Towards a flyway conservation strategy for waders

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Waterfowl migratory flyways are one of the worlds biological wonders. Their maintenance and enhancement should be a global conservation priority. There have been, and are, a great variety of local, national and international conservation initiatives and actions that contribute towards conserving migratory waterfowl. Many vital places on wader flyways continue, however, to be degraded and destroyed directly or indirectly by human activities. To put in place a unifying flyway conservation programme a number of key preliminary steps are needed. These include identifying and filling gaps in knowledge of how waders use the flyways; identifying when and where human activities have an adverse impact; quantifying such impacts and filling gaps in knowledge; and identifying the current level and efficacy of conservation action along flyways. Based on existing information, the paper describes examples of flyway research and conservation and identifies known gaps in knowledge. Examples are drawn largely from the East Atlantic flyway but most are just as relevant to wader flyways worldwide. Activities contributing to implementing the directions identified in the 1992 Odessa Protocol are summarised, and suggestions are made for priorities for taking forwards a co-ordinated programme for wader flyway conservation.

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Пролетные пути, используемые водоплавающими и околоводными птицами - одно из биологических чудес мира. Сохранение и увеличение этих путей следует считать глобальным природоохранным приоритетом. Существовало и существует множество местных, национальных и международных инициатив и действий, способствующих охране перелетных водоплавающих и околоводных птиц. Однако, антропогенная деятельность еще ведет, прямо или косвенно, к деградации и уничтожению многих жизненно-важных местообитаний на пролетных путях куликов. Для того, чтобы ввести объединяющую программу по охране пролетных путей, необходимы некоторые предварительные ключевые шаги. К ним относятся: определение и заполнение пробелов в знаниях о том, как кулики используют пролетные пути; определение, когда и где антропогенное воздействие имеет негативное влияние; определение таких эффектов количественно и заполнение пробелов в знаниях; и определение настоящего уровня и эффективности природоохранительных действий вдоль пролетных путей. Опираясь на существующую информацию, в статье приведены примеры научно-исследовательской работы по пролетным путям и их охране и намечены известные пробелы в знаниях. Приведенные примеры относятся преимущественно к Восточноатлантическому пролетному пути, но большинство из них в равной мере относится и к миграционным путям куликов во всем мире. Обобщены действия, способствующие реализации рекомендаций, приведенных в Одесском протоколе 1992 г., и также сделаны предложения о приоритетах выполнения координированной программы по охране пролетных путей куликов.

Introduction

There is considerable worldwide interest in the field of waterfowl biology. Our knowledge of such aspects of a birds life cycle as reproductive biology, moulting and migratory strategies increases with each year. In our pursuit of science we should not, however, lose sight of the fact that bird migratory flyways are one of the biological wonders of the world. They are a living reminder that we all inhabit one planet and that what may seem to be local actions can have consequences for the environments of other biotopes and in other hemispheres.

Migrant waders make some of the most spectacular of these migrations, often travelling non-stop in flights of several thousand kilometres. Our interest in the detail of their annual cycles in relation to migrations is thus both justified and, in world

conservation terms, one of our highest priorities. There is, however, a risk that in focussing on the detail of what makes up the flyway leads to the whole picture being ignored.

In the UK and mainland western Europe much work has been done to promote the conservation of estuaries and coastal wetlands, the wintering grounds of so many of the same East Atlantic flyway bird populations as breed in eastern Europe and northern Asia. Indeed these migratory bird populations and their use of international networks of sites have often been a major element in the development of conservation measures for wetland ecosystems and their wildlife. But these coastal wetlands in western Europe form just one part of the links in the chain that makes up the East Atlantic flyway jigsaw. There are similar flyways around and through most other parts of the world (see Davidson & Pienkowski 1987; Straw 1997; Gill *et al.* 1994), and similar suites of coastal and inland wetlands and drier habitats in urgent need of safeguard.

Although much conservation effort is expended at local and national levels, for conservationists to be successful in the objective of maintaining and enhancing the bird populations that use flyways a more holistic vision is required. It is the nature of virtually all major flyways to cross many countries and for birds to utilise different habitats at different times of year. Such habits make standard approaches to research and conservation difficult. Conservation law and its implementation is applied unevenly and levels of research interest patchy. Effective flyway understanding and conservation can be achieved only by an integrated approach along the whole flyway, and perhaps also between flyways. Such an approach requires considerable commitment and co-ordination, but is essential.

It is no longer sufficient to consider the links in the flyway chain in isolation. Research in basic biology, the extent and impact of threats, and the conservation, protection and enhancement of species and habitats are all essential to the maintenance of the flyway. This need to undertake local actions within a flyway-scale framework has been increasingly recognised. Much has been, and is being, achieved for wader conservation at a flyway scale worldwide since the 1992 WSG conference in Odessa discussed flyway conservation, notably through the development and implementation of the Bonn Convention African-Eurasian Waterbird Agreement (see Boere & Lenten 1998), the Asia-Pacific Migratory Waterbird Conservation Strategy: 1996-2000 (Anon 1996) and the further development of the Western Hemishpere Shorebird Reserve Network (WHSRN) (Hunter *et al.* 1991; I. Davidson 1997; J. Corven, *in litt.*).

In this paper we identify what is needed to make whole flyway conservation a reality, and to move towards a structure co-ordinating our global activities in the future that will deliver the ultimate aim - the safety, maintenance and enhancement of migratory bird populations and the habitats upon which they depend throughout the world. We draw examples of the needs and processes of wader flyway conservation largely from the East Atlantic flyway since this is one of the two flyways supporting major wader populations breeding in Europe and north Asia. The approach is, however, largely applicable also to other flyways worldwide.

Information needs

To put in place effective flyway conservation action, we need several types of information about the flyways and the way in which wader species and assemblages use them. To provide this information we need the answers to several questions that can

Table 1. Topics for which information is needed to put in place flyway-scale wader conservation.

Basic biology
a. Where are the sites used?
b. What is the ecology and population dynamics of the wader species?
c. What life-history characteristics influence how flyways are used by populations?
d. What role does each site play in the annual cycles of each species?
e. How is each site related to the usage of other sites in the flyway?
f. What features of each site determine how it is used?

