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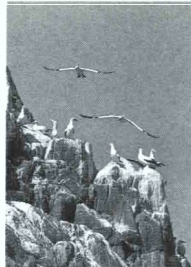
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Front cover: *Sula bassana*
(Photo John McLoughlin)
Back cover: Cliffs in Ireland
(Photo John McLoughlin)

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2. *Tadorna tadorna* (Photo Jan van de Kam)
3. Large concentrations of waders at high tide (Photo Jan van de Kam)
4. *Sterna sandvicensis* (Photo Jan van de Kam)

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Aquatic birds

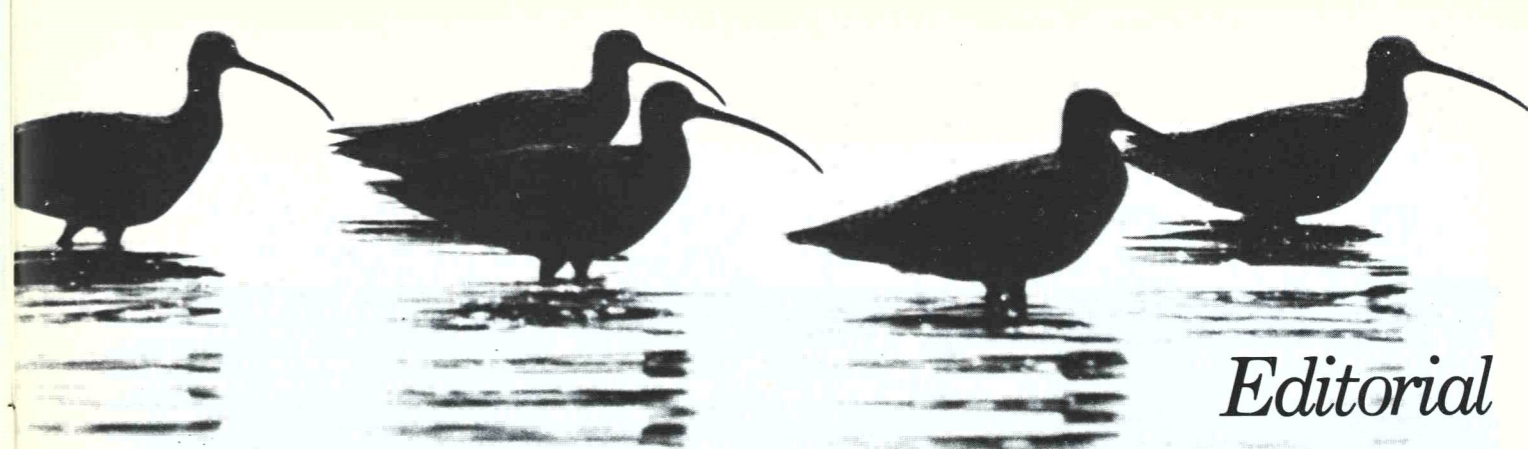
The fascinating environment formed at the places where water and land meet is also under threat. Coasts, lake shores, river banks and beaches, with their characteristic and indeed unique wildlife, are disappearing beneath the harbours, factories, tourist amenities and whole towns that are being built over them. Once again, a typical aspect of our natural environment is vanishing.

In order to safeguard the last remaining coastal and lakeshore biotopes with their wild flora and fauna, the Council of Europe is to hold the Fourth European Ministerial Conference on the Environment in April 1984 in Athens, on the theme: "Coastal areas, river banks and lake shores: their planning and management in compatibility with the ecological balance".

As a back-up to that conference, and in order to present as broad and representative as possible a range of the related problems, the Council of Europe is launching an information campaign on the water's edge. This issue of *Naturoopa*, on aquatic birds, is the first of two issues appearing within the framework of this campaign; the second will be wholly given over to the multifarious problems of preserving coasts and shores and will appear on the occasion of the 1984 Ministerial Conference.

The next issue of *Naturoopa* (No. 45) will examine the situation of small predatory mammals in Europe and will be published on the occasion of the Third International Symposium on the Otter, to be held at the Council of Europe in November 1983.

H.H.H.



Editorial

Numenius arquata (Photo J. Veen)

Over the past few years, environmental protection has become a subject of the gravest concern to all European countries; but the part of the landscape which seems to deserve special protection from all types of on-slaughter, because of its nature and importance, must surely be the coastline.

In most of the Council of Europe member states the coastal areas have been allowed to deteriorate to a worrying extent: beauty spots are left unprotected, flora and fauna destroyed, beaches and forests polluted, urban sprawl unchecked. Unfortunately, these same areas are also subject to the noxious effects of all types of marine pollution, an increasingly serious problem affecting all the seas and oceans.

The concentration of an exceptionally rich and varied wildlife into an area limited by its very geography makes it even more important that the coastal areas be afforded special protection.

Any strategy for their protection must not only aim to safeguard their wildlife, but must also try to foresee the probable effects of current planning.

renewed attention is being focused today on the shoreline and in particular on the natural habitats on which all wildlife depends for survival.

This positive approach is due largely to action on the part of individual scientists and various international bodies like the Council of Europe, but there is still much to be done, especially in the academic world, to develop a deeper knowledge of nature and so help to protect it more effectively.

Exchanges of information and experience are therefore essential in advancing the understanding of problems and arriving at the most rational practical solutions.

But information is not enough in itself to control all the threats to the coastline, and policies must be formulated which will prevent often irreversible damage.

tries. International solidarity and co-operation in this field are evinced by the many international agreements or directives in existence.

In short, the numerous problems to be solved in relation to the coastline have brought in their wake a tangle of legislation, research and action, as a result of the interdependence of most of the relevant factors. So an effective strategy for protecting the coasts must surely be based on an overall view of the problem, such that priorities can be established and the sea-shores managed using a more rational and therefore more carefully considered approach. It must be a multiple strategy because of the diversity of socio-economic activities, and by reason of well-established local traditions.

It must be carefully considered, for these local traditions are a reflection of man's uneasiness in environments in which he does not feel at home. But they also bear witness to the attraction that these rich and varied natural areas have for him.

For a long time, economic activities of a traditional type worked in harmony with the fragile equilibria of these natural habitats. In modern times this no longer applies, and careless planning can cause them to disappear altogether.

Today's effects on the coastal areas are felt ever more acutely. They are subject to often conflicting pressures because of their diversity and their leisure attractions. But the latent resources of the coastal regions are sufficient justification for paying the same sort of attention to their future as to the maintenance and development of economic activities. There must be good understanding of the biological richness and potential of marshlands, tidal reservoirs and estuaries, and not only from a scientific point of view: these ambivalent areas can also appeal to our sense of beauty through discovering and appreciating them.

The use to which these areas are put in the future will represent a particular form of culture, as well as being vital to the human race.

Jean Servat

President, European Committee for the Conservation of Nature and Natural Resources — Council of Europe

The definition of "coastline"

It is almost impossible to arrive at a strict and consistent definition of coastal areas, the place where sea and land meet, because of the range of situations that have to be included and the more or less direct interdependence of coastal areas and their hinterland.

Nevertheless the wetlands (marshes, fens, broads, peat bogs, lagoons) play an essential part in the protection of the ecological balance of the coastline; they are among the most productive organic environments in the biosphere and enrich the biogenic capacity of the coastal waters through their ecological chains. These marginal areas are the home of exceptionally varied flora and fauna; they have a crucial role in regulating the flow of rivers, and have a very long-range fertilising capacity.

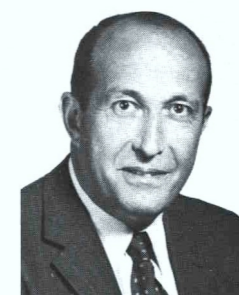
The coastal wetlands: "Get to know and so protect them"

Although all countries have long since recognised the need to protect the seas,

The protection of bird life must be given high priority

The existence of waterfowl with their obvious attractions has often led to the protection of huge stretches of coastline throughout Europe. Compared to other types of environment, coastal areas are the home of very many birds. This is a consequence of their biological potential and at the same time one of its clearest manifestations.

To the extent that mainly migratory species are involved, protecting these birds is not simply in the interests of the coastal country, but also of other coun-



The fascinating water's edge

Fulco Pratesi

Iris pseudacorus (Photo M. Gissy)



Try thinking of "the sea". The picture conjured up will certainly not be of huge ocean breakers or of sweeping expanses of water: to you and me, the "sea" is that thin line of sand which the waves dash and festoon with white surf before retreating only to turn and renew their onslaught.

If our thoughts turn to "lakes", what do we see but a pebble or reed-covered shore where the gently lapping water creates a shimmering mosaic of sparkling light?

Even when we think of "rivers, streams and torrents", pictures of banks lined with willows and poplars are conjured up, with moss-covered banks washed by the current and with the golden flowers of the yellow iris.

In the words of a WWF-Italy slogan, banks and shores are not the end of the earth but the wonderful meeting point of water and dry land.

Between water and dry land

Coastlines, river banks and lake shores, the ever constant and ever moving frontiers between water and dry land, constitute, in the words of a Council of Europe paper on the launching of the major campaign to save them, the richest

of this planet's many different environments because of the variety of flora and fauna found there. Although the open sea and vast lakes may seem to us to be extraordinarily beautiful but empty expanses of boundless blue, the fragile, sensitive strip where water meets land is teeming with different forms of plant and animal life.

It was no accident that the first living cell able to reproduce came into being in the shallow waters seething with gaseous and electrical discharges of some Archaean coast. And it was no accident that animal species made the single most important leap forward in their evolution precisely when they left the sea for dry land and had no alternative but to traverse the shore.

Lastly, the fact that the human body itself for the most part lacks hair, and in this resembles many marine mammals, that down grows in such a way as to comply with the laws of hydrodynamics and that man does not share the other anthropoids' aversion to water has led some zoologists to the view that a not insignificant period in the development of the human race was closely bound up with coasts, shores and water. We need look no further than the countless hordes of people who, every summer, invade the world's beaches to realise that there is nothing odd about this theory.

Sea and lake life is, as we have said, concentrated close to shores. Christopher Columbus and other great explorers in history reckoned they had almost reached their goal when scatterings of

seaweed were first sighted in the water and when the first seagulls appeared on the horizon.

An extraordinary abundance of life

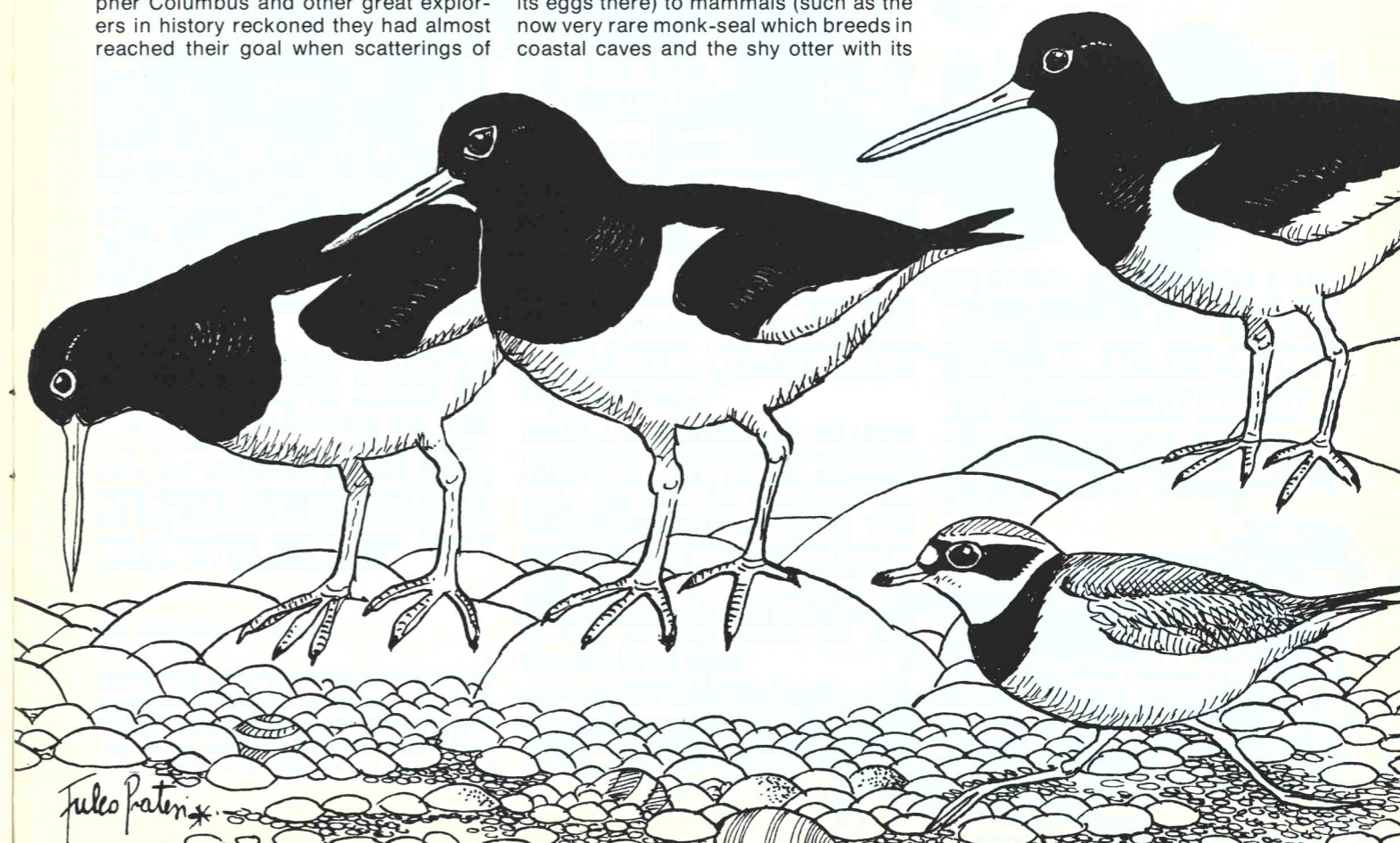
Sandwiched as they are between a hinterland where man's activities have well-nigh completely obliterated all trace of the original natural environment and the blue watery wastes, coastal environments offer an abundance of life that is unthinkable elsewhere: on beaches pioneer plants ranging from marram (*Amphipha arenaria*) to sea-holly (*Eryngium maritimum*) and from sea bindweed (*Calystegia soldanella*) to sea daffodils (*Pancratium maritimum*) prevent sand erosion and enable dune shrubs such as the juniper (*Juniperus* sp.) and oleaster (*Elaeagnus angustifolia*) to grow, while, on the wavebattered rocks, the fairly colourless rupestral vegetation is attended by a pageant of multicoloured underwater fauna—sea anemones, spirographis and sponges, gasteropods and bivalves, algae and phanerogams, fish and shellfish, molluscs and other invertebrates—which turns the first few yards of submerged cliff-face into an incredibly magnificent mosaic of shapes, colours and movement. But of all the animal species which find shelter along coastlines—ranging from reptiles (here I am thinking of the great sea-turtle which lays its eggs there) to mammals (such as the now very rare monk-seal which breeds in coastal caves and the shy otter with its

river bank habitat)—it is birds which make these environments particularly valuable.

