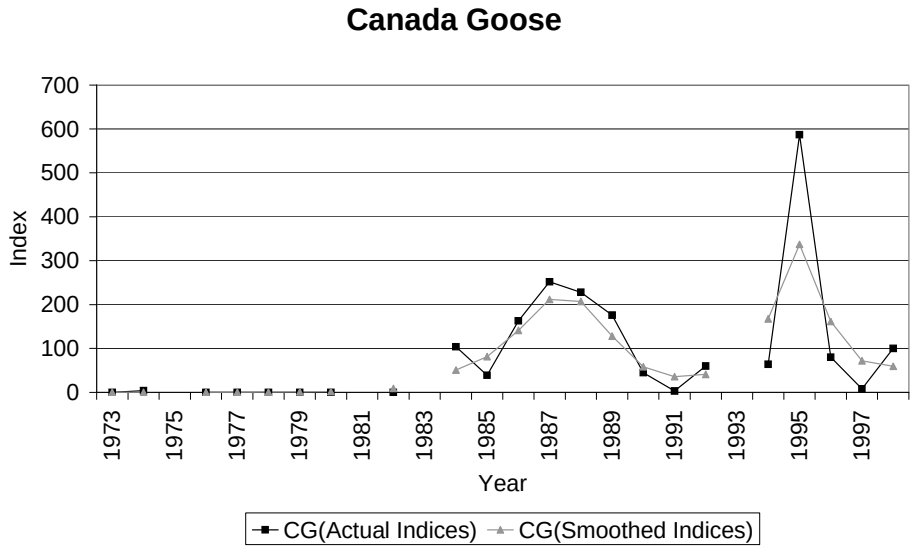
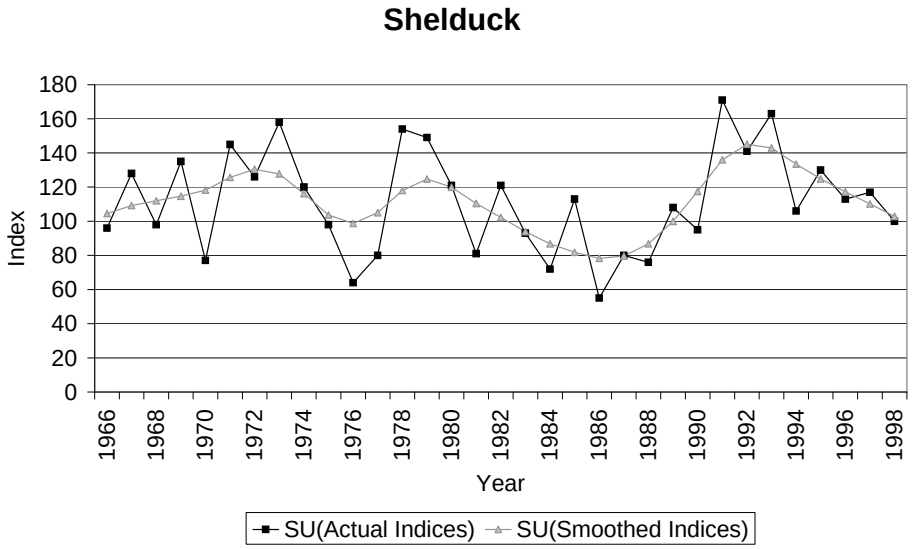
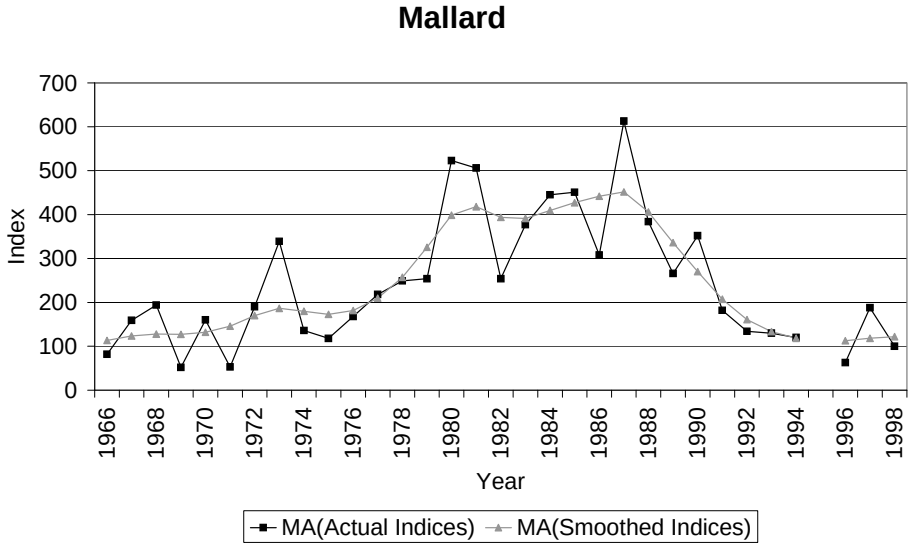