Threats and opportunities
a. What pressures threaten continued usage of each site?
b. What are current constraints on site use by waders?
c. How can be, and are, sites modified, and what are the consequences of these modifications?
d. How can this knowledge be best used to develop and implement flyway conservation programmes?

Conservation actions
a. What level of conservation law provision exists in different countries along a flyway?
b. How can this conservation law be used to deliver national actions and international co-operation?
c. How does site-based conservation fit into the broader needs of dispersed species?
d. How can the flyway conservation needs of waders be linked with the sustainable use and development of their habitats?
e. How can conservation provision for wader flyways be enhanced, especially where weak?

be grouped into three broad categories - basic biology, threats and opportunities, and conservation actions. Key questions that need to be addressed in these categories are listed in Table 1 and described below.

Although some of these questions are deceptively simple, as we describe below they can be very complex to answer. Nevertheless to provide clear and strong arguments for conservation action to safeguard waders needs, increasingly detailed understanding is needed of how and why nationally and internationally important populations of waders use their flyways, and what pressures and impacts affect this usage.

Much action is directed towards individual sites on a flyway - it is often information on the links between sites (and flyways) that is most difficult to gather and hence least known. Furthermore it is important also to consider individual sites of identified high importance for migratory wader populations within the wider matrix of the relevant ecosystems, since some wader populations are widespread around the resource (see *e.g*, Davidson *et al.* 1991; Davidson & Stroud 1996). Whilst such populations may seem to be less vulnerable to habitat change than those dependent on just a few key sites this may not be so, since concurrent degredation of many localities on a flyway network typically threatens wetlands (*e.g.* Davidson *et al.* 1991; Melville 1997).

Conservation programmes, at both national and international levels, are generally directed towards the safeguarding of individual sites, sometimes within a broader framework of sympathetic land-use action. Conservation of flyway populations of waders can be, and often is, approached through the general safeguard of sites used by the flyway wader assemblage. Each wader species within a flyway has, however, a different set of requirements and uses a different suite of sites (Smit & Piersma 1989). It is thus also essential to understand flyway usage by individual species and populations if flyway-level conservation is to be targetted effectively at adequately covering the needs of each population. This poses challenges for assessing how and whether sustainable development of wetland habitats can be consistent with flyway wader conservation.

The basic biology

To achieve a successful programme of conservation and management of any biological system, species or habitat, a knowledge of the mechanics of the system is a prerequisite. Eleven years ago, in 1987, the Wader Study Group reviewed the current state of our broad knowledge of wader flyways (Davidson & Pienkowski 1987). This revealed that although much has been discovered in recent years about the distribution and patterns of usage of wader flyways there remained substantial gaps in knowledge for all flyways. This is particularly so when considering the detail of migration routes, the interdependence of wintering sites, and the breeding biology and distribution of many species.

A recent global review of wader populations (Piersma *et al.* 1997) has confirmed the many gaps in knowledge about large proportions of plover and sandpiper species, including no information about even population size for 46% of species (Table 2). For 27 species almost nothing is known; nine of these species are of conservation concern as being vulnerable or near threatened. Lack of knowledge is particularly acute for species in South America and Africa.

Further reviews of flyways and reserve networks for various groups of waterbirds appear in Boyd & Pirot (1989), Salathé (1991a) and Straw (1997), and much is still being discovered. There has perhaps been more extensive and detailed investigation of the East Atlantic flyway than for any other wader flyway, and there have been further discoveries and reviews of wader usage of this flyway (*e.g.* Smit & Piersma 1989; Wolff 1998) since the reviews in Davidson & Pienkowski (1987). However, startlingly large gaps remain even here, and lack of understanding of the life history characteristics of different waders and how these influence the ways they use flyways is particularly acute (Piersma & Baker in press).

Table 2. The percentages of plover and sandpiper species for which there is no information about their basic biology (from Piersma *et al.* 1997).

Breeding area	No. of species	% SPECIES LACKING INFORMATION ON				
		Population size	Demography	Reproduction	Migration	Food & foraging
Global	155	46	70	23	22	32
South America	15	87	100	73	53	87
Africa	19	95	89	21	37	58
Asia	35	51	86	34	31	49
Australia & Oceania	16	0	63	19	25	25
North America	34	38	71	9	0	3
Europe	36	28	33	0	0	8

International assessments have been generally restricted to single flyways and broad patterns of usage by individual species or populations within a flyway. Yet to set conservation priorities in context and to stimulate conservation action more comprehensively we need also to understand worldwide flyway occurrence and use by the relevant species, and how this differs between flyways. Few such assessments have been made in detail (but see Hunter *et al.* 1991; Lane & Parish 1991; Gill *et al.* 1994).

The assessment of Piersma *et al.* (1997) was made at the species level, but for flyway conservation information at the population level is often also needed. Here lack of knowledge is even more acute. As a follow-up to the broad assessment of flyway conservation for waders (Davidson & Pienkowski 1987), in 1992 the Wader Study Group published a worldwide review of the migration systems of one wader species, the Knot *Calidris canutus* (Piersma & Davidson 1992). This species was chosen because it is generally considered to have a simple migration system (Figure 1) and to be amongst the best known migrant waders. Certainly the Knot has been the target of a great deal of interest and research over the last 20 years. This review has permitted a comparative assessment of key characteristics in each subspecies and also allows an appraisal of the extent to which our current knowledge can contribute to the development of flyway conservation action (Table 3).

The results are alarming: the only subspecies for which levels of knowledge appear broadly adequate for developing conservation action are the two (*canutus* and *islandica*) using the East Atlantic flyway, and even for these there remain uncertainties about some of the most basic information including population sizes and trends, and the location of breeding grounds. For other subspecies knowledge is even poorer and for one (*roselaari* - probably the scarcest subspecies) almost nothing is known. If gaps of this magnitude exist for a well-researched wader species then it follows that similar or greater gaps exist in the knowledge of how other individual populations use flyways.

