

THE CONSERVATION OF INTERTIDAL AREAS IN BRITAIN

by Derek R. Langslow

Britain has a very long coastline which includes a wide diversity of inter-tidal habitats. The inter-tidal areas of Britain can be broadly divided into four categories: rocky shores; flats, lying low in relation to Mean Sea Level (MSL) and usually devoid of vascular plants; saltmarshes generally lying above MSL and having a continuous vegetation cover; and beaches. Flats and saltmarshes support large numbers of birds. Their attractiveness for certain types of development and the popular view of them as wastelands conspire to put these areas under considerable pressure in Britain. This article discusses some of the issues involved in their conservation.

Variety of types of Flats and Saltmarshes

Inter-tidal flats and saltmarshes are derived from water-borne deposits ranging from clay and silt (= mud) through to sand and shingle. The almost level nature of flats, their uniformity and duration of tidal submergence limit the total variety of life they can support. What they lack in species richness, they compensate for in the abundance of the invertebrate fauna and in some instances of *Zostera* spp. and certain algae. Ornithologists sometimes overlook the important biological functions which estuaries perform in addition to providing food for waders and wildfowl. For example, many estuaries are important feeding grounds and also provide nurseries for some species of fish. The flora and fauna of inter-tidal areas are much influenced by the physical and chemical composition of the mud and sand amongst which the lime content has a particularly important influence. This is perhaps most apparent when lime rich silt flats are overlain by a thin surface layer of clay. Under these conditions, *Zostera*, *Enteromorpha* and *Ulva* spp. form extensive swards which attract grazing wildfowl. Good examples are found on the estuaries of the Essex Coast, the North Norfolk Coast, Chichester, Langstone and Portsmouth Harbours and at Lindisfarne in Northumberland.

The composition of the sand and mud flats affects the vascular plants which can colonise flats to convert them to saltmarshes while the tidal range controls the vertical distance over which saltmarsh can develop. The climate affects maritime plant distribution and there is a steady fall in the number of saltmarsh plant species with distance north. The mean particle size of the substrate also affects the floristic composition since fewer plants can grow on coarse sediments. As coarse sediments are more prevalent in the north, the two factors produce a marked cline in species richness. Although open-coast saltmarshes do occur (eg North Norfolk Coast) saltmarshes are more typical of the large estuaries. The frequency of inundation of saltmarshes (related mainly to the average height of the ground above MSL) and their management by man both influence the ornithological interest of saltmarshes. Management activities include sheep and cattle grazing, turf cutting and mowing. The management of the saltmarsh largely determines the composition of the breeding bird communities and the use made in winter by grazing wildfowl.

Importance of British Estuaries to Waterfowl Populations

Estuaries provide one of the most spectacular sights for European bird-watchers as species with relatively small total populations concentrate on a few favoured sites. The aesthetic delight of watching a large flock of waders wheeling and circling on a rising tide in the comparative wilderness of a large estuary during a cold bright winter's day is tremendous. From an international standpoint, the wintering and passage wader and wildfowl populations and the cliff breeding seafoal are one of the most important biological features of Britain. Britain's international responsibility has been recognised in principle within two international agreements to which the British Government is a signatory. One is the "Convention on Wetlands of International Importance especially as Waterfowl Habitat", generally known as the Ramsar Convention, which the UK ratified in 1976 and the other is the Council of European Communities Directive on the Conservation of Wild Birds (1979). Both make special reference to the needs of migratory waterfowl. Whilst the principles of both documents are excellent in considering the needs of waterfowl, the political and administrative constraints within any one country make adequate implementation difficult.