Figure 8.1 Indices and smoothed indices for nine species on the Stour Estuary.





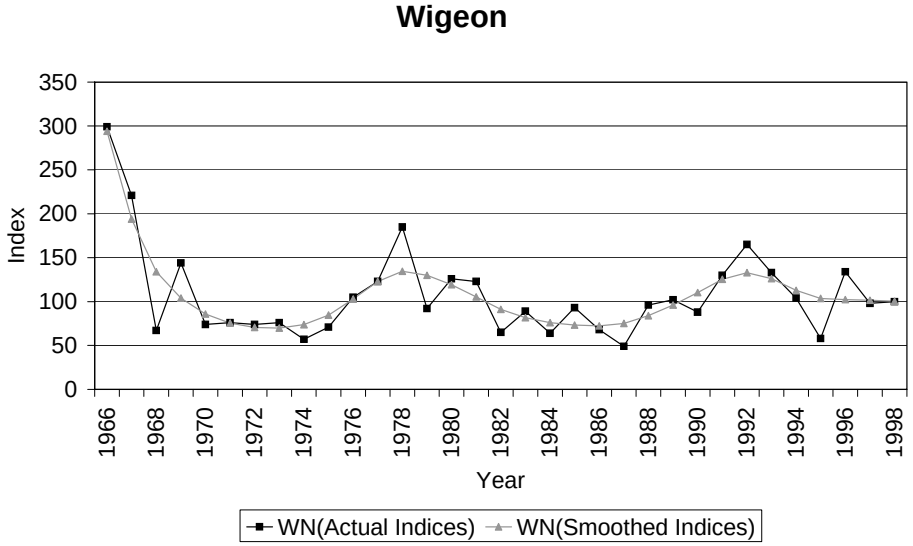
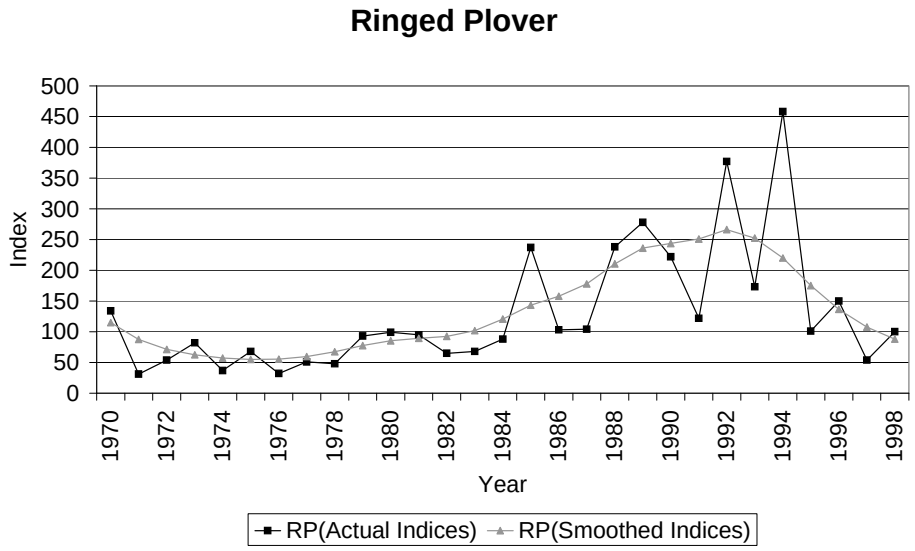
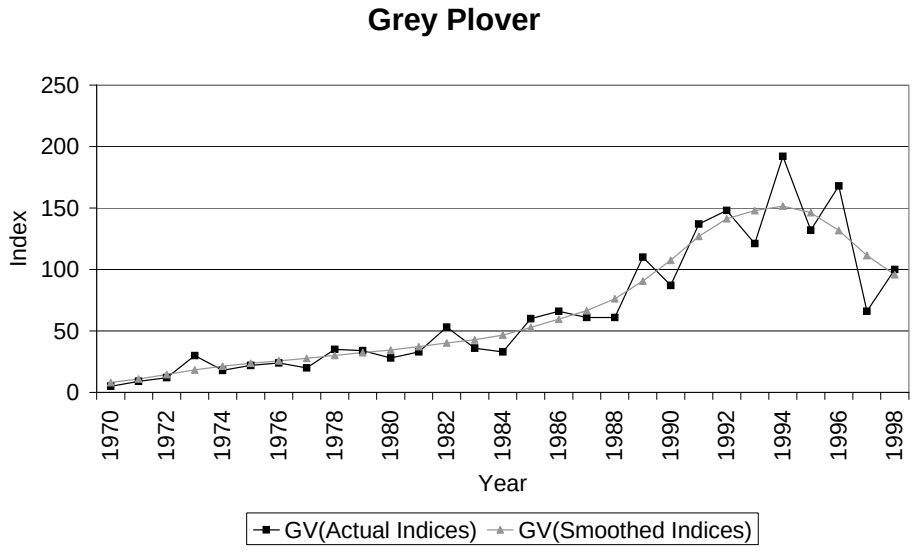