First of all, rocks.

Where birds are concerned, there is, in my view, nothing more spectacular in the world than their massing in the nesting season on the rocky sea cliffs of Northern Europe. Whole islands and cliff faces falling sheer to the leaden seas (and their abundance of fish) are covered in spring with a pulsating, living carpet of millions of sea-birds.

On the grassy slopes extending to the edge of such precipices, multicoloured Puffins (*Fratercula arctica*) build their nests in deep holes; on narrow rock ledges the great and massive Fulmar (*Fulmarus glacialis*) lays its eggs; the Guillemot (*Uria* sp.) and Razorbill (*Alca torda*) turn stone ledges into a mass of black and white and form dark clouds in the sky with their flapping wings. From hollows and protruding rocks rings forth the sharp cry of the Kittiwake (*Rissa tridactyla*); on rocky islets magnificent white colonies of Gannets (*Sula bassana*) rear their young and perform their complex mating ritual; lower down, on rocks rising only a short height above the rolling waves and in hollows in the cliff face are found the unkempt, dirty nests of the Cormorant (*Phalacrocorax carbo*) and Shag (*P. aristotelis*), nimble predators of fish. And then there is the endless and rowdy race of Herring Gulls (*Larus argen-*



tatus), Great black-backed Gulls (*L. marinus*), and Terns (*Sterna* sp.) found in every rocky and marine environment.

On sandy beaches Oystercatchers (*Haematopus ostralegus*) and Shelducks (*Tadorna tadorna*), Plovers (*Charadrius* sp.) and seals inhabit the spots least frequented and least spoiled by man.

A realm for certain species

But there are too birds, appropriately called *uccelli di ripa* in Italian (wading birds), whose habitat consists exclusively of low banks and sea shores.

For many different species of bird—generally those with long, slender legs and beaks—unspoiled stretches of sand, and in particular those vast coastal areas where the ebbing of strong tides leaves submarine sandbanks exposed, are ideal feeding grounds. If you cast your gaze over a beach, estuary or lagoon at low tide, you will see scores and scores of birds busily and resolutely scratching about; the Oystercatcher using its large, red, razor-sharp beak to prise open the valves of stranded mussels and oysters, the Turnstone (*Arenaria interpres*) rummaging among the pebbles for small shellfish, the Godwit (*Limosa* sp.) and Sandpiper (*Calidris* sp.), Plover and

Curlew (*Numenius* sp.) using their beaks to prod mud and sand in search of worms, bivalves and shellfish.

And there is no shortage of bigger creatures such as the large but rare Brent Goose (*Branta bernicla*) which finds its nourishment in extensive mud-flats; the Shelduck and, a little further offshore, marine ducks including the Long-tailed Duck (*Clangula hyemalis*), Grebe (*Podiceps* sp.), Eider (*Somateria mollissima*) and Scoter (*Melanitta* sp.).

What is more, during migration or wintering, all—or nearly all—wild ducks spend shorter or longer periods in coastal waters either to feed [e.g. the Merganser (*Mergus* sp.)] or to avoid being shot by the hunters lying in wait for them by inland marshes and pools.

Lastly there is the Diver (*Gavia* sp.), a large, skilful diving bird which, except for its brief mating period, spends its whole life on the coast.

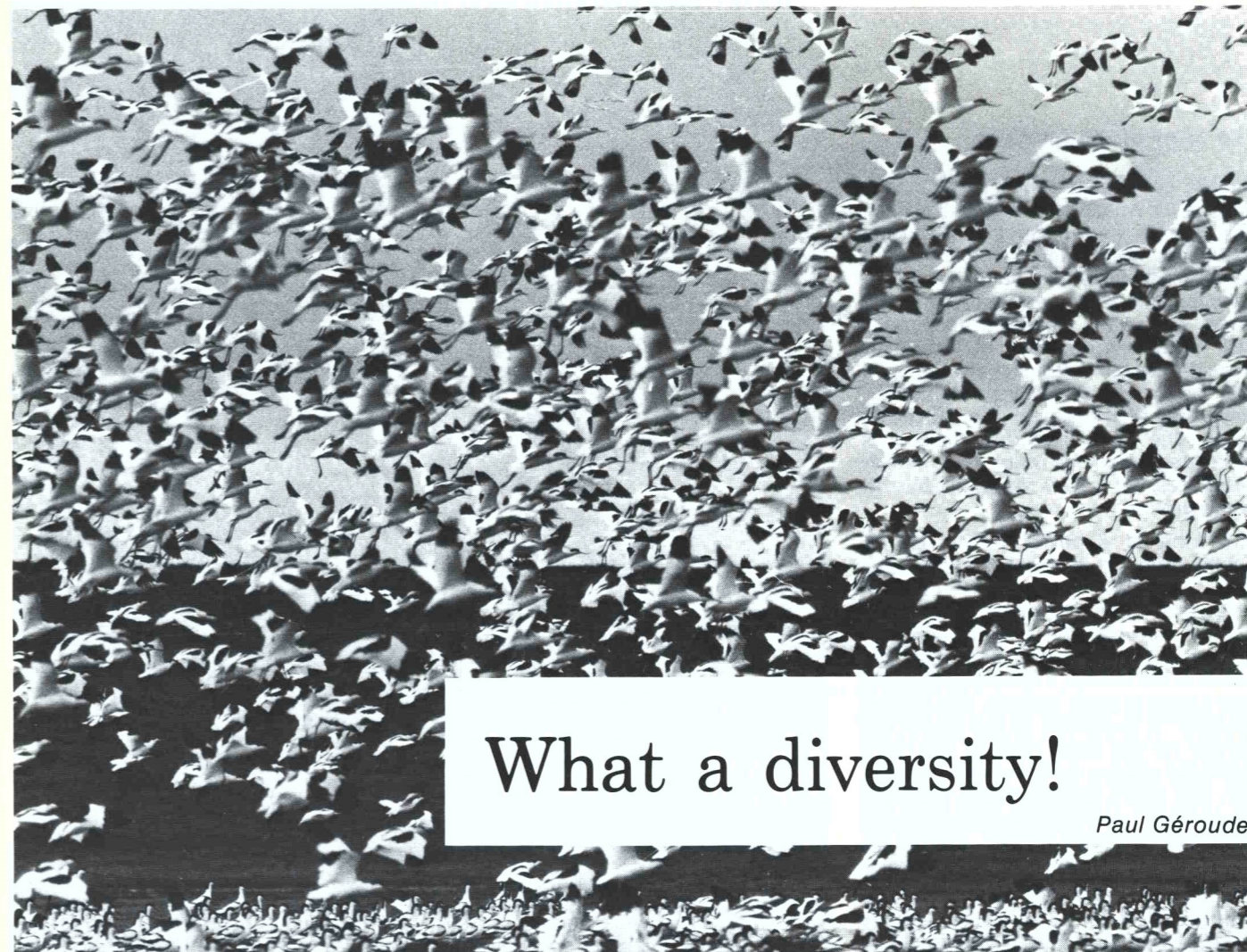
But river banks and lake shores are no less well endowed: the Sand Martin (*Riparia riparia*) (whose very name is proof of its association with such environ-

ments) will dig out a nest for itself only in sandy river banks; in muddy embankments the Kingfisher (*Alcedo atthis*), another riparian bird, likewise lays its eggs in deep hollows; it is on pebbly and sandy banks that the Common Tern (*Sterna hirundo*) and the Little ringed Plover (*Charadrius dubius*) lay their camouflaged eggs; it is on the supple branches of willows along banks and shores that the Penduline Tit (*Remiz pendulinus*) weaves its curious nest; and, lastly, the thick vegetation along banks and shores provides a habitat for the now very rare otter.

The last bastions of nature are threatened

But, just as coasts, river banks and lake shores are a focus of life, so they are also a rendezvous for all that points to death: refuse, oil and poisons which, in open water, are invisible but which, on reaching land, reveal their stark horror in all its fullness: oil coagulating in filthy slicks, ensnaring birds and carrying them up to the water's edge; waste plastic materials cluttering up sandy shores and hideously adorning tree-lined banks; sewage causing eutrophication, evidenced in coastal waters by a profusion of algae and mortality among fish, shellfish and molluscs and by foul odours; marine detergents sprayed over the foliage of Mediterranean pine trees, causing them to wither and die; stinking accumulations of foam lining lake shores and river banks.

In conclusion, coasts, river banks and lake shores, nature's last bastion now that it has been pushed back by mankind's frenzied expansion and the growth of human activities to the thin divide between land and water, are currently the environment helplessly facing the clearest threat of impending death. And, as the Council of Europe has rightly recognised, it is there that the last battle must be fought to protect what is left of the birthplace of life itself. F.P.



What a diversity!

Paul Géroutet

Recurvirostra avosetta (Photo J. van de Kam)

More than one third of the 630 or so species of birds recorded in Europe spend their lives in aquatic environments, whether rivers and streams, lakes and marshes or the sea and the seashore. It is a fact which reminds us that water was the place where animal life began. The wealth of biological forms which develop in water helps us to understand more fully the scale of the bird communities which depend upon it.

The vast range of bird species comprises an astonishing diversity of forms and features, illustrating the evolution that took place in ancient times and which may be still at work, as well as adaptations and sometimes very fine distinctions between the species. From beak to toe they have their own specific features, with differences also in song, feeding patterns and breeding habits.

An amazing richness

Some 150 species of water birds in the broad sense breed in Europe, to which must be added at least 70 more which are regular or occasional visitors from other continents. They cannot possibly all be

listed here: let us simply mention the various groups, excluding the kingfisher, dipper and marshliving passerines.

The divers (4 species) almost never leave the water, and spend long periods fishing beneath its surface. They nest on the shores of the Scandinavian lakes and disperse in winter along the coasts, some even reaching the Mediterranean.

An equally primitive group, the grebes (5) differ from them in several respects but are also excellent divers. They are much more widespread and mainly found in freshwater areas.

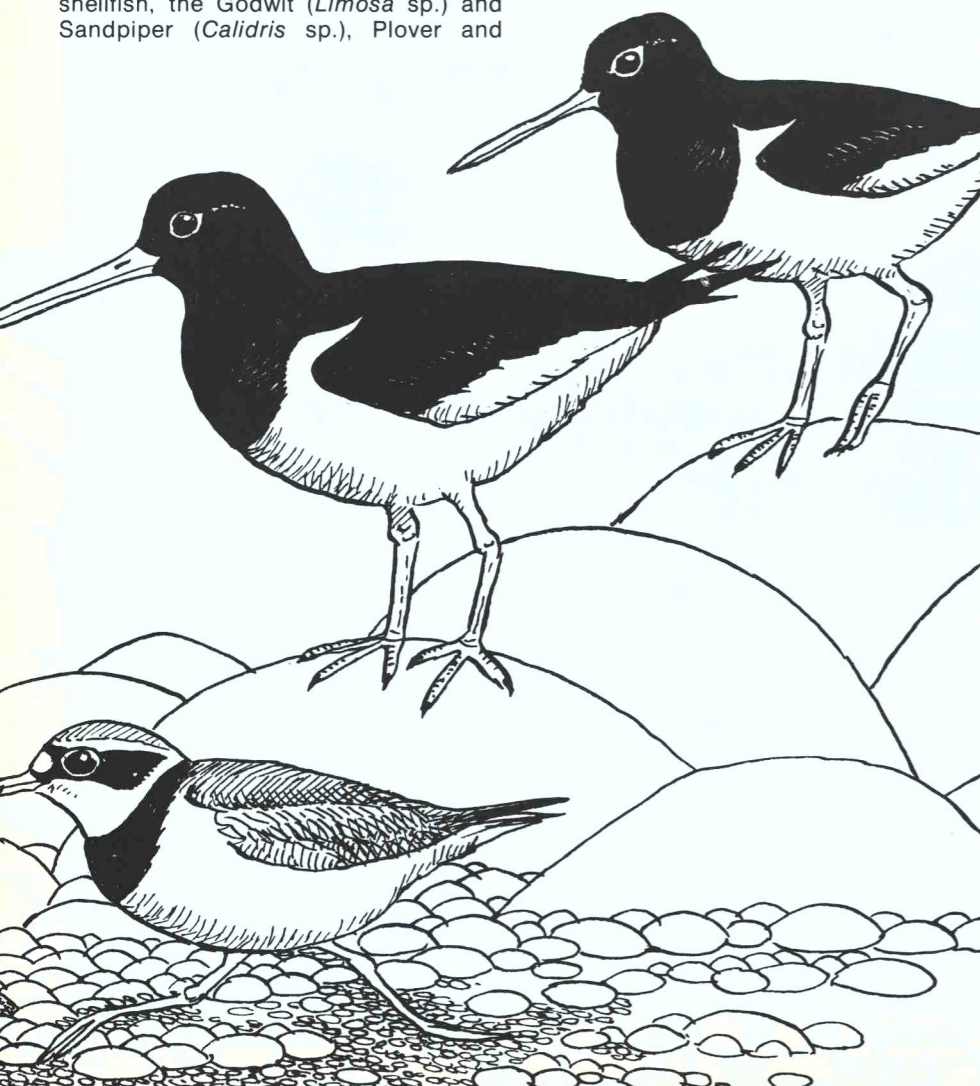
Petrels and shearwaters (5) are strictly ocean birds. With long wings, somewhat similar to the gulls but with a different beak, they skim the waves over vast expanses of the sea in all weathers, never seeming to rest in their quest for plankton and fish. Yet they do have to return to land in order to lay, hatch and rear their young; most of them do so at night, hiding in holes on small islands and reefs pounded by the waves.