In any strategy for the conservation of a habitat or species the first requirement is a good knowledge of the resource. We are fortunate in Britain having a large number of active amateur ornithologists who have cooperated in two major surveys. One is the Birds of Estuaries Enquiry jointly organised by the British Trust for Ornithology (BTO), Royal Society for the Protection of Birds (RSPB) and the Wildfowl Trust (WFT) and the other is the National Wildfowl Count Scheme organised by WFT. Both schemes are backed financially by the Nature Conservancy Council (NCC). These schemes have given a good general picture of the numbers of waterfowl using British inter-tidal areas during the non-breeding season. Our information on other birds using inter-tidal land is more fragmentary. For example our knowledge of the numbers of breeding birds and the use made of saltmarshes in winter by raptors and passerines is very incomplete. In addition to wader and wildfowl counts in Britain, international counts within north-west Europe and, when possible, north-west Africa have been organised by the International Waterfowl Research Bureau (IWRB). This has enabled either total world populations or total flyway populations to be estimated. From these estimates criteria for considering an area to be internationally important for one or more species of wader and wildfowl have been derived. Two forthcoming books will describe in detail the wader and wildfowl populations of Britain and Ireland. The results from the Birds of Estuaries Enquiry (written by Tony Prater) will be published late in 1981 by T and A D Poyser in association with the BTO and NCC. The other book will be a revised and enlarged edition of the Nature Conservancy Monograph "Wildfowl in Great Britain". It is being written by Myrvyn Owen and George Atkinson-Willes and is due to be published by T and A D Poyser in association with WFT and NCC in 1982.

The upsurge of the environmental movement in the 1960s awakened the consciousness of many people to the potentially harmful effects of some developments on ecosystems. Estuaries represent a fragile type of ecosystem where the wildlife interest can all too easily be damaged. The threats to estuaries range from the obvious and permanent ones of industrial and agricultural developments to much more subtle ones involving changes in water quality and recreational use. Estuarine birds have proved to be a fertile area for study by ornithologists especially in the last fifteen years. These studies have included the large scale ringing of waders to determine the migration patterns of populations, the investigation of survival rates, studies on territorial behaviour and energy budgets and, more recently, projects designed to answer questions which come broadly under the heading of the "carrying capacity" of estuaries. This last group of projects includes studies of how many birds use an individual estuary and for how long, and on the number of estuaries an individual bird uses. This last aspect was very much in our minds when the project on Wader Movements in Western Europe was hatched. At present this project is sponsored partly by NCC and partly by EEC and is carried out through Durham University with Dr. Mike Pienkowski as organiser. One of the main aims of the project is to increase our knowledge of the complex inter-relationships between different inter-tidal areas. Anyone who has been involved in conservation issues involving waders and wildfowl will know that developers usually make statements to the effect that "the birds can go elsewhere". In other words they often regard "their development" as small and inconsequential and gleefully point to the apparent large open spaces available nearby. It is the job of those involved in conservation to sustain the technical arguments which often show the absurdity of this notion. Nevertheless, it must always be remembered that the best biological arguments will rarely win on their own. A

variety of political pressures are always present and hence the support and widespread interest of the public is vital in nature conservation issues.

Threats to inter-tidal areas

With the help of my colleagues amongst the Regional Staff of NCC I have compiled a list of immediate past, current and proposed developments affecting the nature conservation interest on inter-tidal areas (mainly flats and saltmarshes) in Great Britain. These are summarised under the following headings:

- (1) Agricultural development and flood protection
- (2) Industrial reclamation and development, sewage disposal, industrial pollution, waste disposal
- (3) Barrages for water storage and power generation
- (4) Harbour and marina development
- (5) Bait digging
- (6) Wildfowling
- (7) Sand-winning
- (8) Special local problems

When confronted with a long list of threats it is perhaps too easy to become pessimistic. The seriousness of the problems varies greatly in that some involve permanent damage whilst others, such as uncontrolled wildfowling, can be solved through local negotiations. Also the intensity of particular threats varies both with the economic circumstances of the country and in less predictable ways with, for example, changes in ownership.

Industrial and agricultural reclamation are the most serious threats faced by inter-tidal flats and saltmarshes. The effects of the development involve the permanent removal of inter-tidal areas and all the wetland habitat is normally completely lost. Reversal of the process, if ever proposed, would be impossible following industrial development and this makes the one important difference between reclamation for industrial as against agricultural purposes. Theoretically at least, reversal of agricultural reclamation is possible although the floristic interest of saltmarshes would be lost for ever. Such areas could however, be made attractive to feeding waders again. Agricultural reclamation always involves the removal of saltmarsh whereas industrial reclamation takes in both flats and saltmarshes. In addition, agricultural developments usually remove much larger areas of inter-tidal land than industrial developments.