Figure 8.1 Continued.





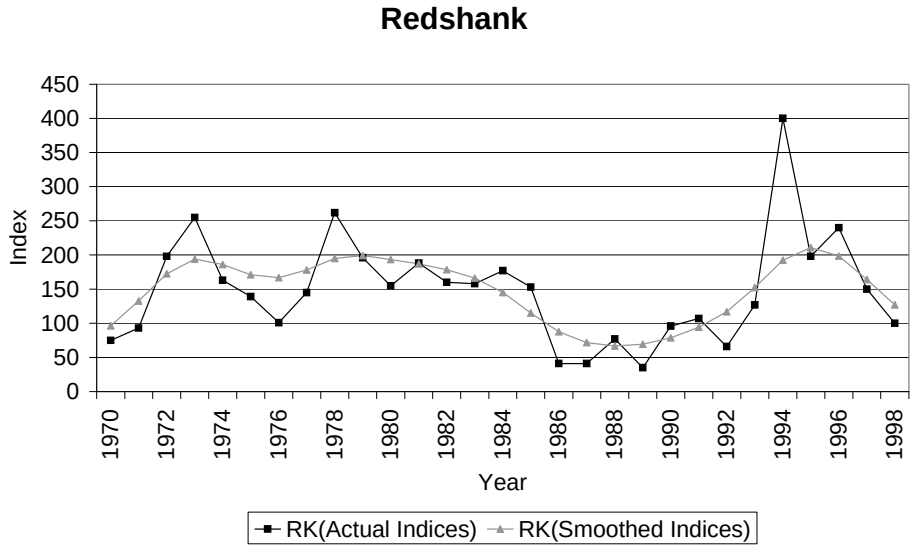


Figure 8.1 Continued.