Redressing the lack of information about population distribution and size is a particular priority and this is widely recognised as the irreducable basis needed for the focus and development of flyway-scale conservation (Boukhalfa *et al.* 1997; Dodman 1997). This paper does not seek to identify all such gaps but rather identifies the need to address this issue in a co-ordinated fashion. There is a clear need for further review of the current state of our knowledge of wader flyways and their species. In addition such a review should set out to identify those gaps in our knowledge of these flyways and species, especially those that hold back the process of flyway conservation. Only following this last step can we then start to set priorities for filling gaps either through guidance to rather ad hoc continued efforts or through a co-ordinated and funded programme of research, whichever is appropriate to the urgency

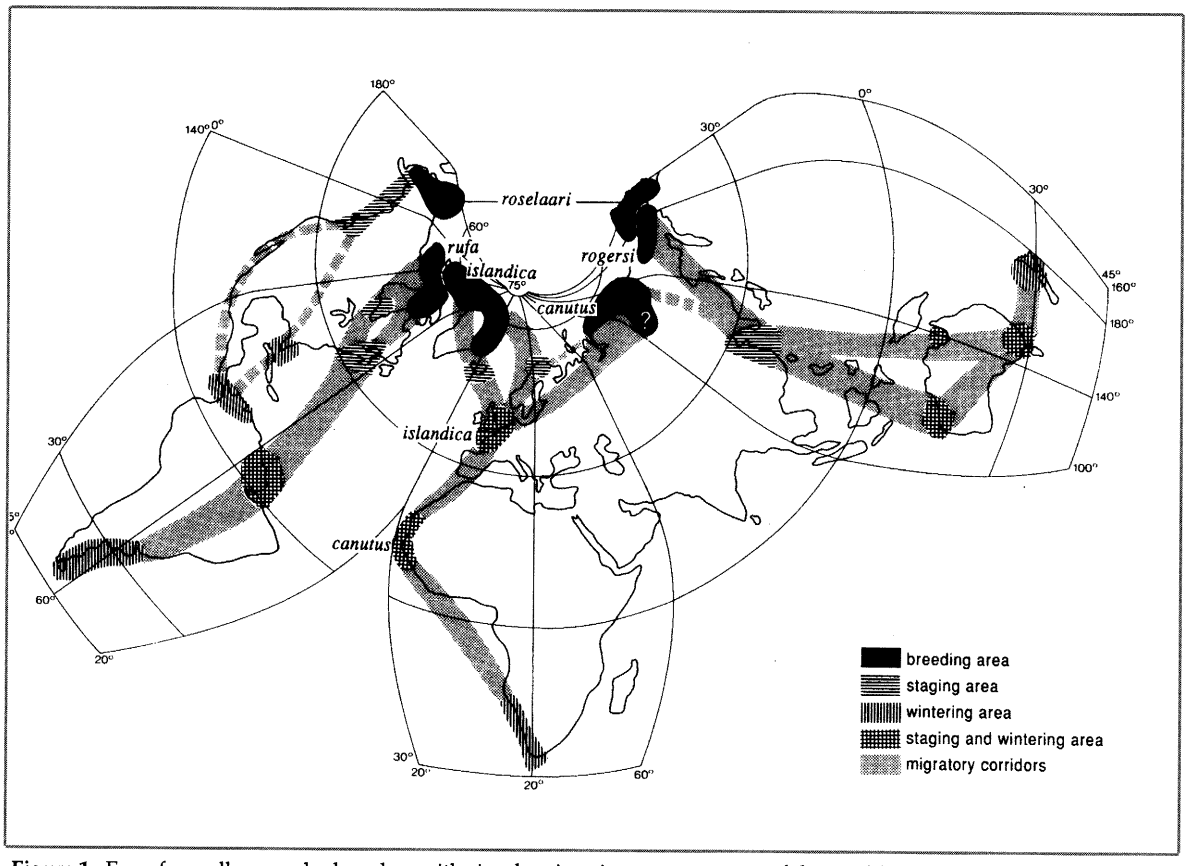

Figure 1. Even for well-researched waders with simple migration systems parts of the worldwide flyway network are poorly established: a review of the current knowledge of the migration system of the Knot *Calidris canutus* (Davidson & Piersma 1992) shows that many uncertainties about migration routes remain.

Table 3. How good for developing conservation action is knowledge of the key features of flyway use by Knots *Calidris canutus*? (from Davidson & Piersma 1992).

Topic	SUBSPECIES canutus	islandica	rufa	rogersi	roselaari
Population size & trend	✓✓	✓✓✓	✓	✓	✓
Breeding location	✓✓	✓✓	✓✓	✓	✓
Non-breeding location	✓✓	✓✓✓	✓✓	✓✓	✓
Site roles & links	✓✓✓	✓✓	✓	✓	○
Key features of sites	✓✓✓	✓✓✓	✓✓	✓	○
Pressures on sites	✓✓✓	✓✓✓	✓	✓	○
Constraints on site use	✓✓	✓✓	✓	✓	○

Level of knowledge: ✓✓✓ good, ✓✓ fair, ✓ poor, ○ none.

of need and availability of resources. Identifying such gaps now form part of recent flyway conservation strategies (*e.g.* AEWA, A-PMWS).

For waders, the International Wader Study Group can play an invaluable role (especially through its rôle as the Wetlands International/IUCN-SSC Wader Specialist Group) in providing a forum for bringing together information from wader-workers worldwide and making it available to an international audience through publication of its *Bulletin* and *International Wader Studies* (IWS) series. These special volumes provide focused information to answer the basic questions underlying conservation strategy development. Volumes so far published cover:

- first estimates of the size of breeding wader populations in Europe (Piersma 1986);
- international flyway conservation (Davidson & Pienkowski 1987);
- the status of waders breeding on European wet grasslands (Hötker 1991);
- the migration of Knots (Piersma & Davidson 1992);
- disturbance to estuarine waterfowl (Davidson & Rothwell 1993);
- waterbirds in the Wadden Sea (Meltofte *et al.* 1994);
- shorebird ecology and conservation in the Western Hemisphere (Hicklin 1996), and
- shorebird conservation and management in the North American Great Basin (Reed *et al.* 1997).

An important source of this key basic information about the location of sites and wader populations is the international wader and waterfowl count programmes and databases co-ordinated by the Wetlands International as the International Waterfowl Census (IWC). This operates as four geographical censuses, covering the Western Palearctic and South-west Asia (WPWC), Africa (AfWC), Asia and Australasia (AWC), and the Neotropics (NWC). Taken together with count programmes for waders elsewhere, such as the International Shorebird Survey (ISS) in North America, the IWC has the potential of providing global and flyway-level wader population information worldwide (N.C. Davidson, *in litt.*).