The order of Pelicanidae comprises different families. The uniquely shaped pelicans (2) inhabit the flooded marshes of large rivers and deltas in the eastern

part of the continent. Cormorants (3) have almost black plumage; they too are fish-eaters, but expert divers, and divide their time between the sea coast and fresh water. The startlingly white gannet is the dive-bomber which haunts the Atlantic and nests in colonies facing the ocean.

The waders, which are content to have their feet in water, bring us back to terra firma. The herons (9), which stand in wait to spear their prey, come in different sizes and colours and build their nests in trees or reeds. While the two species of stork are not absolutely dependent on water for their survival, the glossy ibis and the spoonbill on the other hand specialise in exploring flooded or muddy bottoms.

With its longer neck and legs, the flamingo is closer to the geese by reason of its curious bill which sieves the salt-laden mud to extract tiny crustaceans from it. Salt lagoons and lakes are therefore its preferred habitat. In some particularly favoured areas such as the Camargue, vast colonies build thousands of nests very close to each other, shaped from conical heaps of mud.



The army of the Anatidae

Swans, geese and ducks make up the army of the Anatidae, with about 36 nesting species in Europe and a further 11 visitors. Their common feature (with a few exceptions) is their flat bill, and they constitute the great majority of swimming birds. The swans stand out because of their whiteness and their majestic carriage. Geese come from far away in massive flocks, but are only partly aquatic since they feed mainly in meadows and fields. The more colourful shelduck is more dependent on water and muddy seashores, but prefers to nest in a burrow in the ground.

The tribe of dabbling ducks has its habitat primarily in marshes and coastal inlets. The best known is the mallard, which provides a clear example of the difference between the brightly coloured mating plumage of the male and the brown of the female, a dimorphism that is also typical of other species. This natural "sexism" is explained by the role of the female, for she alone hatches and rears the brood and her drab plumage protects her. But every species has a coloured "speculum" or wing patch—a visual signal clearly visible in flight, even in the dark as it flashes white, green or purple.

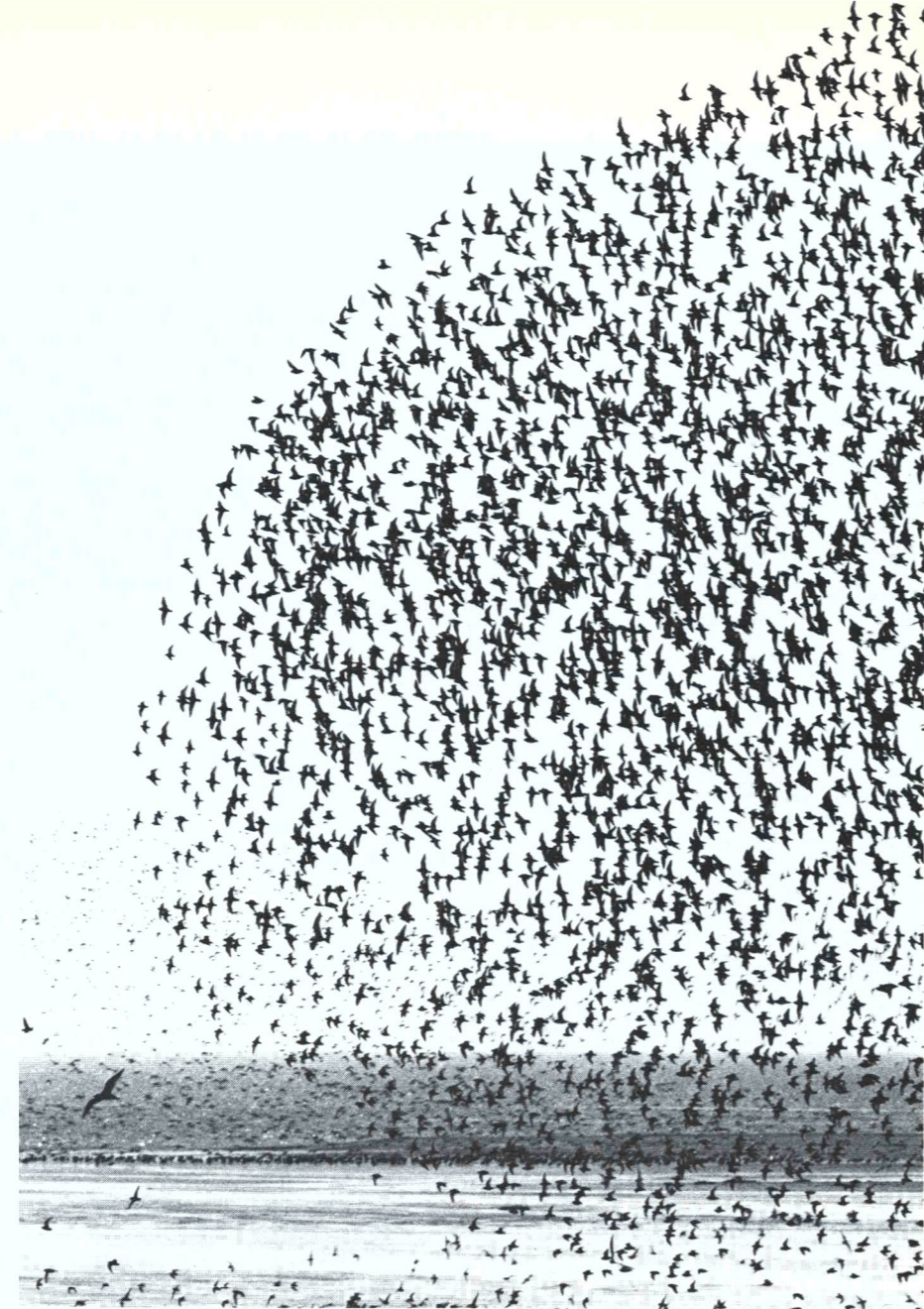
The diving ducks also have their distinctive wing mark, but the patch or bar is usually white. With the exception of the red-crested pochard, the male of which has a flaming orange crest and coral beak, these birds tend to be rather dark in colour or a pattern of black and white; they are often seen in big flocks containing a mixture of scaup, tufted duck and goldeneye. The scoters, eiders and long-tailed ducks are more especially attracted to the sea.

The merganser group (also called "saw-bills" from the shape of the bill) dive in search of fish. The superb goosander shares with a few other Anatidae the unusual habit of nesting in hollow trees, sometimes far from water, or in nesting-boxes provided for it.

The coot, a black diver with a white forehead and bill, is not a duck but a member of the Rallidae (8). Common on lakes, it is better known than the moorhen, which has a red bill, and the rails which hide in the marshes. In spite of its imposing size the crane is related to them, but is not really aquatic.

At least two million waders

There is such variety in the wader population that it is scarcely fair to pick out just a few: the group comprises some 50 species, not counting the rarest visitors. Among them are such unusual kinds as the stone-curlew, pratincole and pha-



(Photo J. Veen)

larope, but also larger groups including plovers, sandpipers, snipe, curlew and godwit, redshanks and greenshanks etc. Many of these small waders nest in the marshes and tundras of the far north, from Iceland to Siberia. Then, after the short Arctic summer they emigrate in vast numbers down to the coasts of the Atlantic, and in some cases as far as Southern Africa. The mudbanks of bays and estuaries then become their home and their life revolves around the tides—they spend hours alternately probing the wet mud and resting in tight-knit groups when the tide rises. At least two million waders visit Europe's shores either on their migrations or to spend the winter.

Related—though very different—families include the skuas (4), those pirates in

dark plumage, while the gulls (13) snap up whatever trifles they can find, generally near the water's edge. Terns (10) are more fully tied to the water as their habitat.

Finally the guillemots, penguins and puffins, belonging to the Alcidae family (5), take us out to the open sea again. Outstanding swimmers and divers, they form huge colonies on the cliffs and islands along the Atlantic seaboard. These, sad to say, are the species most at risk from oil spills.

The bird life of our inland and coastal waters is a thoroughly fascinating subject of study and wonderment, and one that is virtually inexhaustible—provided the basis of this rich heritage is safeguarded. P.G.



Migration

Pavlos Neophytou

Bird migration is a phenomenon observed on all continents; birds migrate from one country to another and often between continents. As is known, bird migration usually takes place because of changing weather conditions. Birds migrate from Europe to winter in Mediterranean countries and Africa, and return to Europe in the spring to breed and spend the summer. Bird migration through Cyprus, especially that of aquatic birds, has been observed since Homeric times. It is natural for Cyprus, the third largest island of the Mediterranean Sea, to be used by thousands of birds as a stepping-stone to and from Africa and for many of them as a wintering place. Apart from its mild climate, it also has the privilege of having two wetlands of unique and exceptional international importance, namely Larnaka and Akrotiri salt lakes. In these two lakes many insects are found, as well as a species of shrimp (*Artemia salina*) and these provide excellent food for aquatic birds. At another site, near Famagusta, where marshes exist from time to time, thousands of birds migrate, winter or breed. Among them we have the elegant swans, though these birds have never bred in Cyprus.

Many "visitors"

Among the aquatic birds that visit Cyprus in large numbers are the cranes; they are usually our first visitors, coming in beautiful V formations. According to recent studies by the Cyprus Ornithological Society, Demoiselle Cranes (*Anthropoides virgo*) pass over Cyprus only

in autumn, bringing with them their young ones, whose voices although weak can always be distinctly heard. They usually traverse the island from north to south, often passing over the low peaks of the Troodos range; they stop at Akrotiri lake, especially at night, to recover and start on their trip again the next morning. Other species of crane pass over Cyprus in spring on their trip from Africa to Europe, but our observations show that when they leave Europe for Africa in autumn, they do not visit Cyprus, apparently passing over Lebanon and Israel instead.

Many times the cranes pass during the night in huge chains, and the only sign of their presence is their shadows silhouetted against the moon and their honking calls breaking the stillness of the night.

The main observation points of bird migration over Cyprus are Akrotiri peninsula where Akrotiri lake is found, the cape of Apostolos Andreas, Paralimni area, the cape of Cavo Greco and the cape of Kormakiti, but the most important place is Chrysochou bay near Akamas cape, where thousands of birds can be seen passing, especially from August to the end of September. During this period, huge flocks of ducks start gathering in the bay from early morning onwards. The number of individuals in a flock may exceed 500. During the daytime, the flock usually stays on the water but will occasionally fly over at a low altitude. As soon as the sun sets, one flock after another rises, they join together (the number of birds sometimes exceeding 2,000) and after making a huge circle over the sea, they disappear southwards, passing over cape Akamas.

It has been observed that about 90 % of these ducks are Garganey (*Anas querquedula*) and the rest are Teal (*A. crecca*), Mallard (*A. platyrhynchos*), Pintail (*A. acuta*) and a very few Shoveler (*A. clypeata*).

Many other aquatic birds pass in more or less the same way over Cyprus, such as the Grey heron (*Ardea cinerea*), the Purple heron (*A. purpurea*), the Squacco heron (*Ardeola ralloides*), the Little egret (*Egretta garzetta*), many gulls and terns. These birds also gather above the islets which are found near the seashore up to the end of the cape, and by dusk they start leaving in the same direction, but in separate flocks. All these aquatic birds prefer to travel over the sea, and very rarely over the land.

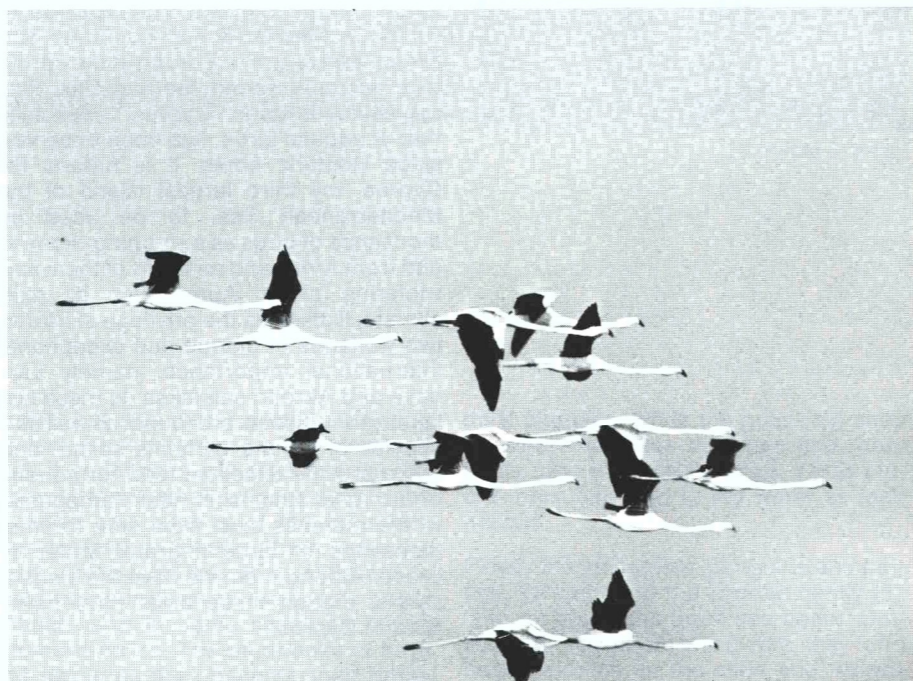
The flamingos

Among other aquatic birds that migrate through Cyprus, but which also winter there in great numbers, are the flamingos (*Phoenicopterus ruber*); they are found at the two salt lakes, Akrotiri and Larnaka. These lakes, which dry out in summer, get their water from winter rain and the flamingos appear there one or two days after the first rains. They come to Cyprus from the USSR and Iran, or from Turkey, as has been shown by ringing.