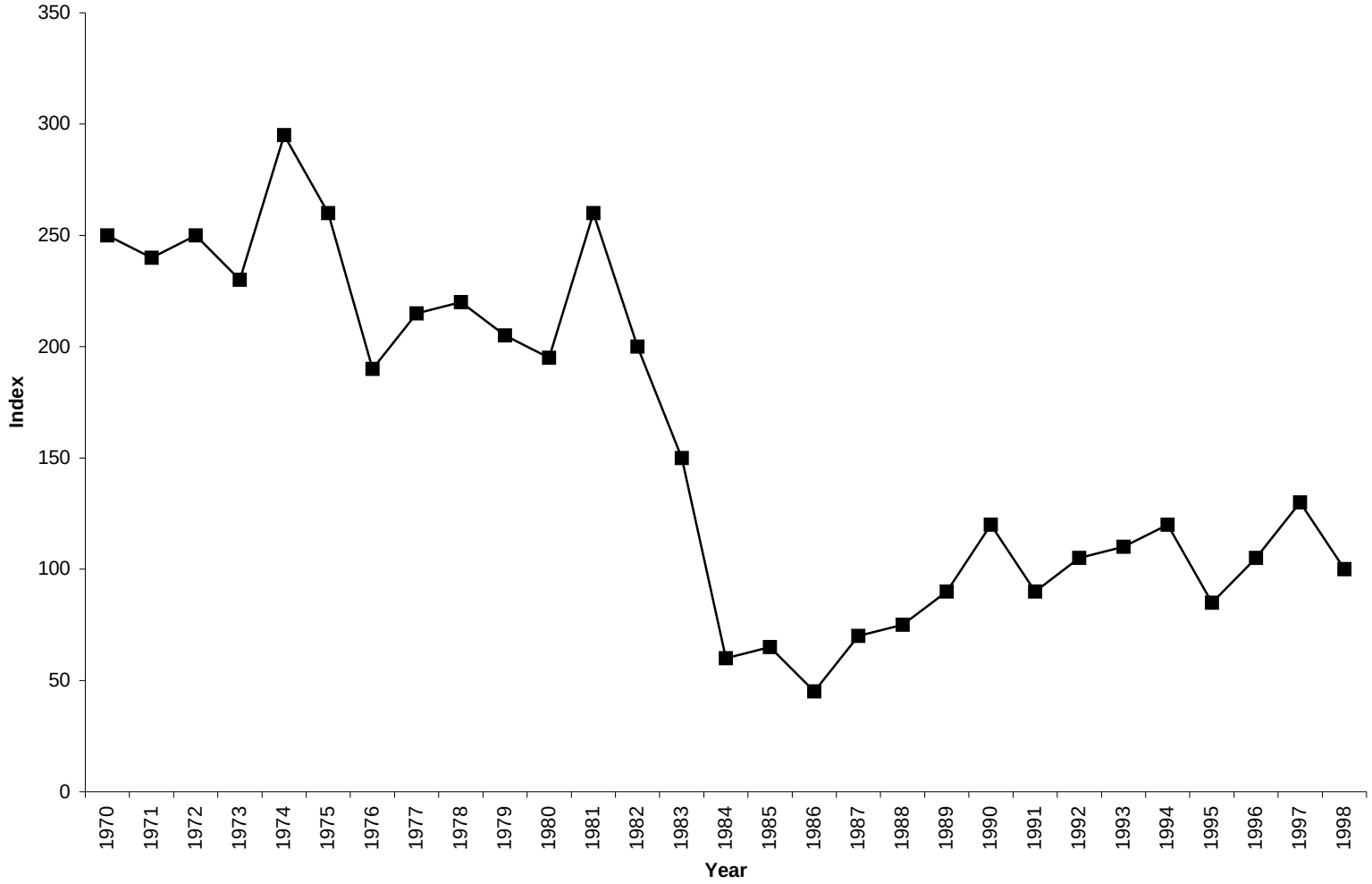


Figure 9.1 Example fictitious species undergoing a major decline in index value.