Such information is already used both at the flyway level to produce estimates of population sizes and trends and, especially in ares where coverage is patchy to identify conservation sites of importance for wader populations as well as being used for increasing local awareness of wader, waterbird and wetland conservation (Rose 1998). In addition the various national and supranational count and population indexing programmes, such as the Wetland Bird Survey (WeBS) in the British Isles (*e.g.* Prater 1981; Cranswick *et al.* 1997; Delany 1996) and (Meltofte *et al.* 1994; Poot *et al.* 1996) for the international Wadden Sea, provide the essential basis for developing conservation programmes in their areas of coverage.

Threats to the flyway system - and opportunities

Knowledge of the basic biology of the flyway, their species and habitats is also essential to this second element of the approach. To reach our ultimate goal of flyway conservation, maintenance and enhancement, we have to acknowledge and understand the pressures that are being placed on the system both naturally and through the activities and impact of people.

Analyses of patterns of human activity on the estuarine wintering grounds of waders and wildfowl in Britain indicate alarming extents of habitat loss and the frequency of occurrence of a wide variety of potentially damaging human activities (Davidson *et al.* 1991), a pattern common to many parts of the non-breeding range of waders worldwide. Not only has, for example, at least 25% of Britains estuarine habitat been destroyed during the last 2,000 years but such piecemeal land-claim for a wide variety of human uses is continuing (despite the many conservation designations applied to estuaries) at an apparently little

diminished rate. This not only affects many of the large estuaries of great importance for migrant and wintering waders but also many small estuaries which together form an important part of the range of the more dispersed wader species (Davidson *et al.* 1991; Davidson 1991). Such habitat loss may be particularly threatening to the continued survival of wader populations where it occurs on migration staging areas, especially those depended on by long-distance arctic-breeding migrants (Smit *et al.* 1987; Evans *et al.* 1991).

The results of such survey work gives considerable concern when assessing a flyway as a whole and projecting its future health. It is the nature of bird migration to be so dependent on chains of suitable sites that pressure points or bottle-necks will occur naturally. The safeguarding of these places is vital to the maintenance of the whole system (Lane & Parish 1991; Scott & Rose 1996; Rose 1998).

As the area of suitable habitat for waders becomes progressively reduced the many continuing human activities are compressed into smaller and smaller areas. Furthermore many of these activities are themselves apparently increasing in scale. This leads to increasing potential pressure from 'traditional' uses such as shell-fisheries and bait-digging as well as the wide variety of recreational activities. Rather little is known in detail about the effects and impacts such as disturbance to waders but Davidson & Rothwell (1993) provides a summary of the current limited knowledge of recreational disturbance to waders in north-west Europe. Such information is vital if sustainable management of human uses such as recreation are is to be implemented on wetlands and other areas used by wader populations (Davidson 1997; Stroud 1997a) (Table 4).

Such comprehensive survey assessments as Davidson *et al.* (1991) have been made elsewhere, especially in the USA (*e.g*, Tiner 1984), but are not yet consistently available for other major parts of flyways. It is clear, however, that similarly great impacts of human-generated habitat loss and degradation is widespread throughout many parts of the world (see *e.g*, Lane 1987; Bildstein *et al.* 1991; Biber & Salathé 1991; Finlayson & Moser 1991; Hunter *et al.* 1991; Lane & Parish 1991; Melville 1997; Tobai 1997).

A comprehensive examination is needed of the activities that could potentially have an adverse impact on migratory bird populations on the flyway. It is essential that we can assess the likely impact of humans, both through their existing activities and via the effects of changes in our use of habitats. Such a programme of investigation could involve also all-encompassing problems such as global

Table 4. Different scales of intervention in the management or reduction of disturbance to waterfowl populations in Europe. Generally the different approaches are complementary (from Stroud 1997a).

	Habitat based	Species based
International legislation		
EC Birds Directive	Special Protection Areas	Regulation of: time of hunting modes of hunting
African-Eurasian Waterbird Agreement	National/international protected site network	Regulation of: time of hunting modes of hunting
Ramsar Convention	Wise-use requirements	Wise-use requirements International co-operation in species management
Biosphere Reserves	Zoning of land-use activity	
National legislation	Nationally protected sites and	National hunting/taking laws: nature reserves may further restrict time/mode of hunting or quarry spp. (*e.g*, enabling cold weather shooting bans)
Regional regulations and laws	Regionally protected sites	Further restrictions possible within international/national frameworks
Local regulations	Bylaws - restrictions on certain activities	*e.g*, sand-yachting, cockling, bait-digging, low-flying avoidance areas etc. Refuge areas Local planning to avoid key habitats/areas
Non-statutory measures	Other local nature reserves	Codes of conduct: Jet-skis hunters birdwatchers

warming. How will this affect bird distribution? Will areas and locations of breeding and wintering habitats change, through for example inundation of tidal flats by rising sea-levels and constriction of Arctic tundra breeding areas consequent on possibly altering Arctic climate? Over long time-periods major natural population declines in arctic-breeding species have been linked to the periods of Pleistocene glaciation, when the area of suitable breeding habitat would have been severely restricted (Baker *et al.* 1994), but will additional human pressure artificially depress the size of populations so making them less able to survive periods of natural stress?

On a smaller scale we should be quite clear as to the impact of exploitative activities like shellfish harvesting (an activity that has recently caused substantial impact on waders in the hugely important international Wadden Sea (Piersma & Koolhaas 1997), tidal power, amenity and storm surge barrages, waste disposal and pollutant discharge, dock and harbour construction, marina and recreational developments, channel dredging, and drainage and degradation of inland wetlands.

For an activity such as shellfish farming and harvesting we need to know how damaging this is to wintering bird populations and whether such impacts can be mitigated through alterations to practises. The Ramsar Convention requires 'wise use' of our wetlands, so we need to know to what extent such activities are 'wise' in the sense of ensuring sustainable use of the ecosystem. Is there a sustainable level of harvesting that provides for birds as well as for people? Are some harvesting methods more damaging than others? Is there a consistency of effect and impact on the activity on waders in different parts of their flyway (and between flyways) perhaps dependent on densities of birds, or is such impact entirely site-specific?