Akrotiri salt lake is their main station, their number there rising sometimes to 25,000; as already mentioned, they use the lake as a resting place a few days before they migrate. Their migration seems to be continuous from autumn to spring and sometimes up to June, as detailed in a study by the Cyprus Ornithological Society entitled *A note on the study of the greater flamingo at Akrotiri salt lake*. "The greater flamingo uses the lake as a migration and wintering point as long as conditions remain favourable. Migrants arrive in November, almost as soon as there is sufficient water in the lake to accommodate them, suggestive of previous overflying during the month. These first migrants are nearly all adults, and many of them migrate further south after a stopover. Nevertheless, there is a steady build-up in numbers throughout December, and a marked increase in the number of juvenile birds. By the end of the month numbers have stabilised, the flock has quietened down, and there is little significant activity until early March. At this time the noise level begins to increase and there is increasing evidence of "proving flights" of small flocks of birds at low level. In 1976 the last 2,000 of the wintering flock left overnight 11/12 March, but transient flocks passed through until as late as 17 July. There were periods when there were no birds at all, and numbers in this period never rose

above about 200, sometimes divided into separate flock groupings.

There was clear evidence of the husbandry of young by adult birds. In the wintering flocks most young are gathered together in schools, usually protected by surrounding adult birds. In spring, flocks of non-breeding juveniles are escorted by small numbers of adults, also presumably non-breeding and at least in their second spring. In some instances flocks were 90 % juvenile, and in April the first brown-plumaged juveniles from the previous summer's hatching were seen. These immature birds form an increasing percentage of the flock and had reached 95 % in early May. By June the legs of the first year birds started to turn pink. No young of the year were noted on the autumn migration in either 1975 or 1976; nonetheless, it is evident that in the flamingo world the mature breeding birds come and go first, and the weaker and younger follow on some time later."



Phoenicopterus ruber (Photo A. Gandolfi-Jacana)

Save Akrotiri salt lake

To conclude, it should be mentioned that Akrotiri salt lake, which is the largest of the two wetlands of Cyprus, is found in one of the two British Sovereign bases. It is the most important wetland in the Mediterranean basin, from an ornithological point of view and from the point of view of its flora and general environment.

Unfortunately plans have been prepared to use a substantial part of this lake for the sewage plant of the town of Limassol.

The Cyprus Ornithological Society has made and continues to make strong representations to the Cyprus Government, the British authorities, local and international organisations, in an effort to prevent the imminent destruction of this unique wetland which forms part not only of Cyprus' environmental heritage but also of that of the rest of the world.

P.N.



(Photo J.-C. Chantelat)

A chance of survival?

Urs N. Glutz von Blotzheim

Few types of landscapes exercise so much fascination as do the natural banks of still and flowing bodies of water with their distinctive patterns of change. These changes have often been taken as a direct challenge; could people really be expected to look on passively as wide tracts along the banks were rendered unsuitable for any form of exploitation by the seasonal rise and fall of the water level or by flooding after heavy rains? What is more, particularly extensive areas were also breeding grounds for disease-carrying insects and therefore had to be drained simply for health reasons. One drainage project led to another and, as the waters gradually came under increasing control, the alterations originally carried out for reasons of safety (e.g. to prevent malaria or protect against flooding) provided greater opportunities for construction on banks and for exploiting the water as a source of energy or for shipping. Humanity not only rose to the challenge of bringing the waters' natural dynamics under control, but went all out to make use of them in ways which could hardly have been more varied. For instance, while the banks were cleared for human use, the water itself was used to dispose of waste of all kinds. As a result, extensive riparian plant communities soon became so scarce that in recent years more and more people have come to feel that the fascination lies rather with those areas of the shoreline which have remained close to the natural state, although their ideas about what should be done with them still vary very widely.

While some urge that riparian areas should, as a matter of principle, be made accessible to the public and every public holiday sees hundreds and thousands

congregate at lakeside swimming areas and campsites, others feel the need to escape the madding crowd and penetrate, with boat or surf-board, on foot or swimming, into the last areas along the banks which have been left relatively undisturbed. There are still too few people who realise what effect this development has had on other living creatures, and that is why I propose to illustrate its consequences for four bird species specially adapted to life in pioneer vegetation in river meadows and along the banks of stretches of still water.

Alternative biotopes can still help

Riverside shingle banks provide nesting sites for, among others, two species of waders which have become rare throughout much of Europe and are therefore on many countries' Red List of endangered bird species. During the nesting season the experienced bird-watcher recognises them primarily by their territorial songs and warning cries. The species' requirements differ, which is why they are not threatened to the same degree. A two-syllable "piu", singly or repeated, or a constant rhythmic "gría gría gría" betrays the presence of the nimbly scurrying Little ringed Plover (*Charadrius dubius*), a bird the size of a lark but plumper, with earth-brown back and white underparts, black forehead-band, black breast-band and bright yellow eye-ring. Originally the species nested mainly on gravel, shingle and sand banks along rivers or on alluvial land with little or no vegetation, where it found not only safety from ground predators and the flat-bottomed stretches of

fresh and brackish water needed for raising its young, but also areas of sparse vegetation and a coarse substrate on which the camouflage of plumage and eggs was at its most effective. These natural breeding areas have drastically declined in the past hundred years as water courses have been channelled, made navigable or harnessed for energy generation. As though to compensate, however, ever since the late Middle Ages, excavated areas and overburden tips have furnished anthropogenic sites which correspond more or less well to the environmental requirements of the Little ringed Plover. A bird which nests in gravelly river meadows must in any case



be prepared to adapt to conditions which can change in a very short time and sometimes quite without warning, since high water levels can at any time alter the course of a river with numerous arms, transforming old gravel surfaces and exposing new ones. It was not therefore difficult for a highly mobile species with

no particular links to its place of birth to adapt to gravel pits, sewage ponds and other substitute biotopes characterised by the sparseness of their vegetation. The boom in concrete construction after the second world war and the accompanying rationalisation of sand and gravel extraction and transport methods produced such an abundance of suitable substitute biotopes that the breeding population of the far from timid Little ringed Plover increased spectacularly. Nonetheless the future development of the species' numbers must be very carefully watched because of the considerable conflict of interest over the substitute biotopes, most of which came into being by chance rather than design. Often the nature of the sites changes suddenly in the course of exploitation. When excavation ceases nesting sites may be lost to over-abundant vegetation, backfilling of pits or reclamation where this is required by contract. The Little ringed Plover's nesting sites are also favoured by anglers, water sports and motocross fans, among others, and many clutches of eggs and nestlings fail to survive the weekend. Lastly, the present "Atlantic" phase of climate with wet, cold weather in May and June is not exactly favourable to the species. Now, with so much of the countryside cleared and in many places covered over with concrete, precipitation reaches the streams, most of which have been channelled, too rapidly and is then carried very fast into the rivers, which, since they too have been channelled, no longer have enough space to carry the water; in consequence the nesting sites which remain are flooded even more frequently than in the past. Rain and cold weather can cause almost as high losses in the substitute biotopes.



(Photo J.-C. Chantelat)

Too rare for research

In the vicinity of high-lying sand and gravel islands with illecebrum or petasites communities, reed-grass and willow and grey alder shrub a three-syllable "hididi" or the rapid rhythmical territorial song "titi - hihihhi - titi - hihihhi" draws our attention to a snipe-like bird with a grey-brown back, white under-parts and a beak as long as its head, hopping along the shoreline with a characteristic bobbing of its tail, or flying low over the water with jerky wing-beats alternating with short glides. The Common Sandpiper (*Actitis hypoleucos*) lays its eggs not on the open gravel bank but in a hollow hidden in the vegetation or under washed-up debris, and lined with dry leaves. Chicks no more than two or three days old react to their parents' long-drawn warning calls by taking shelter in vegetation. This species, too, has suffered as a result of river straightening,

construction along the banks and water sports, and numbers have fallen severely, particularly in low-lying land and in many of the lower mountain ranges of central Europe. Even along Alpine rivers the species faces numerous threats and numbers are so low everywhere that it is impossible to investigate whether, in addition to the monogamy of isolated pairs during the nesting season, higher population densities also give rise to a pattern of successive polyandry, in which the males do most of the work of rearing the brood, as happens with the Spotted Sandpiper (*A. macularia*), an American species. This is only one of many bird species which have already become so rare over large areas of Europe that questions of the utmost interest to science can no longer be investigated. Unlike the Little ringed Plover it is unusual for the species to adapt to alternative sites in sand and gravel pits.

A jewel disappears from inland waters

The Little Tern (*Sterna albifrons*), hardly bigger than a swift, with its white forehead and orange-yellow beak, fascinates the observer with its indefatigable diving. Admittedly, even diving from a height of as much as 8 to 10 metres, this delicate little bird does not reach a depth of more than 80 centimetres; it is therefore forced to forage in clear shallow waters with abundant small fish, sites which occur both along the coast and inland. In the nesting season it moves to sites with little or no vegetation, protected from ground predators by water or by a clear view over a long distance. In inland areas the only possible nesting sites have always been shingle and sand banks in large rivers and sometimes, though rarely, in lakes. Today the nesting colonies along the big rivers of central and western Europe, which were abundant as late as the first half of the 19th century, have largely disappeared as a result of the extension of the system of navigable waterways and the construction of flood barriers. The last remaining significant inland sites are in Poland (inland population in 1973: 500-600 pairs), Hungary (total population not known, but declining), on the Loire and Allier rivers in western France (about 370 pairs in 1980) and in the Valli di Comacchio in the Ferrara and Ravenna provinces (900-1,000 pairs in 1981). We cannot simply resign ourselves to the further fall which is likely in inland populations, the more so as the coastal population is by no means certain of maintaining its present levels (in spite of the population up-turn thanks to the creation of seabird sanctuaries), and industrial effluent polluted with dieldrin and telodrin has on one occasion already had catastrophic effects on the population in the Netherlands and Belgium.

A frightening decline

While the Little Tern fishes only in clear water with no vegetation and lays its eggs in a hollow formed in sand, gravel or shell deposits, the marsh terns (*Chlidonias* sp.), whose plumage during the breeding season varies from more or less grey to coal black, build large nests in low swamp vegetation or floating vegetation communities. Over heavily overgrown shallow water they are more likely to catch insects and other small invertebrates, either by skimming low over the water surface or picking them out from the vegetation, than to dive for small fishes just beneath the surface of the water. The most widespread in Europe has always been the Black Tern (*C. niger*), but numbers were already beginning to decline by the mid-19th century and since the end of the 1950s the decline



Chlidonias niger (Photo J. van de Kam)

has become more rapid everywhere, even in the species' remaining heartlands in the Netherlands, Schleswig-Holstein, Denmark and Luxembourg. In the Netherlands, the number of nesting pairs has declined by as much as 15-30 % in 25 years and the present population of 2,000-3,000 pairs represents perhaps only 10 % of population at the turn of the century. In Schleswig-Holstein there were still 800 pairs during the period 1960-66; today there are at most 150. Around 1850 the Black Tern was a very common nesting bird almost everywhere in Denmark, but the sharp decline which began around 1920 brought numbers down to about 700 nesting pairs in 1950 and around 200 in 1974. In Mecklenburg the number of nesting pairs fell by half during a period of 30 years. In the case of this species too, Poland and Hungary are nowadays home to two-thirds of the central European population. This drastic decline must be ascribed primarily to deteriorations in habitat. The Black Tern needs a basis for its nest; but since the nest lies only just above the surface of the water and plant growth must not hinder the bird's landing or take-off, low vegetation early in the nesting season is essential. Suitable nesting sites are therefore eutrophic shallow waters, heavily overgrown ditches and sluices, water-filled hollows, depressions and cattle watering places in marshes, swampy meadows which dry out regularly and where water may reach ankle- or knee-depth, flat expanses of water in swamps, areas which are silting up, and fish ponds. Rivers are suitable only if they are slow-flowing, with abundant reeds and herbaceous plants along the banks, conditions most readily met by backwaters and abandoned channels. But these overgrown shallow expanses of water are the first victims of drainage projects to clear the way for more intensive agriculture, industrialisation and the ever-expanding towns, and of canalisation measures. Further negative influences have been the severe pollution of many rivers which has reduced the species' prey, and the threats to successful rear-

ing of the brood in the few remaining suitable sites as a result of increasing pressure from holiday-makers and leisure seekers (construction along lake shores, bathing and boating, fishing, etc.). The vulnerability of nesting sites (to storm floods, too early drying out of the water, trampling by grazing animals, etc.) means that even under natural conditions young may not always be reared successfully.

More is at stake than just landscape and birds

Some bird species, like the Little ringed Plover, can adapt to changes in their environment. But there are many more whose requirements are very specific and which disappear once these requirements are no longer met. It is precisely these species which are responsible for nature's wealth of forms and diversity. We humans depend for our well-being on a high degree of environmental diversity. We may not notice a Common Sandpiper or Black Tern, but their habitat is as

important to us as it is to them. A landscape which has been cleared and brought under control may satisfy business economic interests but in the long term it cannot satisfy even national economic interests, and certainly not the longings with which we look forward to our free time. To find places where we can really relax we have to travel further and further at weekends and holidays. But how many Europeans are already in a position where they can no longer freely choose where they will spend their holidays? That alone should make us think twice and show us that the rapid changes in wildlife which we are now seeing as a result of changes in the countryside and new methods of production are an alarm signal which we must take seriously for our own good. We must ask ourselves whether the immediate surroundings of the place where we live can still cast their fascination over us or whether landscape clearance and regulation have already gone so far that without holidays on some relatively unspoiled distant island or mountain meadow we can no longer be truly content.