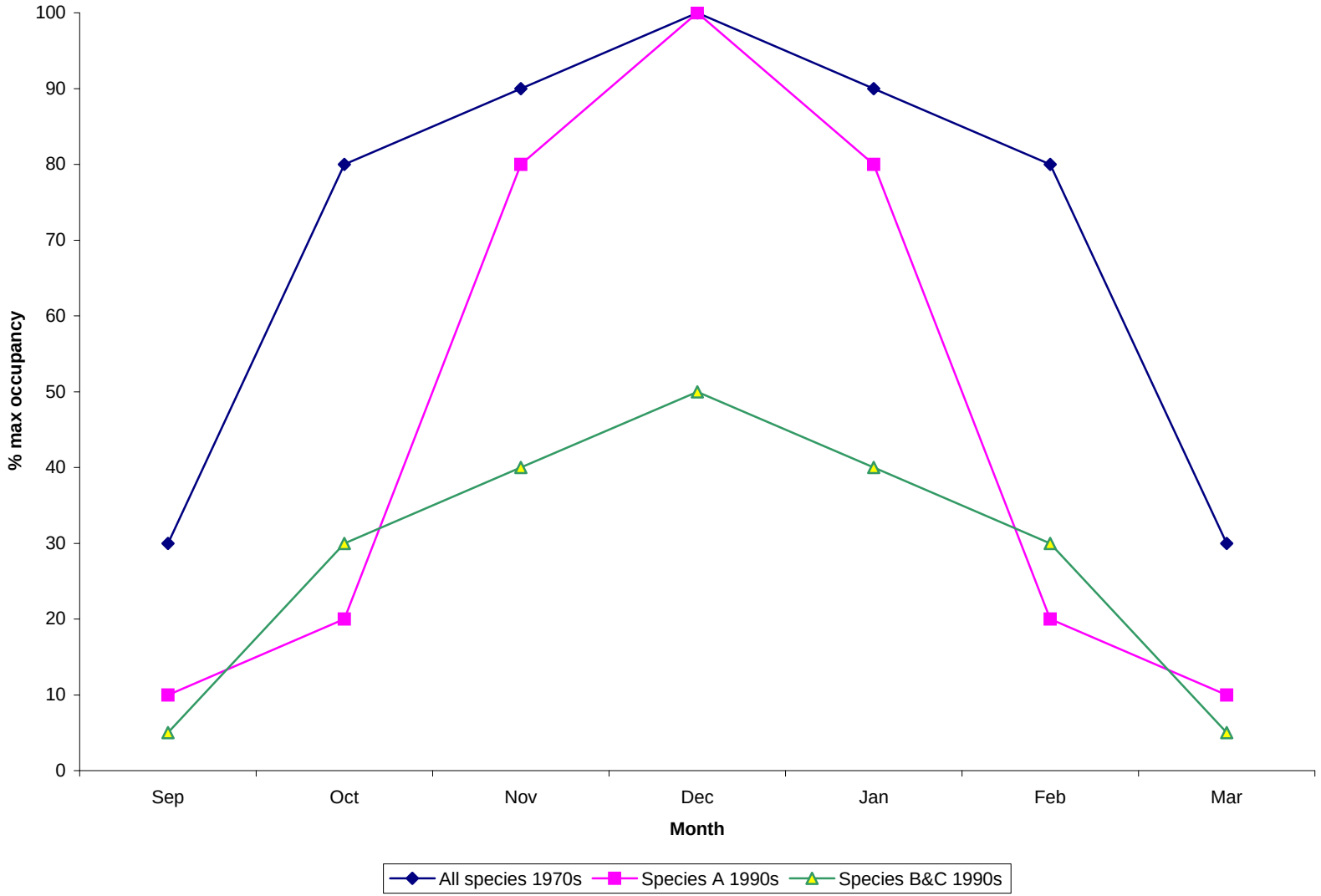


Figure 9.2 Differing patterns of occupancy through a winter for three fictitious species.