Finally, on a very small scale, how does piecemeal small land-claim or recreation or shooting impact on birds? Answering such a question can require detailed research in each location. In the UK at least there have as yet been few impact studies for which there is adequate before and after data with which to make an assessment, but see Goss-Custard *et al.* 1997). For some countries collecting such site-specific information may not be practicable so we need detailed studies undertaken in such a way as to provide general principles applicable elsewhere.

It is essential that we are able to answer questions such as these if we are to understand human impact on the flyway, and use this understanding to direct effort towards reducing any impacts found to be adverse. As with the basic biology there will be clear steps in the process. There is a need to identify what is known and what is required to be investigated. There is also a need to set out to fill the gaps in our knowledge in a co-ordinated and planned fashion to provide maximum benefit to achieving conservation and management goals.

International co-operation means that not everyone has to 'invent the same wheel': general studies made in one country can be applicable also to others. This results in the cost-effective use of the limited resources available for conservation science.

In addition it is vital to consider the patterns of impact of human activities on migratory birds such as waders in the broader context of the impact on the habitats on which such birds depend, and to understand the human impacts on the many other wildlife features of these places. Developing an effective conservation programme for these habitats is the mechanism through which international measures such as the Ramsar Convention and the EEC Directive on the Conservation of Wild Birds are effected. In Europe these measures provide safeguard for much larger areas of some habitat types such as saltmarshes of importance to waders than will sites selected for their intrinsic habitat importance under the EEC Directive on the Conservation of Natural Habitats and Wild Flora and Fauna (Davidson & Stroud 1996).

Understanding impacts on habitats at a variety of scales (Table 4) and developing conservation safeguards delivered through sustainable management for these places thus underpins the safeguard of migratory waders. Waders and other migratory waterfowl are very valuable at linking international networks of these sites, and the continued presence of all of these network sites are essential for safeguarding the populations.

Conserving flyway populations of waders

Many countries have developed considerable programmes of conservation effort that include safeguarding migratory waders and their habitats. Underpinning this is the use of distribution and population knowledge to identify sites, notably through BirdLife Internationals Important Bird Areas (IBA) programme (Grimmett & Jones 1989) and national analyses such as Stroud *et al.* (1990). Some of the site-based designations and broader-based land use and management are operated through domestic legislation. Others are implemented through the application of non-statutory safeguard such as nature reserves managed by voluntary conservation bodies such as, in the UK, the Royal Society for the Protection of Birds (RSPB).

Many countries on wader flyways also apply domestic conservation measures in response to international conventions such as Ramsar, Berne and Bonn, or international law such as the EEC Directive on the Conservation of Wild Birds, and the more recent EC Directive on the Conservation of Habitats and Species. Other international measures derive from bilateral agreements between countries sharing migratory bird populations (see Biber-Klemm 1991).

One voluntary international wader conservation

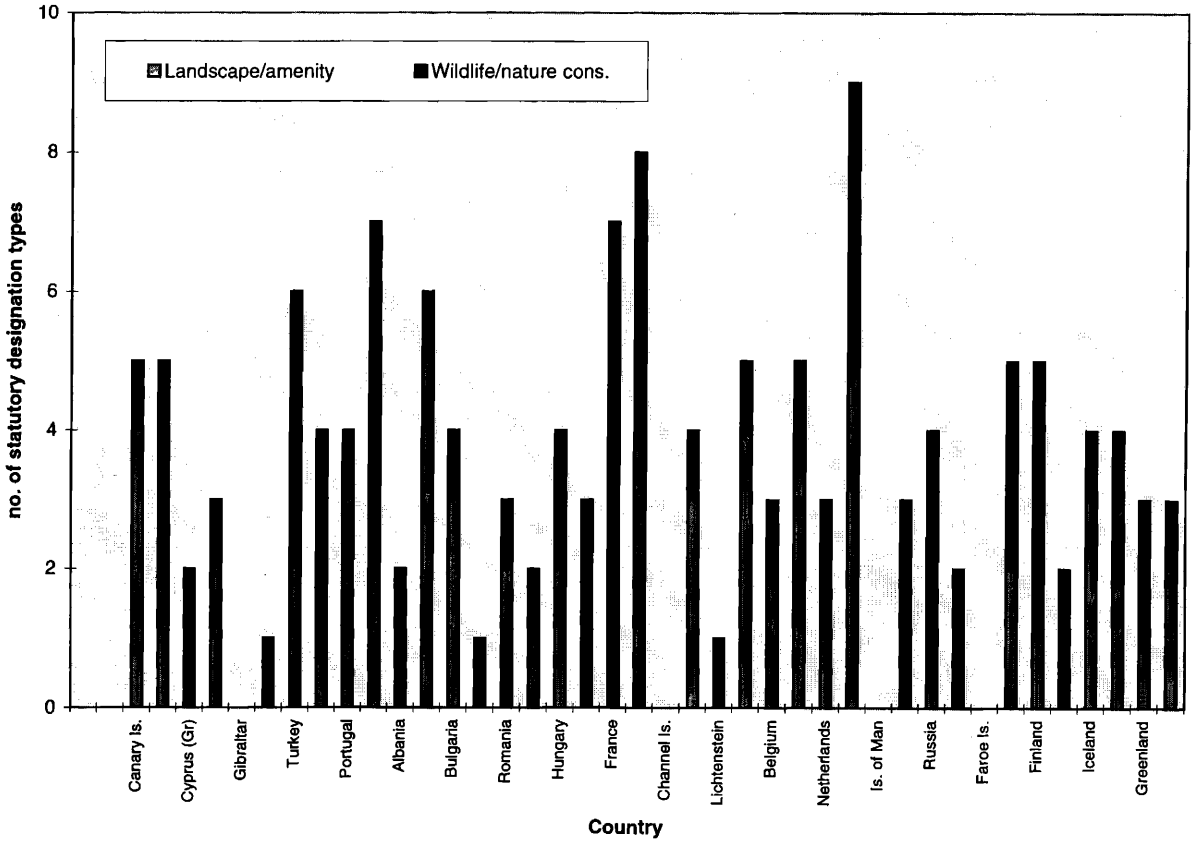

Figure 2. The number of different types of domestic statutory wildlife and landscape conservation site designations in each European country (derived from information in Grimmett & Jones 1989).

mechanism, the Western Hemisphere Shorebird Reserve Network (WHSRN) has become a highly successful international non-statutory mechanism for raising support and awareness of the importance of key wetland sites on the flyways of American waders since its inception in 1985 (WHSRN 1990; Hunter *et al.* 1991; I. Davidson 1997). WHSRN now has four categories of reserves: *hemispheric, international, regional,* and *endangered species.* By 1995 there were 14 hemispheric, 10 international and five regional WHSRN reserves covering about 1.5 million ha and supporting 30 million shorebirds. Reserve membership is entirely voluntary. Central to the network is the understanding that the conservation and management of shorebird habitat remains the responsibility of the inhabitants of the region in which the reserve is located. Within this structure there are three levels of site participation - *certified sites, dedicated sites,* and *secured sites* - affording increasing levels of voluntary and sometimes statutory safeguard.