U.N.G. von B.

Sterna albifrons (Photo J. van de Kam)





Saltmarshes on the island of Griend (Photo J. Veen)

The Wadden Sea

Theunis Piersma

Denmark, West Germany and the Netherlands share one of western Europe's largest remaining wildernesses, the international Wadden Sea. Covering 10,000 km², the Wadden Sea is the shallow southern and eastern side of the North Sea, separated from deeper water by a row of more than thirty barrier islands which are separated from each other by deep channels. A considerable proportion of the area enclosed by the barrier islands falls dry twice a day. The periodical drying of these so-called intertidal flats is the most striking feature and biologically the most deciding characteristic of the Wadden Sea.

The Wadden Sea is strongly tied to industrial Europe by three large rivers which discharge into it: the Ems, Weser and Elbe. In addition, the water of the Rhine reaches the Wadden Sea by way of the IJssel and by a northward current along the Dutch coast. Other links to urban western Europe are the numerous tourists who visit the Wadden Sea and its islands during their holidays. Apparently, many people are attracted to this vast, relatively unspoiled space with its great natural richness of which birds form an inseparable and conspicuous part. Even the uninformed visitor can hardly escape noticing the large flocks of birds foraging

on the sand and mudflats at low tide, or flying up from their roosts during high tide.

The Wadden Sea is important for about fifty species of birds. Some use the area mainly as a breeding place. Other species do not breed in the Wadden Sea, but spend the winter there. Still others visit the Wadden Sea only once or twice a year during their migrations. They build up energy reserves for the long and demanding journeys between the breeding areas in the north and the wintering areas in the south.

Waders, geese, gulls, terns and ducks all have many interesting things to tell about their lives. During the past two decades a lot of exciting facts concerning their habits have been discovered but many intriguing questions still remain.

In this article we shall give a general view of the breeding, the wintering and the long-distance migratory birds that visit the Wadden Sea, and explain why so many birds stay there for shorter or longer periods of their lives. Classifying the birds in breeders, winterers and migrants is obviously somewhat artificial, but very useful. Under each of the following headings we shall discuss some selected species that conform best to these categories.

Breeders

Shelducks (*Tadorna tadorna*), Eiders (*Somateria mollissima*), Oystercatchers (*Haematopus ostralegus*), terns and gulls are typical breeding birds of the Wadden Sea, the latter being most numerous. Black-headed Gulls (*Larus ridibundus*) increased dramatically in number during the last three decades. In 1950 only a few hundred pairs bred in the German part of the Wadden Sea but this increased to 20,000 pairs in 1980. Although many Black-headed Gulls forage on the tidal flats for small crabs, shrimps and worms, the increase in population size is an effect of the improved feeding conditions inland: the gulls have taken the opportunity to forage on the ever increasing refuse dumps and have also profited from modern developments in agriculture.

Herring Gulls (*L. argentatus*) are very numerous as well (circa 70,000 pairs nest in the Wadden Sea) and have also benefitted considerably from man-induced changes of the environment. They feed on a wide variety of estuarine organisms (from mussels, cockles and crabs to the eggs and young of other gulls and terns) as well as on refuse dumps. Common Gulls (*L. canus*) and Lesser Black-backed Gulls (*L. fuscus*) are the least numerous gulls of the Wadden Sea (respectively about 4,000 and 15,000 pairs) and are also the least dependent on the intertidal flats for their food. Common Gulls prefer the insects and earthworms of the grasslands whereas Lesser Black-backed Gulls are birds of the open sea.

In contrast to the gulls, all the species of terns have declined in numbers in the past. Most probably, this is a direct consequence of their being at the end of a polluted food chain: they eat almost exclusively fish. Once, Sandwich Terns (*Sterna sandvicensis*) were very numerous and breeding concentrated on some small exposed islands. On the tiny island of Griend in the western Wadden Sea for example, in the 1950s some 20,000 to 25,000 pairs bred there. From 1959 to 1963 numbers dropped to about 800 pairs. It was conclusively shown that this tragical decline was due to industrial discharge of the insecticides dieldrin and telodrin in the river Rhine near Rotterdam. The pollutants were transported to the Wadden Sea by a northward current along the Dutch coast. Since this pollution was detected and stopped, the number of Sandwich Terns has increased somewhat. Nowadays 3-4,000 pairs nest on Griend. About a third of the total west European population breeds in the Wadden Sea. Unfortunately they have never fully recovered. Common Terns (*S. hirundo*) are currently as numerous as Sandwich Terns (circa 10,000 pairs) but in the 1950s their numbers were far greater. They were then estimated at circa 35,000 pairs for the Dutch part of

the Wadden Sea only! The reasons for the decline of Common Terns are probably the same as for Sandwich Terns.

The last characteristic and numerous breeder of the Wadden Sea to be mentioned here is the Avocet (*Recurvirostra avosetta*). About 6,000 pairs, half of the west European Avocet population, breed in the Wadden Sea. Avocets forage on the muddiest mudflats. Only there are they able to shuffle with their fragile and upwardly curved bills through the upper layer of the sediment to capture worms and small crustaceans. Most of the soft sediments are next to saltmarshes in which the Avocets breed.

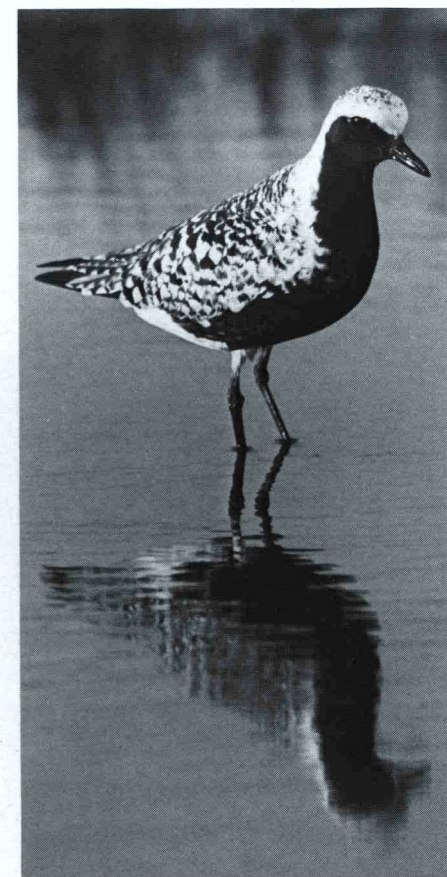
Gulls, Terns and Avocets have one thing in common: they all nest in colonies. Often colonies of these species are associated or even mixed. A probable function of breeding colonially is that predators can more easily be detected and more successfully deterred by all the birds of a colony than by one bird alone.

Winterers

For many species of wildfowl and waders the Wadden Sea is an important wintering area. For Eiders, large marine ducks, the Wadden Sea is the wintering area for half of the complete Baltic population of more than 650,000 individuals. The food of Eiders consists almost exclusively of mussels, cockles and crabs. They dive to the bottom to pluck off or dig up the molluscs. And because they forage by diving, they are able to use the resources of the subtidal flats and deeper channels, which cannot be harvested by wading birds. As they are relatively large and therefore eat much, and because they occur in relatively great numbers, Eiders consume about a third of the total amount of food eaten by birds in the Wadden Sea. In terms of food consumption they are the most important bird species of this ecosystem.

Less demanding species are the Red-breasted Merganser (*Mergus serrator*) and the Goosander (*M. merganser*). These beautiful ducks are not easily seen from the shore since they mostly live on the open water. The Mergansers are fish-eaters and avoid areas with tidal flats. This is why they only occur in large numbers in the most western part of the Wadden Sea, where these flats are less common. In this shallow sea, about 20 % of the northwest European Red-breasted Mergansers and about 30 % of all the Goosanders are wintering.

Pluvialis squatarola (Photo J. Veen)



The Wadden Sea



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2



3

A vast intertidal zone which is irreplaceable, especially for hundreds of thousands of migratory birds.



4

One of the more spectacular flying creatures of the polders and the saltmarshes surrounding the Wadden Sea are the geese. Two species are entirely dependent on the Wadden Sea for their survival. All Barnacle Geese (*Branta leucopsis*) of the Barents Sea population, two-thirds of all Barnacles in the world, appear in the Wadden Sea in late autumn. They return from their breeding areas on Novaya Zemlya in the USSR. Before 1970 their main autumn haunts were in Schleswig-Holstein but they have since moved westwards to the newly reclaimed Lauwersmeerpolder in the Netherlands. Here the Barnacle Geese find extensive pastures of their preferred food plants and less disturbance from shooting than in Schleswig-Holstein. However, during the spring migration, the saltmarshes of Schleswig-Holstein still function as a main area of departure. In severe winters most of the Barnacles leave the Wadden Sea for milder areas in southwest Netherlands but in mild winters many of them stay. Recent research revealed that in spring, flocks of Barnacle Geese crop fields of growing food plants on the saltmarshes at regular intervals. The intervals are timed so that the growth rate of the grazed plants is optimal. Growing plants are rich in proteins and proteins are the raw material for the contents of the eggs which they are about to produce. By their regular visits to particular parts of the saltmarsh, the birds themselves, like genuine farmers, are able to enlarge the amount and quality of their food.

Dark-bellied Brent Geese (*B. bernicla*) breed on the tundras of Taymir Peninsula in Siberia, even further away than Barnacle Geese. The entire population comes to the Wadden Sea to winter. At the beginning of this century several hundreds of thousands of Brents spent the winter in the Wadden Sea. All these birds fed only on eelgrass in the extensive beds which then covered large parts of the intertidal flats. In the 1930s a widespread disease wiped out the eelgrass completely. It did not recover and in 1953 only 16,000 Brents were left. Since then the size of the population has increased again to more than 120,000 individuals and this is due to two factors: firstly, the hunting of Brents in the Wadden Sea has been stopped and secondly, the Brents have started to feed on grasses and other agricultural crops in the polders and saltmarshes. Hence, the amount of food they can use has increased considerably. Although survival seems guaranteed now, we have to realise that the reproduction of this species is highly variable and unpredictable. This variability depends both on the period of snow cover in the breeding area and the physical condition in which individual Brent Geese leave the Wadden Sea in spring. Physical condition is re-

flected by the weight of individuals at departure. Departure-weights are related to the availability of food and we therefore infer that the quality of the feeding sites in the Wadden Sea in spring is crucial for the breeding success of the geese in the Arctic. We must conclude that for certain species the conditions in the Wadden Sea affect what happens 9,000 km away. Such is the importance of the Wadden Sea!

Migrants of autumn and spring

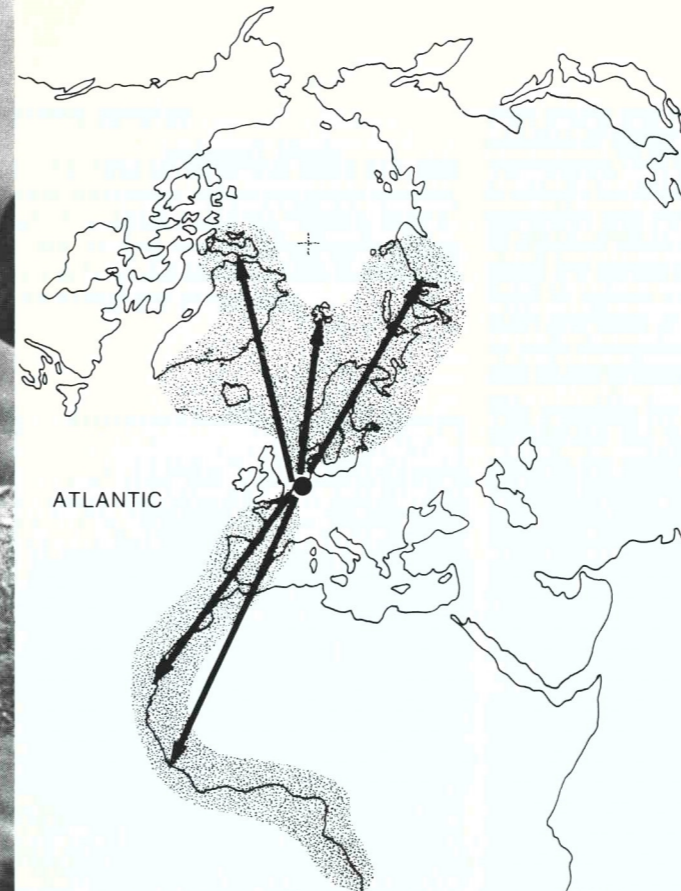
After every summer, in August, all 60,000 adult Shelducks that breed in western Europe assemble on a few mudflats around the mouth of the river Elbe in the German part of the Wadden Sea. On arrival these large geese-like ducks become flightless: they drop all their worn flight-feathers to replace them. As far as biologists understand the process, the renewal of feathers (or moult) is an energy-consuming affair. Birds are mainly moulting when they are not engaged in other energetically costly activities like breeding or migrating. The energy argument and the fact that flight is often impaired by incomplete wings are the reasons to consider moult periods as critical in the life of birds. The peculiar habit of Shelducks to moult collectively on a few mudflat areas in the German Bight is not yet fully understood. Presumably these mudflats were historically selected by generation after generation of Shelducks as a safe place, which at the same time provides sufficient food for all these birds.