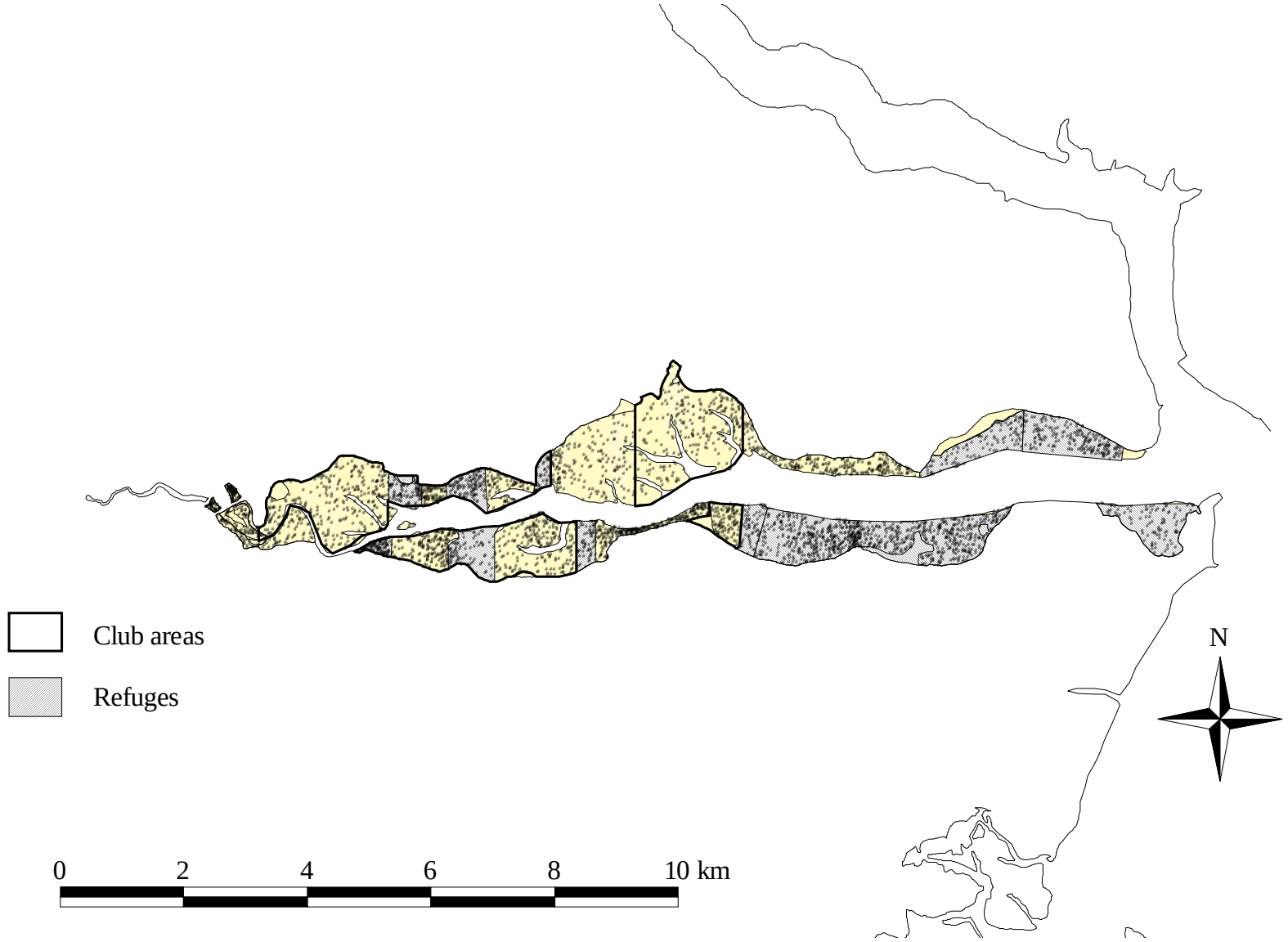


Figure 9.3 The distribution of fictitious species B in the 1990s.

Figure 9.4 The distribution of fictitious species C in the 1990s.