Agricultural development and flood protection

Reclamation for both agriculture and flood protection schemes removes saltmarshes from the influence of the sea. Inter-tidal flats are normally affected only indirectly. The reclamation of saltmarsh for conversion to arable or reseeded pasture has been going on for many years especially in the areas such as the Wash, the Ribble Estuary and the Essex Coast estuaries. For a long time the agricultural reclamation of saltmarsh was not believed to have any serious environmental consequences since new saltmarsh often accretes outside the new sea wall. More recently several factors have changed this somewhat complacent view. Firstly, there must obviously be some limit to the possibilities for new accretion when the sea wall approaches a main river channel. Secondly, the increased awareness of the relationships between saltmarsh plants and estuarine food chains has come about following research programmes especially in the USA. Thirdly, studies on the Wash have suggested that the low tide line has not moved seaward in the last 150 years and hence the total inter-tidal area of the Wash is steadily decreasing. Fourthly, reclamation produces a truncation in saltmarsh development and hence fewer examples of complete saltmarsh plant succession can be observed. Fifthly, the importance of some saltmarshes, notably the older and more mature ones, to the breeding waders and terns has been realised.

Unlike reclamation for industrial purposes, agricultural schemes are not subject to the Town and Country Planning Act except under special circumstances. The schemes enjoy considerable public subsidy (via Water Authorities and the Ministry of Agriculture, Fisheries and Food (MAFF)) but there is no opportunity for public comment as can be done for planning applications. If the area is a Site of Special Scientific Interest (SSSI) then the NCC is consulted over proposals and if MAFF and NCC disagree, the matter is referred to the agriculture ministers for a decision. Occasionally a public inquiry is called, as over the proposal to reclaim 80 hectares at Gedney Drove End in the Wash. The Inquiry was held in February 1980 but the outcome has not yet been announced. In particular a number of complex legal issues were raised during the inquiry and the determination of these could have far reaching consequences for the conservation of Britain's estuaries.

The Wash has had more recent reclamation of saltmarsh than any other estuary. About 800 hectares were reclaimed between 1974 and 1980 representing about 27% of the mid and upper level saltmarsh. All the areas were converted to arable regimes. In addition to the 80 hectares at Gedney, a proposal for the reclamation of a further 70 hectares is now awaiting the outcome of the Gedney inquiry. Attrition of the higher level saltmarsh at this rate will soon eliminate it completely except for two areas; the Ministry of Defence (MOD) Bombing Range and a small area which is difficult to reclaim. Many of the recently reclaimed areas in the Wash are in Lincolnshire and there are reclamation proposals pending at two other saltmarshes in the county outside the Wash at Grainthorpe and Tetney. The largest area of saltmarsh on the Ribble Estuary came under threat of reclamation in 1978. After a long dispute Banks Marsh was finally purchased by NCC with the help of a special grant from the then Labour Government. During 1980 an adjacent area of saltmarsh on the Ribble was reclaimed; this represented a real loss of nature conservation interest in the estuary, although not nearly such a serious one as the loss of Banks Marsh would have been. Several saltmarshes have proposals for reclamation pending or in abeyance, these include areas on the Humber, the Beaulieu Firth, the Dee (part of the saltmarsh was recently surveyed by MAFF), Lindisfarne, the Ribble, Morecambe Bay, Kirkconnell Merse (Solway), the Cree Estuary, Nigg and Udale Bays (Cromarty Firth) and several areas in Kent and the Tay estuary.

Damage can also occur to saltmarshes when sea walls are strengthened and this has been a particular problem on the Wash, the Humber, the Ribble and Morecambe Bay. Sea defence works can have other effects. For example, Breydon Water in Norfolk is likely to be affected by the Yare Flood Barrier. Other schemes for flood protection on estuaries pose threats both to inter-tidal areas and the grazing marshes behind the sea walls.