Everywhere in the Wadden Sea, the end of the summer sees masses of waders pouring in from their breeding grounds in the near and high Arctic. As for Shelducks, the Wadden Sea is for them the place to renew feathers after the long flights to and from the far north. The area from which the waders originate (from Ellesmere Island in the Canadian Arctic in the west, to Taymir Peninsula in the east) is immense: its surface is at least 125 times larger than the area covered by the Wadden Sea as a whole. At the end of the summer the Wadden Sea is hospitable: the worms, crabs and molluscs in the mudflats which form the food for all these millions of waders, have completed their season of growth, and so there is an optimal amount of food available for the returning waders. The species we are concerned with here and which are collectively called waders (in North America they prefer the title "shorebirds") are the plovers, especially Ringed (*Charadrius hiaticula*) and Grey Plover (*Pluvialis squatarola*); the sandpipers, Knot (*Calidris canutus*), Sanderling (*C. alba*) and Dunlin (*C. alpina*); the Turnstones (*Arenaria interpres*) and the long-legged



Branta bernicla (Photo J. van de Kam)

Redshanks (*Tringa totanus*), Spotted Redshank (*T. erythropus*), Greenshanks (*T. nebularia*), Bar-tailed Godwits (*Limosa lapponica*) and Curlews (*Numenius arquata*). Two types of waders can be distinguished: the plovers on the one hand and the sandpiper-like waders on the other. Plovers are birds with relatively short stout bills and large eyes. They forage visually. Standing motionless for a certain time to scan an area for a moving prey, they then run a short distance, either to peck at the located prey or to stop again to scan a new area. The plovers are therefore dependent on active, crawling prey. In contrast, sandpiper-like waders have a tactile foraging method. They all have relatively long pointed bills, with which they probe into the mud to "feel" or "taste" the prey items with the very sensitive points of their bills. Only occasionally, when conspicuous prey types are to be captured, sandpipers rely on their eyes for prey location. The probing way of finding food means that only the invertebrates which do not live deeper into the sediment than bill length are available as food for the sandpipers.



The information on how waders obtain their food is very important for a better understanding of their distribution over various parts of the Wadden Sea and the way in which they exploit the area. In general, waders prefer the areas with the highest densities of their preferred prey. Some species, like Avocets and Spotted Redshanks, prefer the muddiest parts of the Wadden Sea whereas Sanderlings only occur on sandy beaches. This fact has important implications for the management of the Wadden Sea as a nature reserve. An example is presented by the Dollard, the threatened estuary of the river Ems, an area with extremely soft sediments. The area is of disproportionate importance for Avocets and Spotted Redshanks, who stay there in large numbers throughout the year and who perform the annual moult there. Reclaiming even a part of the Dollard would severely affect the populations of these two species, for similar muddy areas cannot be found elsewhere in the Wadden Sea.

After completion of the moult, most Ringed Plovers, Grey Plovers, Knots, Sanderlings, Bar-tailed Godwits, Greenshanks and Redshanks as well as many

Dunlins move away from the Wadden Sea to the large southern wintering areas along the west coast of Africa: the Banc d'Arguin in Mauritania and the Bijagos Archipelago in Guinée-Bissau. The fact that so many birds visit the Wadden Sea can be explained by the abundance of food. Why then, do all these waders leave the Wadden Sea in late autumn to fly huge distances to wintering areas in Africa? Once again the probable reason was discovered by the study of the food and feeding habits of the birds: when the temperature of the sediment decreases the invertebrates become less active and bury deeper. This is why plovers and small sandpipers then have difficulty in finding sufficient food in winter, which is augmented by an increase of energy requirements when it becomes colder. Furthermore, there is the risk that in severe winters the surface of the sediments may freeze, thereby making prey totally out of reach. In contrast, weather, and by inference, feeding circumstances in west Africa are more predictable. We can therefore interpret the temporary disappearance of many waders from the Wadden Sea as a consequence of their inability to catch sufficient food in cold weather.

Indispensable link between Arctic and tropics

Waders probably show most dramatically the great responsibility of our governments to protect and conserve the Wadden Sea as a natural habitat. Waders breeding in all the northern countries move through the Wadden Sea in autumn and spring or spend the winter there. At many crucial moments of their lives, as during moult and during the fattening periods before the long migratory flights, they are entirely dependent on the foods which the intertidal flats of the Wadden Sea provide. There are even indications that the breeding success of some high Arctic wader species is correlated with the feeding circumstances in winter and spring in the Wadden Sea, as was shown to be the case for Brent Geese. In addition, there are many findings which indicate that the Wadden Sea is literally full of birds: reclamation, even of small parts of the Wadden Sea, would result in the loss of individuals and would pose a threat to species. We should realize how vulnerable these seemingly abundant species in fact are: they are entirely dependent on the places where land and sea meet and where tidal flats still exist. These places are increasingly rare. Consider now that many more species than waders populate the Wadden Sea, and conclude for yourself: the Wadden Sea should be for the birds! T.P.



Waterfowl: past and future

Alain Tamisier

Water birds, seabirds, birds of lakes and rivers, the Anatidae (geese, swans and ducks) are all of these at once. Familiar figures of popular imagination by reason of their epic migrations and the mistaken belief that their passage foretold the future, they are the subject of a wealth of hunting and culinary lore and cast their spell over travellers' tales of the past. But memories of times past should not blind us to present-day reality of 1983.

Two types of constraints

Like everything else in nature waterfowl have to face two types of constraints:

1. Their habitat (wetlands) is shrinking

inexorably year by year despite all the protection measures which natural habitats enjoy or appear to enjoy. This is not limited to one region, country or bioclimatic zone. It is a reality which knows no geographical limits, which affects the birds' breeding areas, especially in the Soviet Union, just as much as their migratory staging posts in Western Europe and their wintering areas as far south as the tropics. A direct consequence of economic development, this systematic degradation of wetlands, euphemistically referred to as "improvement of low-lying land", has shown no signs of slowing down in recent years.

2. Even where the habitat still exists, waterfowl have to face ever-growing pressure resulting from the increases in

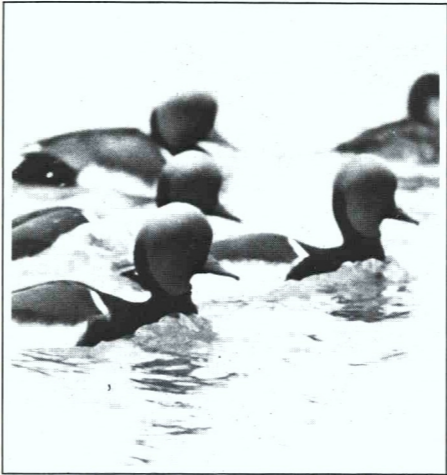
human population and from the increasingly perceived need for individuals to reestablish a certain type of contact with nature. The effects of these constraints are the more serious as the natural areas they affect are becoming smaller; impact increases exponentially, affecting not only the habitat itself but also the species which rely on it.



Anas platyrhynchos and *A. crecca* (Photo A. Dervieux)

Game species

In the case of waterfowl there are also specific constraints on the game species, which in effect mean the majority of Anatidae. Hunting has very significant effects not only on population levels but also on the availability of habitats.



Netta rufina (Photo A. Dervieux)

The Anatidae of the Western Palearctic are indefatigable migrants, twice a year crossing the majority of countries of the Eurasian continent and in some cases those of North and West Africa too. The hunting situation they face is different in each country, since it has not so far proved possible to reach any international agreements on the subject. Overall the period in which the birds are absolutely safe from shooting is only one and a half months, since they may be shot from mid-July to the end of May depending on the country. It should nevertheless be added that these extreme dates apply to fewer and fewer countries (France, Belgium and Holland for the opening of the shooting season, and Finland, Poland and Malta for the close). The average duration of the season is 3.7 months a year in the countries of Eastern Europe, 4.3 in Northern Europe, 5.9 in Western Europe and 6.6 in Southern Europe. The longest shooting seasons are 7.3 months in France and Greece and 8.8 in Malta. The opening and closing dates span a fairly wide range and are often determined by factors of climate or tradition rather than of biology. This explains the surprising fact that in two-thirds of the countries concerned the season is open by 15 August, even though most duck species have not yet finished rearing

their young and not all the young will be capable of flying, and thus of defending themselves, until the end of September. It is equally surprising to note that shooting continues well beyond the end of winter, at a period when practically all the birds killed are paired and ready to breed. It is hard to ignore the damaging effects of such practices on populations subjected to such disruption at the beginning and end of the breeding season.

The statistics for birds shot every year throughout the European countries, including the USSR, account for 45 % of the total estimated duck population. If we add to this birds injured or killed but not retrieved, the total numbers lost to guns are found to be between 50 and 60 % of total population, a figure twice as high as the North American equivalent. The various countries' share varies considerably:

Malta	0.01 %
German Democratic Republic	0.40 %
Belgium	0.50 %
Romania	0.80 %
Norway	1.20 %
Great Britain	1.60 %
Sweden	1.70 %
Spain	2.40 %
Netherlands	3.70 %
Federal Republic of Germany	3.80 %
Finland	5.00 %
Denmark	8.40 %
France	23.00 %
USSR	23.70 %

These disparities, which are not related to the total areas of the countries in question since this total area includes land which is of no use to waterfowl, are not related to the size of the wintering population in each country either. Comparison of the ratio of birds taken to the wintering populations shows up some very surprising disparities:

Great Britain	0.2
Bulgaria	0.2
Romania	0.3
Spain	0.8
Federal Republic of Germany	1.2
Netherlands	1.2
Denmark	2.7
France	8.4

The use of the size of wintering populations as a criterion, applied to countries situated within the climatic zone where wintering is possible (areas of water generally free of ice), would appear to be a good indicator of a country's potential duck populations, combining the concept of total wetland area with the notion of its availability to waterfowl.

Safeguarding the future

During migration ducks are exposed to very different conditions from one country to another, reflecting the different levels of responsibility assumed by each one for maintaining populations of Anatidae. It is fair to say that the majority of European countries nowadays provide waterfowl with relatively safe and suitable habitats, so that populations of all species taken together are not in any immediate danger, as can be seen from winter population counts. But a few other countries, less committed to nature protection, threaten to nullify all the work done by their neighbours, by taking advantage of this situation.

It is difficult to accept such an imbalance at international level. To safeguard the future of Anatidae populations, a collective wealth distributed—according to season and species—throughout all the countries from the Urals to Senegal, three complementary types of measures should be adopted internationally:

- systematic protection of all wetlands and rehabilitation of those which can still be saved;
- establishment of a coherent network of reserves capable of meeting the birds' needs wherever they happen to be;
- enactment of common shooting legislation, based on a two-fold principle:
 - absolute respect for the biological laws of the species hunted;
 - balancing out of numbers taken by shooting between all countries, specifically as a proportion of the resources which each one has to offer these birds.

The challenge is enormous; and it is for us to do everything we can to meet it.

A.T.



(Photo J.-C. Chantelat)

The threats

Ferdinand Lorenz

Water birds may be defined as species from different groups of birds which have in common some connection with wetlands, from water meadows to the open sea. Water birds include ducks, waders, rails, herons, gulls, kingfishers, dippers, etc., about 150 species in all. Every species exploits a certain part of the wetland by its way of feeding and by its preferred food. Each species occupies its own ecological niche.



Habitat destruction

Most of the species are adapted to live in the very fertile grass border-zone between land and water, both near fresh water and by the sea. Generally the best areas are the border-zones where there are small differences in levels and different types of habitat, for example islets, deltas, shallow lakes with swamps and meadows, and shallow areas with salt meadows.

As well as being an excellent place for water birds, this type of biotope is, after draining, especially suited for agriculture, so that today draining is the biggest single threat to water birds. This is because of the favourable nature of the ground and also because good bird areas are often found where the soil would produce profitable crops.

Consequently there has been much draining of good bird areas in those parts of Europe which have a high population density and intensive agriculture. This is the case in deltas and along the coast of the Wadden Sea in Denmark, West Germany and Holland. In many areas, draining has been going on for hundreds of years, but it is only since the middle of this century that it has been done to such an extent that it is a threat to water birds. It is very difficult to assess exactly the influence of draining on bird life, as knowledge of the distribution and numbers of birds has only been acquired during the last three decades.

In Denmark, government aid in the period 1940-70 financed the drainage and conversion into farmland of some 140,000 hectares of bird areas, including

meadows, marshes, river valleys and heathland.

In the period from about 1960 to 1975, more than 16,000 hectares of wetlands of high ornithological value disappeared —over 15 % of the total wetland areas in this short period alone.

This development was accelerated by large government grants which between 1940 and 1970 covered up to 80 % of the investment and was made cheaper and easier by modern methods of building dykes and draining the land. In Denmark it had serious consequences for large areas of wetlands important to birds, for instance the delta of the Skjern river in West Jutland.

Nowadays it is possible to dyke and drain an area so thoroughly that wetlands are turned into barren agricultural fields. In former times, when technical possibilities were limited and drainage was carried out by the single owner, it had a more limited effect and the consequences to nature were not so extensive. Quite often the wettest parts, those most important to birds, were left and this created a landscape mosaic with open water areas, reed beds, water meadows, etc.

Some projects even increased the possibilities for water birds. This is true of the largest wetland in Denmark, Vejlerne in Northern Jutland, where the total draining of a dyked fjord had to be given up in the 1880s, thus creating an enormous bird area with many different habitats. Today the area is protected and regarded as a first-class natural site.

It must be pointed out that if in these areas total draining is not carried through and the wettest parts are left, large numbers of birds will still be able to live in them. But if the distance between the single wetlands becomes too great, it may have unfortunate consequences for many organisms and a too great distance between plants prevents natural dispersal and exchange between sites. This probably has especially serious consequences for many smaller animals that are not able to migrate.

Both in Greece and Ireland, with support from the EEC, people still wish to drain many important bird areas. If these plans are to be carried through, efforts must be made to ensure that some areas are left water-filled. In some districts wetlands have become so scarce that attempts are being made to re-establish them, partly because of the lack of possibilities for hunting ducks. An example of the re-establishment of a large wetland is Lake Hornbogasjön in Sweden, where a big drainage project failed. In spite of technical, economic and ecological problems, the re-establishment was a success.



Hunting problems

The mountain regions and woodland lakes of Scandinavia, the woodland lakes of Finland and Russia and, last but not least, the infinite tundras of Siberia have always been the breeding grounds of enormous numbers of geese, ducks and waders. When the breeding season is over the birds migrate towards the south and the west. The majority of them winter in western Europe. The northern limit of the winter quarters lies in south Norway and in the Danish inland waters.