A similar network, the East Asian - Australasian Shorebird Reserve Network, was launched in 1996 and now has 19 sites from Russia to New Zealand in its network (Weaver 1997; Watkins 1997). These voluntary networks are proving particularly effective at developing flyway conservation for waders where coverage of key sites by statutory conservation measures are patchy or limited. No such network has yet been developed for flyways covering Europe and Africa, perhaps because of the relatively greater coverage of key sites in Europe by national and international conservation designations.

The rather numerous international commitments relevant to waders are listed in Table 5. Most measures lead to the identification and/or formal designation of sites important to waders during their annual cycle, and some require that these sites are the subject of special safeguards within a broader matrix of measures to safeguard birds throughout their range and commitments to the sustainable use of wetlands and their birds.

In a single country there can also be a multiplicity of domestic site safeguard measures. These include:

- statutory wildlife designations which in part are designed to implement the international commitments listed in Table 5;
- non-statutory wildlife designations, some of which are sites owned or managed by voluntary conservation bodies; and
- a variety of statutory and non-statutory landscape designations, which provide for management safeguards in places of importance to migratory waders.

There are, for example, at least 18 different wildlife and landscape conservation measures (some statutory, some voluntary) relevant to the conservation of migratory wader sites in Britain (Davidson *et al.* 1991). Many of these have a complex relationship of overlapping boundaries and

are selected, designated and managed by many different organisations. Most countries in Europe have several categories of statutory wildlife and landscape conservation measures (Figure 2), although the diversity and type of designation varies considerably as does their efficacy and extent of application to key wildlife sites.

The development and implementation of both international and domestic conservation programmes for migratory waders is not uniform throughout the flyways of the world. Not all countries have joined even the most worldwide of conventions such as the 'Ramsar' Convention or the Bonn Convention, although states can be party to the agreements of the Bonn Convention without full Convention membership being in place. Legally binding Directives of the European Union apply to only part of the range of most migratory wader populations during their annual cycle - for example only the wintering and/or staging areas of arctic-breeding species. Furthermore the application of common Conventions can differ from place to place with differences both in application and interpretation of international law and Convention (Biber-Klemm 1991; de Klemm & Shine 1993).

Little assessment has yet been made of the consequences of all this variability on the extent to which wader flyways or individual wader species are afforded real safeguard throughout their annual cycle. Stroud *et al.* (1990) assessed the extent to which bird populations, including many waders, would be included in the proposed Special Protection Area network (EEC Birds Directive) in Great Britain. Davidson & Piersma (1992) made a first assessment of the way in which Ramsar designations of wetlands of international importance have been applied to each Knot subspecies at different times of year (Figure 3). This shows confirmed that there are very great differences in the extent to which Ramsar site designations have been made for different subspecies, for different times of year (breeding grounds are particularly poorly covered since the dispersed nature of breeding Knots means that site-based designations in these areas (CAFF 1994) cover only small parts of the population) and for different stages of the annual cycle of a single subspecies.

A broader assessment for Knots worldwide of the proportion of each subspecies at each stage in its annual cycle that is afforded some form of conservation safeguard (domestic and/or international) shows a similar pattern of great variability within and between populations (Figure 4). Some subspecies are poorly safeguarded by site designations at most or all times of year; for others the extent of conservation coverage is uncertain because of the uncertainties about the even basic site locations for the population.
In parallel to the uncertainty surrounding the extent to which conservation designations apply to flyway populations of waders, there is no clear flyway-scale