Impacts of industrial development and pollution

Industrial processes can be broadly divided into the following categories (not always mutually exclusive but reflecting the first reason for development):

- (a) Disposal of domestic refuse and fly-ash from power stations.
- (b) Reclamation for port and industrial development especially for the petrochemical industry.
- (c) Pollution resulting from industries adjacent to the shore or built on reclaimed land.
- (d) Sewage disposal (sometimes harmful, sometimes beneficial to birds).

The search for areas to dispose of domestic refuse and fly-ash from power stations continues endlessly. Inter-tidal flats and saltmarshes provide a tempting target since they are frequently regarded as waste ground. Their acquisition usually inconveniences few members of the general public and there is no loss of 'good' agricultural land. The potential of the reclaimed land for later development is often cited as an additional reason for the dumping. Until recently, the ecological consequences of waste disposal were rarely considered. Domestic refuse is dumped, or there are proposals to begin, on flats and saltmarshes on the Moray Firth, Firth of Tay, Montrose Basin, Neath Estuary, Burry Inlet, Medway Estuary and a number of other small areas. Fly-ash disposal occurs or is proposed at Musselburgh and Torry Bay (Firth of Forth), Spurn Bight (Humber), Aberthaw (South Wales), Dee Estuary and several areas in Kent. The long term requirements for sites for fly-ash disposal will depend on the decisions for future methods of generating electric power. The more power is generated from coal, the more acute the problem will become.

Perhaps the best (or worst depending on your view!) example of industrial development on former inter-tidal land is at Teesmouth. The steady loss of inter-tidal areas has been studied by Dr. Peter Evans and his colleagues at Durham University. The Tees could perhaps become the first estuary to lose virtually all its inter-tidal areas. In 1975 the Secretary of State for the Environment identified the remaining 365 acres of Seal Sands (the largest area of mud-flat) for industrial development in the "national economic interest". Whilst plans for the complete reclamation were made, they have not yet been implemented, partly as a result of the economic recession. A curious result followed from the official recognition of the importance of the area to shorebirds at the Public Inquiry into the Teesmouth development. The Secretary of State instructed Cleveland County Council in cooperation with the Tees and Hartlepool Authority and other relevant bodies to examine the feasibility of providing alternative wetland areas. Practical problems such as who was to provide the land were scarcely considered and this solution seems unlikely to solve the problems which would be caused by almost total reclamation.

Two kinds of development resulting from the discovery of oil in the North Sea have affected inter-tidal land. Firstly, further development of the petrochemical industry in Britain has been given a major boost. The huge developments at Grangemouth (Firth of Forth) preceded the present oil boom but they have contributed to the pressures on the adjacent flats at Kinneil as well as polluting the mudflats. Kinneil is zoned by the Regional Authority for development as is the nearby area of Blackness. Petrochemical complexes are also under consideration for Nigg Bay (Cromarty Firth), the Tay Estuary and the Mersey. Cheshire County Council are at present considering the Mersey Marshes local plan, which is likely to determine the location of new industry. Secondly, there was a demand for oil platform sites but this is now much reduced. Reclamation took place to construct sites at Nigg Bay and Whiteness Head (Moray Firth). Other sites exist, notably in the West of Scotland, and there have been some spectacular and expensive mistakes by government in constructing yards to build platforms which have never won an order.

Threats from other industrial developments are varied. At Musselburgh (Firth of Forth) some proposals for deep mining would have caused a subsidence of 1.5 metres of the mudflats and thus increased the time when the area was covered by the sea. In the end a modified scheme was agreed which involved a subsidence of only 7 to 20 cm. Alluvial tin extraction on two areas in Cornwall, Devoran Creek and the Hayle Estuary, poses some long term problems especially with the associated pollution. The development of Maplin Sands (Essex) as a third London Airport was proposed, and rejected, some years ago. However, the proposal undergoes periodic revival and the threat to this important area remains until a third London Airport is actually developed elsewhere or the growth in air traffic ceases. Proposals are now being put forward to reclaim the Pyewipes area of the Humber for industrial development. These mud-flats are affected by sewage disposal and enjoy a 'pollution enriched fauna' which is attractive to waders. A proposal to develop a new British Gas Terminal on the Irish Sea coast threatened areas in the Dee, Ribble and Morecambe Bay but eventually the decision was taken to place the terminal at Barrow. The Medway Estuary is one of the most highly pressurised estuaries. Plans for port and industrial development, dumping of river dredgings and further power stations appear regularly. The power stations at Kingsnorth and the Isle of Grain (presently famous for an industrial dispute involving pipe ladders!) have both caused the loss of inter-tidal areas.