In the European wetlands, where these immense crowds of birds stay during winter, hunting and catching birds must have been practised since the Stone Age. As is the case today, the birds in former times probably stayed in the areas with the best feeding possibilities, for example in northern Greece, the Po Valley, the Rhone Delta, along the Spanish rivers, along the Atlantic coast of France, in England and Ireland, in the Danish inland waters and, of course, in the Wadden Sea. In the western European wetlands the wintering birds mix with the local breeding populations. It is estimated that about 20 million ducks and several hundred thousand geese each year pass through or winter in western Europe.

Until the middle of last century, when the shotgun was first mass-produced, catching ducks and waders was most probably done by means of nets and decoys.

In Denmark, it seems that the catching of water birds was always concentrated in the inland waters and the Wadden Sea. This seems to have been allowed, even though until 1840 all other types of hunting were governed by the Crown.

Many things indicate that in the last half of the 19th century, when the shotgun had become cheap, hunting grew more intensive than before and many coast and water birds declined in numbers.

Until a few decades ago, some duck-shooting along the Danish coasts was semi-professional, that is to say, many fishermen and farmers made an additional income by hunting. Today this is no longer the case and hunting has become a recreational activity in which a lot of time and money is invested without, however, a corresponding return. This development is due to the increasing number of sportsmen and the decreasing number of water birds.

The International Waterfowl Research Bureau (IWRB) has, during the last 20 to 30 years, collected information on the number of water birds shot in Europe, hunting seasons and hunting techniques.

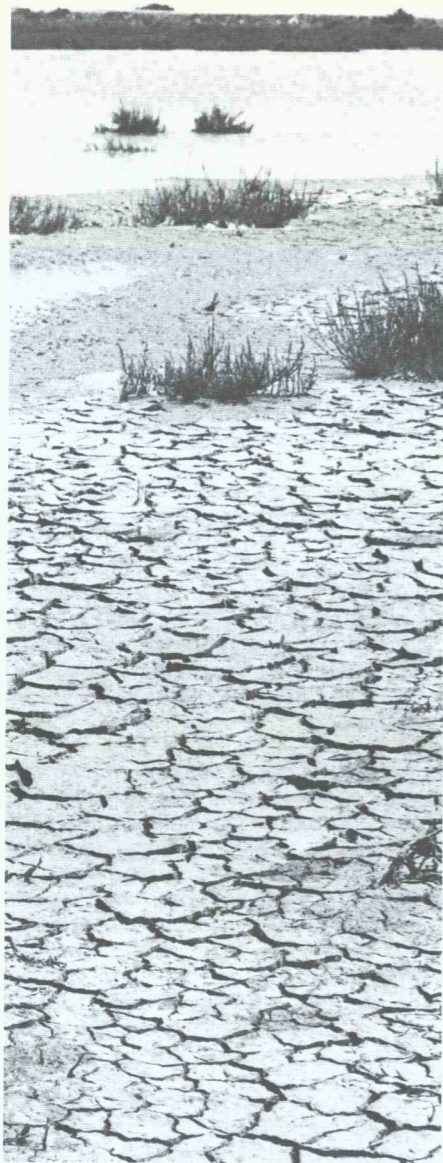
In a report covering the years 1970-75, the total number of European hunters of water birds was estimated at 3.2 million. They shot approximately 11 million ducks and 200,000 geese annually and a smaller number of waders. France and Denmark are those Western European countries in which the highest number of ducks and geese are shot, respectively 2 million and 800,000 per year.

Dabbling ducks, which feed mainly in shallow waters along the coasts and in marshes, are shot in the highest numbers. The Mallard is the most frequently hunted species in Western Europe (5 million annually), but smaller dabbling ducks, such as Teal, Pintail and Shoveler, are important bags. Dabbling ducks are usually hunted at dawn and at twilight, morning and evening, when they are looking for new feeding areas both in inland waters and along the coast.

The IWRB report for 1970 notes that at that time there were big differences between the hunting techniques allowed, the hunting seasons and the hunting intensity in the various European countries. The differences stem from the varying traditions in each country and its nature protection policy, and are particularly surprising where hunting seasons are concerned. While there is a close season for some species in one country they may be hunted in others, while the length of the open season varies from species to species and country to country. Hunting techniques also vary: hunting from motor boats is allowed in Denmark and night hunting is allowed in England, while these techniques are prohibited in almost all other countries.

The EEC Directive on Wild Birds is an excellent initiative from a bird and nature protection point of view; it has solved some of the above-mentioned problems by protecting many water birds in all EEC countries and by prohibiting certain hunting techniques. Finally, the Directive has brought about the establishment of several water bird reserves.

In some countries (e.g. Denmark) duck and goose hunting today is so intensive that it influences the way in which the birds distribute themselves within and among the areas. Intensive hunting in an area will scare away the birds for long periods. Many scientists are convinced that this "side-effect" of hunting influences to a high degree the feeding possibilities of the birds and makes them unnaturally shy.



(Photo J.-C. Chantelat)

Lead poisoning

Lead pellets are used for hunting water birds. Intensive investigation in Denmark and the USA has shown that the lead pellets are left on the sea or lake bottom so that the species feeding in the sea or lakes pick them up.

In Denmark an increasing number of dabbling ducks and swans are found dead of lead poisoning in shallow waters where there is intensive hunting. The birds may die after having swallowed only a few pellets. Apart from this fact, the dispersal of lead pellets generally increases the lead pollution level of the environment. The Danish environment authorities are looking at this problem with growing concern and are considering important restrictions on the use of lead pellets. Steel pellets are to be used instead.

Conclusion

From the above it may be concluded that there are many problems regarding the water birds of Europe; they may be summarised as follows:

1. In a few years, the protection of all wetlands which are important to birds and the establishment of new wetlands will be essential in many areas.
2. Hunting must be better co-ordinated, and more research is required into the effect of hunting on the distribution and populations of birds.
3. The use of lead pellets must be strictly restricted.

F.L.

Filfla Islet is a massive rock of upper coralline limestone which rises in precipitous cliffs of up to 60 metres, forming a sort of plateau. It has an area of only 2.5 hectares and is situated nearly 5 km south of Malta. The battered cliffs are surrounded at the sloped base by numerous rocks and boulders among tons of debris.

An area of special scientific interest

Filfla was reduced to the present rugged state by being used as a bombing target for nearly a century. Bombing practices were greatly increased in the fifties and sixties by the British and American armed forces, until they were stopped by the Maltese Government in 1971. Then in 1980, when the bird protection regulations were revised, Filfla was included in the list of bird sanctuaries where bird shooting and trapping, which are still popular in the Maltese Islands, are prohibited.

The low scrub-type vegetation, which is mainly restricted to the plateau surface, is growing more profusely since bombing has stopped. *Suaeda vera* is the dominant plant and covers most of the plateau, followed by an *Allium* sp. (supposed to be *ampeloprasum*) which has the flower growing on a stalk as high as 150 cm, much higher than those of the specimens growing on the mainland.

The isolation of Filfla from the rest of the Maltese Islands produced an interesting different variety in at least two animal species: the nominate race of the endemic Maltese Wall Lizard (*Podarcis filfolensis*) is restricted to the islet, where a rare endemic land-snail (*Trochoidea pyramidata despotti*) is also found.

The importance of Filfla as an area of special scientific interest lies also with the

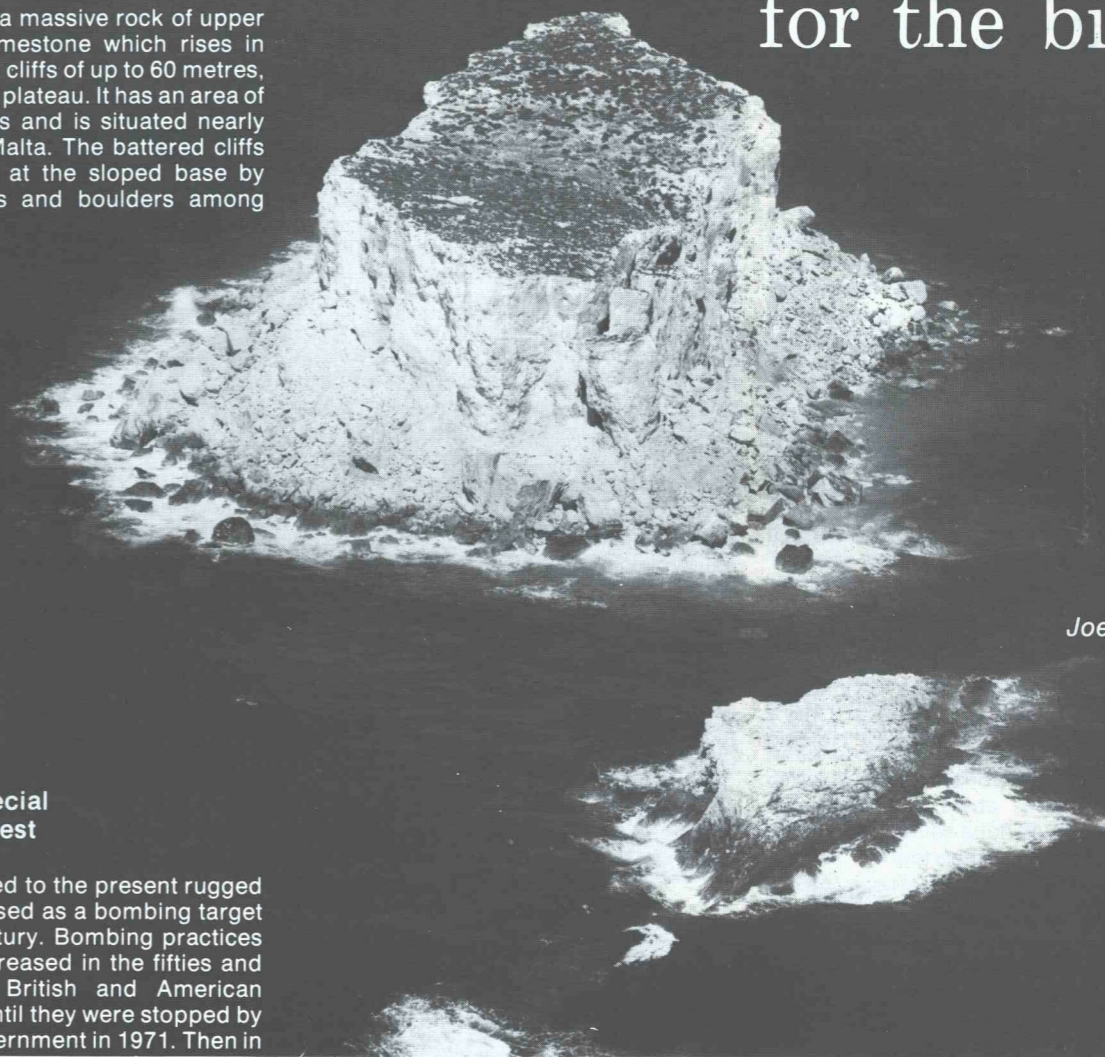
fact that it is the main seabird breeding station in the Maltese Islands with four species, the Storm Petrel (*Hydrobates pelagicus*) being the most common.

Storm Petrel

The Storm Petrel is the smallest European sea-bird; only 15 cm in length and with a wing span of 35 cm. Its plumage is sooty black with a contrasting white rump. Its slender decurved bill, which has nasal tubes, as well as its webbed feet, are also black.

It breeds in large numbers in the boulder and rubble slopes of the islet and the colony has been estimated at about 10,000 pairs. Courting is still at its peak

An island for the birds



Joe Sultana

in mid-May but by this time a few birds have already laid their single eggs. The egg is white with a faint zone of minute reddish speckles around the broad end.

The Storm Petrel is very rarely seen from the coast and leads a strictly pelagic life, coming only to Filfla during the breeding season, when it is nocturnal. Its "purring" and "hiccupping" calls can be heard frequently coming out from beneath the debris in the early part of the breeding period, replaced later in the season by the calls of the chicks, which leave the burrows for their first flight from mid-August. Nest sites range from a metre above sea level to the top of the islet, but the bulk of the colony is found below the cliffs, among the rocks and debris frequently more than 150 cm away from light.

Several thousands of Storm Petrels have been ringed on Filfla but the recovery returns, as expected from such a species, have been rather poor; two off the Tunisian coast, six off Sicily and one in the Ionian Sea off the south-east coast of Italy.

The other two breeding Shearwaters on Filfla, the Cory's Shearwater (*Calonectris diomedea*) and the Manx Shearwater (*Puffinus puffinus yelkouan*), do not interfere with the Storm Petrels and in some crevices they may be found nesting close to each other. On the other hand Storm Petrels' remains are frequently found in the pellets of the Herring Gull (*Larus argentatus michahellis*), the other breeding sea-bird.

It is not known to what extent the bombing of the islet has affected the Storm Petrel's population which was still quite high in the sixties. With the accumulation of the large amount of debris and boulders beneath the cliffs it may be said that it created adequate habitat for this species' breeding requirements. On the other hand it did have a harmful effect on the population of the Shearwaters and the Herring Gull. However the number of these species seems to be picking up again, with at least 200 pairs of Cory's Shearwaters and 120 pairs of Herring Gulls at the present time.

Cory's and Manx Shearwaters

Shearwaters are well adapted to a maritime and aerial life.

They have strange habits. They are pelagic, are nocturnal at their breeding colonies and have a long breeding season. They have long, slender and pointed wings and short rounded tails. They seem to be able to fly effortlessly for long spells using the up-draughts above the waves. On land they are rather clumsy and walk in a funny, shuffling manner, as their legs which are set far back on their bodies are more adapted for swimming and diving. They have webbed feet, waterproof plumage and a strong hook-tipped beak. On the upper mandible they have external tubular nostrils. They lay their single chalky white egg in a deep hole, burrow, crevice or fissure and do not use any nest material.