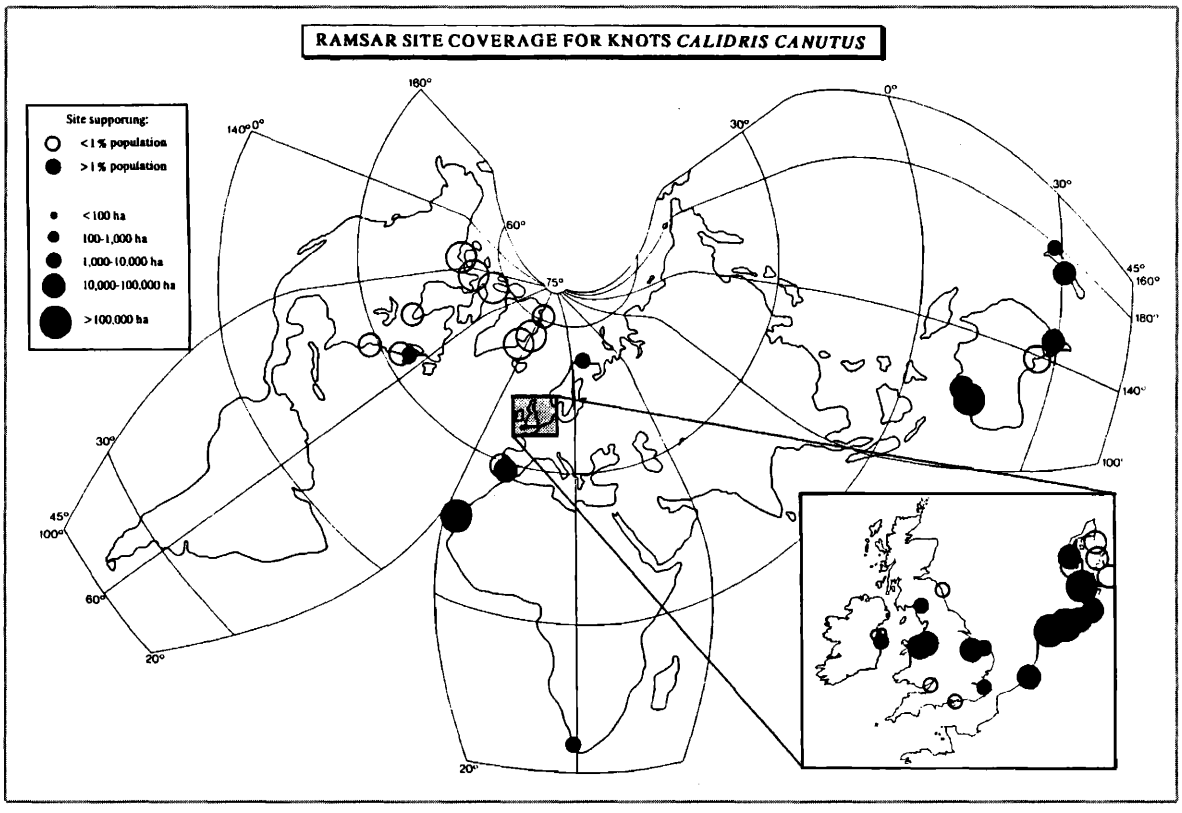

Figure 3. The distribution and size designated Ramsar sites (wetlands of international importance) that regularly support more than 100 Knots (from Davidson & Piersma 1992). Filled symbols show sites that are internationally important for a Knot population (*i.e.* the site supports >1% of a biogeographical population). Note that some sites support Knots in more than one season, some support populations of both *canutus* and *islandica* Knots, and some provide only partial coverage for the coastal sites used by Knots.

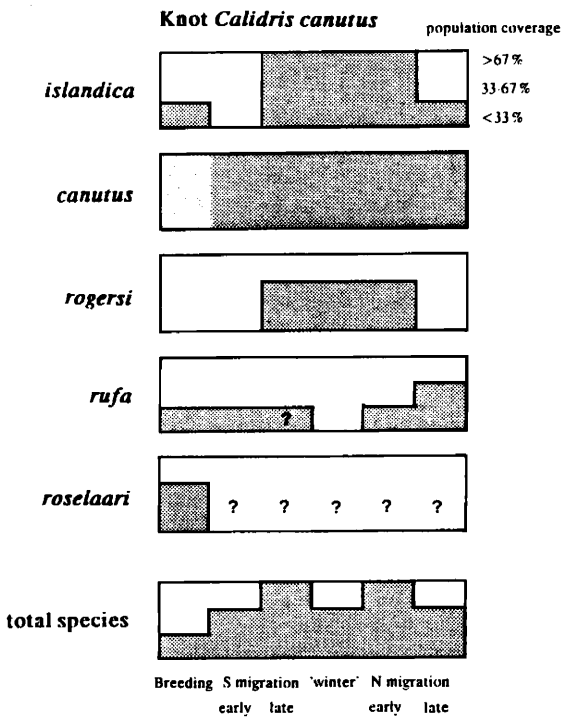

Figure 4. Estimated proportions of Knot populations occurring within designated conservation sites during different stages of their annual cycle. Conservation designations include both domestic and international designations (from Davidson & Piersma 1992).

assessment of the extent to which all these designations are successful in providing safeguards for the populations they are designed to protect. Some information is, however, available for individual countries, and the portents are not good. For Britain, Davidson *et al.* (1991) have described continuing loss and damage to many estuaries that are nationally or internationally important for waders, and at rate twice that of other habitats in Britain. The presence of a designated or proposed internationally important site appears to be little deterrent to further habitat loss since in 1989 over one-half of Britains internationally important estuaries faced land-claim proposals that if undertaken would lead to further loss of habitat used by waders (Davidson *et al.* 1991). As recently as 1996, government approval for landclaim for dock expansion was given for an area within the internationally designated Dee Estuary Ramsar site and Special Protection Area. Many other sites on wader flyways worldwide are known to be suffering habitat loss and facing further damage or destruction (Straw 1997).

Perhaps partly in response to these perceptions of the current failure of the many conservation designations to safeguard migrant waders, there are several new conservation initiatives under development. Several of these relate to the development of a co-ordinating rôle through international strategies and management plans. The IUCN, for example, established in 1985 its global wetlands programme, and at about the same time ICBP (now BirdLife International) developed its

A. Worldwide	
	Ramsar Convention (1971)
	World Heritage Convention (1972)
	CITES (1973)
	Bonn Convention (1979)
	Convention on Biological Diversity (1992)
B. Europe/Africa/West Asia	
	Berne Convention (1979)
	EEC Wild Birds Directive (1979)
	African Convention (1968)
	EEC Habitats and Species Directive (1992)
	African/Eurasian Waterbird Agreement (Bonn Convention) (1995)
C. East Asia/Australasia	
	Asia-Pacific Migratory Waterbird Conservation Strategy (1996)
	East Asia-Australasia Shorebird Reserve Network
	Bilateral agreements between USA, Japan, China, Australia, India, Russia *e.g*, JAMBA (Japan-Australia Migratory Birds Agreement)
D. Americas	
	Protection of Migratory Birds Convention (1916)
	Protection of Migratory Birds & Game Mammals Convention (1936)
	Western Hemisphere Convention (1940)
	US-Japan Migratory Birds Convention (1976)
	US-USSR Migratory Birds Convention (1976)
	Western Hemisphere Shorebird Reserve Network (WHSRN) (1985)
	North American Waterfowl Management Plan (NAWMP) (1986)
	US National Shorebird Plan (in prep.)

Table 5. International statutory and non-statutory conservation measures and agreements relevant to waders and their habitats.

Migratory Birds Conservation Programme (Salathé 1991b, c).