Pollution of the inter-tidal areas is caused in many different ways. There is a chronic problem of oil pollution in many harbour areas together with the ever present threat of major oiling incidents arising from an accident. The oil industry has a good record in preventing pollution from production installations. The worst problems come from the illegal washing of tanks in oil-carrying vessels at sea. Another significant source of oil in the sea is run off from the land and this source can pose serious local pollution problems. The regular spillage of small quantities of oil is a particular problem on the Humber, in the Firth of Forth, in Findhorn Bay, the Montrose Basin, the Thames and Medway estuaries.

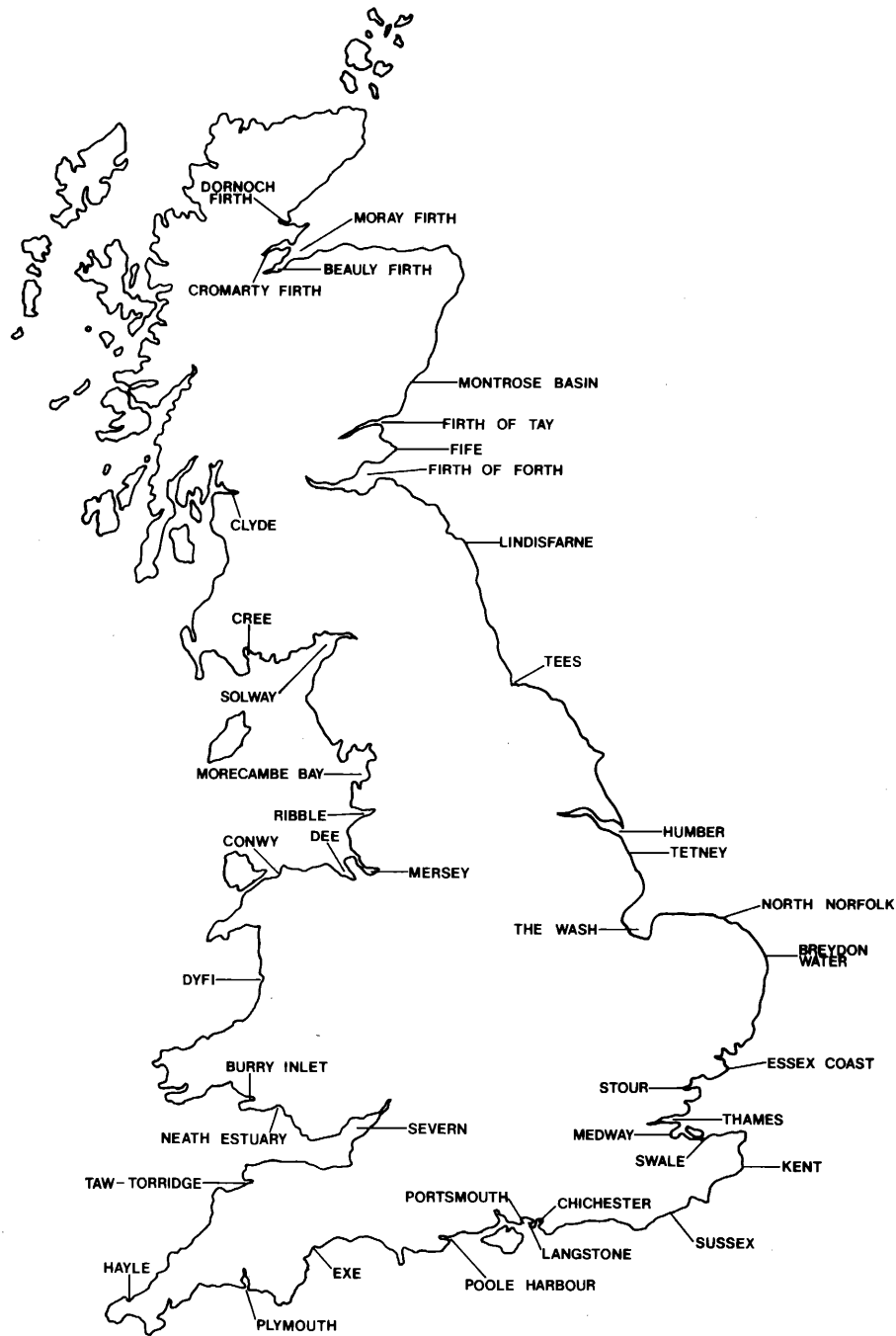
Other estuaries suffer from heavy metal pollution (the Tees, Humber, Dee, Poole Harbour, Burry Inlet are amongst them) or contamination by sewage (many areas). Sewage can provide some enrichment and is undoubtedly beneficial to the invertebrate fauna in some areas and hence to the birds. In some places (eg Langstone Harbour) sewage enrichment has stimulated the growth of *Ulva* and *Enteromorpha*. They have invaded the mud-flats and, whilst taking away feeding areas for waders, have created a new food source for grazing wildfowl. In excess sewage can produce anaerobic conditions which are detrimental to many invertebrates. Distillery wastes can be another form of beneficial pollution and they attract seaduck such as Goldeneye *Bucephala clangula*.