Of the two Shearwaters breeding on Filfla, the Cory's Shearwater, with 45 cm in length and a wingspan of about 137 cm, is the larger. It has brownish grey upper parts with blackish wing primaries and tail. The underparts are rather dull white. The birds prefer to visit the islet during moonless nights when they make an awful din with their weird, wailing and guttural cries.

The Cory's Shearwater starts arriving on Filfla at the end of February and after the courting period the first eggs are laid in mid-May. Both sexes incubate, taking turns of several days each for about seven weeks. When the young bird hatches it is covered in thick, soft, grey down. It is fed at night by the visiting parents with regurgitated food. After about ten weeks the young leaves the burrow after it is abandoned by the parents. Its surplus fat is used up during its most critical time when it has to start feeding for itself.

It was a common practice for some people to go to sea in boats to shoot shearwaters with the excuse of using the white underwing feathers for fishing. With the enactment of the present bird protection regulations this practice is now illegal.

The Manx Shearwater has the same strange habits as the Cory's. It is however smaller, has a lighter beak and has blackish upper parts contrasting with the pure white underparts. Its breeding season starts earlier and the first eggs are laid in late March. As with Cory's Shearwater no nest is built and the egg is laid on bare ground in the burrow. As it is more crepuscular, much less vocal and breeds in the deeper parts under the debris, the population is very hard to estimate. However it seems that its numbers on the islet are smaller than those of the Cory's.

Herring Gull

While the action on Filfla during the night is carried out by the Shearwaters and the Storm Petrel, the Herring Gull takes it up during the day. The gull colony is mainly restricted to the inaccessible plateau surface of the islet, where the birds build a rather crude nest on the ground amongst the vegetation, under which the young creep to hide after they hatch. At this time the adults are busy fishing and gathering food for them while they keep a watchful eye for any danger.

Those concerned for nature conservation are also keeping a watchful eye on this islet which is part of the Maltese national heritage of natural beauty. The fact that the bombing of the islet was stopped was the first good omen for the future of this rock and its fauna. J.S.

Importance of natural sites



(Photo G. Lacoumette)

The loss of natural habitats has resulted in dramatic changes in the flora and fauna of Europe. Some species have become extinct; others have greatly modified their distribution and population densities, often existing in fragments or sub-optimal remnants of former extensive habitats; yet others have adapted to the new order, and many have actually benefited from man's impact on the environment.

Natural habitats in danger

One group of animals—the aquatic birds—because of their dependence to varying degrees on aquatic habitats, has been profoundly affected by the taming of the European landscape. However, the term “aquatic birds” includes a wide variety of species such as divers, grebes, petrels, shearwaters, herons, ducks, geese, swans, gulls, terns, auks, and so on, and the populations of these different groups have been affected in different ways, some more drastically than others. Those species, or groups of species which are largely dependent on extensive freshwater wetlands, either for all or part of their annual cycle, have been particularly badly hit as drainage and pollution have diminished or degraded their habitats. It is a sad fact that many wetland species in Europe today owe their continuing existence to the network of bird sanctuaries and nature reserves which has been established (mainly at the eleventh hour) during this century in order to preserve remnants of once extensive wetland habitats and the fauna and flora which manage to hold on there.

Aquatic birds which live mainly on the coast, whether they be seabirds which use islands and cliffs as nesting places, or migratory wildfowl and waders which feed on intertidal mudflats and salt-marshes, have tended to fare better than those which depend on freshwater habitats inland. But many coastal habitats are far from safe, and their bird populations are under threat from developments such as further reclamations for agricultural and industrial projects, water storage schemes, tidal barrages for electricity generation, recreational development, pollution, and so on.

For many thousands of years—since the last glaciation—much of Europe has been inhabited by an ever expanding human population. Until about the Middle Ages man's influence on the natural habitats of Europe had been gradual, allowing time for wildlife to adapt to the changing landscape. However with exponential growth in human population and advances in agricultural methods and industrial technology, the natural environment of most of temperate lowland Europe was increasingly and rapidly modified into an almost completely artificial mosaic of farmland, plantation woodland, cities, towns, roadways, canals and other man-made structures. Even large areas of shallow tidal coasts, bays and estuaries were reclaimed from the sea for agricultural, industrial and urban development. By the beginning of this century most of Europe had been “tamed” by man, and the only extensive areas of fully natural habitat were confined largely to the tundra and taiga zones of northern Europe, the higher mountain ranges and the more inaccessible rocky coasts and islands.

Oscar J. Merne

Hydrobates pelagicus (Photo J. Sultana)



The example of Ireland

The island of Ireland has suffered perhaps less than most European countries in terms of degradation and loss of natural habitats. Its 82,880 square kilometres are inhabited by less than 5,000,000 people and until recent times there was little industrialisation. It should be said, however, that before the great famines of the 1840s there were twice as many people. Almost all the native woodland had disappeared, but the wetland habitats were virtually unspoilt. Large scale drainage works only began to have an effect on the inland wetlands during the second half of the nineteenth century.

The country is well endowed with wetlands, both coastal and inland. The relatively high rainfall, ranging from 71 cm to 320 cm per annum, and the saucer-shaped structure of the island with a large central plain and a ring of coastal mountains favour the formation of many freshwater wetlands—lakes, rivers, marshes and peat bogs. The 4,000 km coastline is heavily indented, especially in the west, and provides many sheltered bays and estuaries. The rocky headlands, cliffs and islands, with easy access to extensive shallow sea areas rich in fish, are ideal breeding sites for colonial seabirds.

Ireland's avifauna is rather limited because of the island's small size and its position on the western fringe of Europe, but the country is notable for its aquatic bird populations which benefit from the relative abundance of natural wetland habitats. In the international context the country hosts very significant proportions of the European populations of many waterbirds, especially breeding seabirds and wintering waterfowl—the ducks, geese and swans. Most of these depend to a greater or lesser extent on natural sites, though a few have demonstrated their capacity to exist rather well on artificial habitats.

An important wintering area

Ireland is particularly important as a wintering area for the Greenland White-fronted Goose, over half of whose world population overwinters there between October and April. Formerly this goose was confined to natural habitats, especially the extensive moorlands and bogs and the grassy flood-plains of rivers; nowadays the main wintering site of 6,000 birds (circa 40% of the world population) is on the Wexford Slob, an intensively farmed polderland in south-east Ireland. The geese also use the natural sandbanks in the nearby Wexford Harbour as their nighttime roost. Another Irish wintering goose, the Pale-bellied Brent from northern Greenland and

islands in central arctic Canada, was, until ten years ago, confined to tidal mudflats and saltmarshes where it fed on *Zostera*, green algae and saltmarsh plants. While the great majority still depends on these natural habitats, the Brents are beginning to adapt to feeding on seaside farmland.

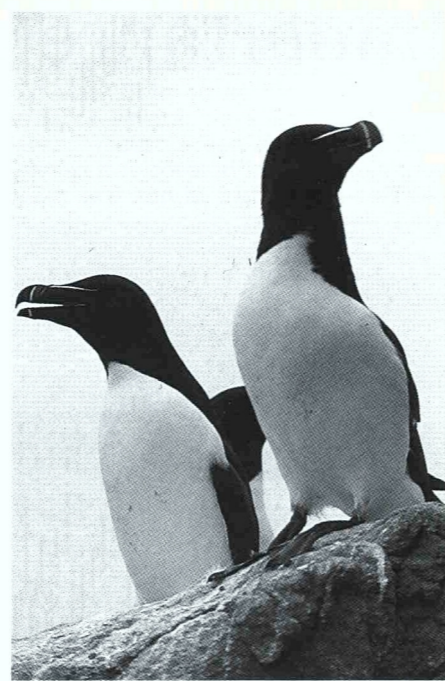
The 4,000 Irish wintering Barnacle Geese (part of the 24,000 strong north-east Greenland population) use small grass-topped rocky islands off the west coast as their main feeding areas; there are but two mainland sites, one managed, the other semi-natural grassland.

The two migratory swans—the Whooper from Iceland and Bewick's from Siberia—winter in Ireland in internationally significant numbers (e.g. up to 20% of the European population of Bewick's) and like the geese, they seem to prefer the natural or semi-natural wetlands sites to the purely artificial ones; but again there are exceptions. Increasingly, both swan species are found on improved agricultural grassland and crops such as winter wheat. In one or two places they even feed on waste grain, sugarbeet tops and potatoes. It is encouraging to see some of these aquatic birds adapting to artificial habitats: they will be less vulnerable if their natural habitats disappear or are so reduced as to be unable to accommodate all the birds. On the other hand, feeding on agricultural crops tends to result in antagonism from farmers towards geese and swans and the birds may be forced to quit farmland and return to their natural way of life. It is important to ensure that natural wetlands sites are conserved for their use. Anyway, it is possible that feeding on a monoculture of winter wheat or rye grass may not be in the best long-term interests of the birds, and the more varied and traditional diet from natural sites may be important for their wellbeing.

Natural wetlands are sometimes essential

There are, of course, certain species of aquatic birds for which completely natural wetlands are essential. They include many freshwater marshland and reed-bed specialists. The drainage of such sites throughout Europe has resulted in serious declines and contractions in breeding ranges of numerous birds. Some species also depend on these kinds of habitats outside the breeding season.

Other inland wetlands such as lakes, ponds and rivers are also important for a variety of aquatic birds. To some extent lakes and ponds can be replaced by alternative open water sites such as man-made reservoirs, gravel and clay pits and the like, but many natural rivers and



Alca torda (Photo O. J. Merne)

streams have been drained and canalised, thereby destroying the natural variety of habitats (with their diverse flora and fauna) which are normally found along their courses. An artificially straight river with even depth and flow, and with graded, treeless banks, holds only a fraction of the wildlife one can find on a naturally meandering watercourse with its pools and riffles, reedbeds, oxbows, marshy edges and overhanging trees.

In Ireland one of the main threats to the inland wetlands is arterial drainage which is being systematically carried out, catchment by catchment, almost entirely to benefit agriculture. Particularly detrimental to aquatic bird populations is the loss of callows and turloughs (grassy flood plains and grassy depressions in limestone areas which flood in winter) which support a large proportion of the wintering waterfowl, many of which occur in internationally significant numbers. In spite of its small size Ireland has many internationally important sites for waterfowl, and included in these are natural or semi-natural freshwater wetlands which are threatened by drainage.

Coasts are also threatened

Some of the important coastal sites (e.g. Dublin Bay, Cork Harbour and the Shannon Estuary) are also threatened, mainly by urbanisation, industrialisation and pollution. Fortunately others seem little threatened, while in general the rocky headlands, cliffs and islands (because of their remoteness from human population centres, inaccessibility, and unsuitability for agricultural development) seem safe, at least for the time being. Many of these are wholly natural sites which provide nesting space for impressive colonies of seabirds. The 20,000 pairs of Gannets on a precipitous rock off the south-west coast of Ireland, and the 20,000 pairs of Manx Shearwaters and 10,000 pairs of Puffins on another south-west island are spectacular sights indeed. While their breeding sites may be safe enough, many seabirds face other hazards from

man's activities, such as oil slicks, over-fishing, entanglement in fish-nets, and insidious forms of marine pollution which may interfere with food chains.

In spite of the loss of wetland habitats through drainage, Ireland has largely escaped the worst excesses of environmental degradation experienced by more populated and industrialised European countries. There are still many natural wetland sites with an abundance and variety of wildlife, but many sites have been destroyed and there is no room for complacency regarding the future. We must learn from the mistakes of others and take steps now to ensure that at least some of the best sites are preserved for the future. This must be done for the sake of wildlife, which is so dependent on wetlands, and for our own enjoyment of the aesthetic value of such wild and natural places. O.J.M.

Fratercula arctica (Photo J. McLoughlin)





Alca alle in the Svalbard (Photo M. Norderhaug)

Alcidae

Magnar Norderhaug

In large parts of the Arctic, about 95 % of the breeding birds consists of only four species: Fulmar, Kittiwake and two species of *Alcidae*, the Little Auk (*Alca alle*) and Brünnich's Guillemot (*Uria lomvia*). Of all the northern seabirds, the *Alcidae* are probably the ecologically most well-adapted.

Their arrival on the breeding grounds in early spring is well synchronised with the breaking-up of the winter ice, snow melting on their breeding sites and a rapid increase in biological production in the sea, due to improved light conditions.

When nestlings hatch in July, the coastal waters are full of zooplankton and small fishes, the basic food of all *Alcidae*. Plankton and fish brought to the colony to feed nestlings are also important in another sense. Seabirds transporting organic material from sea to land are a vital link between the two ecosystems, and waste from seabird colonies is an important source of nutrients to Arctic terrestrial ecosystems, as demonstrated by the rich vegetation under the colonies. In turn, this vegetation forms the basis for other terrestrial organisms like insects, land birds and various mammals. This organic transport is considerable. Studies of Little Auks revealed that in a colony of 100,000 pairs, parents trans-

ported about 70 tons of plankton during four summer weeks to feed the nestlings alone.

During August the *Alcidae* leave their colonies and autumn migration starts. Ringing of *Alcidae* in the colonies on Svalbard has revealed fascinating migratory movements.

Instead of moving southwards like most other Arctic birds, Little Auks and Brünnich's Guillemots cross the Arctic ocean to spend the winter in West Greenland waters. The following spring their migration cycle is completed by a similar movement back to the breeding colonies.

Pairs often stay together for years and usually return exactly to their old nesting site.

Arctic *Alcidae* are remarkable examples of adaptation to extreme environmental conditions and of the close ecological links between land and sea in these regions. In relation to man's increasing activities in the Arctic they also act as ecological indicators, since modern fishery and oil exploration may easily alter delicate ecological balances. To maintain the Arctic *Alcidae* may therefore prove not only to be an important conservation task in the years ahead, but also a rather difficult one. M.N.

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Stercorarius parasiticus (Photo G. Lacoumette)



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