Barrages

During the late 1960s and early 1970s, studies were carried out to assess the feasibility of fresh water storage on the Dee, the Wash, Morecambe Bay and the Solway. All the schemes would have produced big changes to four of the most important inter-tidal areas for birds in Britain. Since these feasibility studies were done, the demand for water has been re-assessed. The extremely large demands for water which were forecast in the 1960s have proved to be gross over-estimates. Water is now used more efficiently and the need for this type of water storage has disappeared into the 21st century. It was also proposed that the barrage across the Dee should carry a road.

At present the government is sponsoring a pre-feasibility study for a barrage across the Severn under the direction of the Severn Barrage Committee. Over the last decade several ideas for harnessing the large tidal range of the Severn to generate electricity have been proposed. The development of road crossings, water storage, port facilities and airports have been linked with some of these proposals. The potential impacts of these schemes on the natural environment of the estuary are enormous. Several possible positions for the barrage are being considered which would use turbines on either an ebb-flow or flood-flow basis. The estimated costs of the schemes are enormous and the system would be designed to generate up to 10% of the UK's requirement for electricity. There are many factors to consider in assessing the impact on birds. For example, how much mud-flat will remain, will saltmarshes increase, for how long will the mud-flat be exposed, what will be the new tidal range, what will be its timing, how much will water salinity and quality alter, how will sedimentation patterns alter, and so on. There will undoubtedly be some deleterious effects on the ornithological interest, but whether these are large or small will depend on the scheme eventually adopted.

THE LOCATIONS OF MAJOR INTERTIDAL FLATS AND SALTMARSHES IN BRITAIN



Harbours and Marinas

Wherever estuaries and tidal basins provide sheltered anchorages, small boats will be found. As their numbers increase there is a demand for marina facilities. Problems caused to inter-tidal areas by small boats mainly occur along the south and south-east coasts of England. This partly reflects the suitability of these areas for this recreational pursuit and partly the large human population concentrated nearby. Boating activity is more intense in summer than in winter and some constraints on the winter movements of boats can have beneficial effects for waterfowl. The shore-based facilities of marinas generally occupy only a small amount of the shore and thus the major problem caused is disturbance. However, the impact is reversible and local negotiations can often solve especially severe problems. Marinas pose some pressures on inter-tidal areas at Chichester Harbour, the Arun and Adur estuaries (Sussex), Cuckmere Haven (Sussex), Exe (proposal for marina now with Secretary of State), Plymouth (including water-skiing), nine locations in Essex, the Stour Estuary in Suffolk, the Swale, the Inner Clyde, the Cromarty Firth, the Conwy and Dyfi estuaries.

Bait Digging

Removal of invertebrates from the mud-flats can cause local problems by disturbance of the sediments and occasionally, through direct competition with man. The alleged competition between fishermen and Oystercatchers *Haematopus ostralegus* for Cockles *Cerastoderma edule* on the Burry Inlet is well known and led to a large cull of birds. Bait-digging causes particular problems on a number of mud-flats in south-east England and also at Spurn Bight and Cleethorpes on the Humber and at Budle Bay, Lindisfarne. Oyster dredging at Chichester Harbour and at Dengie (Essex) can have considerable effects to shorebird feeding areas.

Wildfowling

Disturbance due to wildfowling can pose local problems. Whilst increasing numbers of wildfowlers are members of recognised clubs who organise, educate and control their members, there are several inter-tidal areas where the shooting is uncontrolled. At both Pagham and Chichester Harbours, the disturbance of roosting waders by wildfowlers (and sometimes birdwatchers) is a problem. Amongst the areas where shooting is uncontrolled are the Montrose Basin, the Fife coast of the Forth, Eden Estuary (East Fife), Inner Tay, Swale, High Halstow marshes (Thames), Donna Nook (Humber) and several parts of the Moray Firth. Conversely there are several areas where the shooting is controlled and disciplined including the Burry Inlet, the Dyfi, the Humber, the Dee, the Ribble and Lindisfarne, although at Lindisfarne visitors and bait diggers sometimes disturb the sanctuary area.

Sand Winning and other local problems

Sand extraction occurs on a number of inter-tidal areas. Detailed studies on the Ribble suggested that it had no impact on the use of the sand-flats by birds. In other areas such as the Taw-Torridge Estuary (presently subject to Public Inquiry) considerable disruption of sediments and wader feeding has been apparent. Sand winning presently takes place on the Ribble, the Tees, the Eden Estuary, Morecambe Bay, the Swale, the Stour in Essex, Tynningeham (Firth of Forth), Burry Inlet, South Gower, Swansea Bay and the Lower Dornoch Firth.

A wide variety of local problems affect the conservation of inter-tidal land. Some range from the almost comical (such as the disturbance of wader roosts by police dog training) to more important ones such as the MoD proposal to extend a runway in the Outer Hebrides, the local opposition against the declaration of Local Nature Reserves, the closure of the Port of Preston on the Ribble Estuary, the hoverport developments in Kent and Cheshire and the accumulation of radioactive waste in sediments at Auchencairn Bay (Solway).

The invasion of mud-flats by Cord Grass *Spartina* sp may become a severe problem in areas such as the Ribble, the Dee, Lindisfarne, the Dyfi, the Conwy and others since it promotes accretion and hence saltmarsh development at the expense of mud-flats. Obviously this has implications for wader feeding areas.

Prospects

The variety of number of threats/problems on inter-tidal areas in Britain can all too easily lead to a pessimistic and defensive outlook. Equally the problems must be faced and the conservation movement must have the best possible biological basis on which to support its arguments for the needs of waterfowl. The conservation of inter-tidal areas depends not only on NCC, RSPB and other conservation groups but also on the widest possible public support. The present knowledge of the distribution of waders and wildfowl on inter-tidal areas and of their movements needs to be supplemented by the study of the requirements of individual species during the non-breeding season. The response of those interested in catching and in watching waders to the project on wader movements in Western Europe has been marvellous. The outcome from their project promises to be a valuable contribution towards the conservation of inter-tidal areas.

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WADER STUDY GROUP DATA FORMS: SECOND ADDITIONS

by Michael Pienkowski

Among the first set of completed new-style WSG forms to be received were several which used the forms in ways slightly different from those described in the instructions. In some cases this resulted from situations which occur (or have occurred) fairly frequently but which we had not anticipated. Accordingly, where practicable, we have tried to amend the data handling programs to cater for these. Some of these changes were described in WSG Bull. 30: 10. One further enhancement is noted below.

Moult code

In some situations (especially when large catches are being dealt with) full primary moult details were not taken but the fact that the bird was moulting its primary feathers was noted. This information can now be coded on the forms by entering '1' in the moult code space for that bird and leaving the primary moult score spaces blank. Similarly, the fact that a bird was in arrested primary moult (but details were not taken) can be noted by an 'A' in the moult code space and blanks in the primary moult score spaces.

Forms and instructions are available on request from:

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