More recent, and of particular significance to the flyway conservation of waders, are the Asia-Pacific Migratory Waterbird Conservation Strategy (Anon 1996) and the Bonn Convention African-Eurasian Waterbird Agreement (see Boere & Lenten 1998). The AEWA provides a mechanism for co-ordinating and linking conservation action on the two major wader flyways in the western Palearctic (East Atlantic, and Mediterranean/Black Sea) and parts of

a third (West Asia/Africa), and provides a framework for developing consistent site safeguards and co-ordinated species/population conservation strategies. International management plans are also in preparation for some other individual waterbird species, notably on the White Stork *Ciconia ciconia* (Goriup & Schultz 1991), Dark-bellied Brent Goose *Branta b. bernicla* (van Nugteren 1997) and the Greenland White-fronted Goose *Anser albifrons flavirostris* (Stroud 1992, 1998). These provide useful models for potentially wider use.

To summarise, ensuring the long-term survival of any migratory flyway needs compatible standards to be applied throughout its range, taking account of local situations. To determine this, as with the first two elements of our strategy, requires a review of conservation effectiveness along the flyway. Again this requires co-ordination and an aim of identifying the weak links in the chain, both in terms of sites and of key features of wader ecology and flyway usage. Having undertaken this review, a programme of action to correct such deficiencies should be implemented.

Future directions for migrant wader conservation

Wader (and other waterfowl) migratory flyways are one of the worlds biological wonders. The maintenance and enhancement of these populations through appropriate conservation management of the habitats upon which they depend should be a global conservation priority. Some migratory organisms may be able to survive even after being forced to abandon their migratory habitats through, for example, removal of key sites in a migratory network. Many migratory wader populations would, however, seem unlikely to be able to adopt rapidly a non-migratory lifestyle should key sites in their flyway network be removed. Such removal would prevent the populations from moving between their breeding and wintering grounds: arctic-breeding species could not survive there through the arctic winter, and there would not seem to be suitable large areas of alternative breeding habitats around the coastal and inland wetlands on which so many populations depend for their winter survival. Indeed many of the wader populations that currently use these places throughout Europe are in serious decline largely through habitat destruction (Hötker 1991; Tucker & Heath 1994; Hagemeijer & Blair 1997). Hence destruction of key elements in migratory wader flyways would mean the destruction of the species.

Much is already being done to promote the conservation of migratory waders, but many populations remain vulnerable and face apparently increasing threats to their continued health. To put in place a conservation programme for the future, we need to take a number of key steps. These are:

a. identify what we do not know about the basic biology of the species and fill the gaps, highest priorities first;

b. identify which human impacts are having an adverse impact and quantify such impacts along the flyway. When gaps in our knowledge are identified they need to be filled; and

c. identify the current level of conservation action along the length of the flyway, determine its effectiveness and set about enhancing conservation action where it is seen to be inadequate.

Undertaking these steps, on a worldwide basis or even for a single flyway, will involve considerable work requiring both collation and reappraisal of existing information, and collection and collation of further information where gaps are identified. Such assessments are unlikely to fall easily within the scope of individual organisations, whether national or international. Many of the major advances in our understanding of migratory waders have come from international collaboration by wader-workers and conservationists. It is appropriate to develop such future work vital for the safeguard of migratory waders as international co-operative exercises.

Some flyway features, species and regions can already be identified for priority action. We have, for example, highlighted the parts of the annual cycle for one arctic-breeding migrant wader for which there is little site safeguard (*e.g.* during the breeding season) - but note that measures other than site safeguard are often more appropriate for conserving such widely dispersed populations. Similar reviews for other species would highlight priority areas for action, and there are now proposals to review global Ramsar site coverage of threatened waterbirds (A. Green, *in litt.*).

The priority lists of species provided by the then draft Western Palearctic Waterfowl Agreement Management Plan (Netherlands Ministry of Agriculture, Nature Management and Fisheries 1991) permit a broader assessment of the characteristics of the most threatened and vulnerable wader populations on the East Atlantic and Mediterranean/West Asian flyways. Of the 50 wader species and populations in the Western Palearctic 31 (68%) were listed as threatened, rare, decreasing or vulnerable, making waders amongst the higher risk groups of waterbirds (Table 5). Western Palearctic waders are thus in general in need of priority conservation action. Worldwide the largest number of the 39 globally threatened and near-threatened wader species (*sensu* Collar *et al.* 1994) are, however in East Asia/Australasia (20 species), with a further ten species in the Americas (data from Stroud 1997b), suggesting a particular priority for action in these regions.

Different high risk wader species and populations occur in all breeding zones from arctic to temperate, depend on all main types of wintering and staging area habitat and use East Atlantic and Mediterranean-West Asian Flyways. However widespread species - those with major parts of their

population using more than one breeding zone, non-breeding habitat or flyway are markedly less vulnerable than those of more restricted distribution. This emphasises the importance of range conservation for migratory waders.

Projects to underpin priority actions

We suggest that to take international wader flyway collaboration forward, projects should include the following:

1. Compilation of **a sourcebook of global wader species and population characteristics**, providing the basis for analyses summarising and comparing wader features across flyways that are designed to inform flyway strategy priority setting (see 2. below). Some summarising work has already been undertaken, *e.g*, for North Pacific waders (Gill *et al.* 1994). General assessment of species life-history characteristics that affect the way they use flyways (*e.g*, Piersma & Baker in press) can also provide such strategic guidance.

2. **Reviews of individual flyways**, drawing in part on individual species reviews and how the patterns of use by many different species combine to give the overall flyway picture. Elements of such reviews appear already in many guises, including the WSG *Bulletin* Supplement on flyway conservation (Davidson & Pienkowski 1987), the various papers in Salathé (1991a), IWRB wetland inventories, AEWA and its action plan, the Canadian Wildlife Services South American shorebird atlas (Morrison & Ross 1989), IWRB flyway population reviews (*e.g*, Smit & Piersma 1989) and reviews such as NCCs Estuaries Review (Davidson *et al.* 1991), and papers within this volume (*e.g*, Kube *et al.* 1998).

3. Establishing a **global wader census network**, developed from Wetlands Internationals IWC and Wader Database, to improve efficiency of providing regular updates on wader population sizes and trends.

4. **Migration and flyway use reviews for individual species and populations**, including worldwide appraisals. A model for this is the WSG *Bulletin* Supplement on Knot migration worldwide (Piersma & Davidson 1992).

5. Compilation of a **wader flyway atlas**, providing distribution and population information for all wader species on each flyway, i.e. information packaged in more summary form that in 4. above. A model is the Anatidae flyway atlas produced in support of the AEWA (Scott & Rose 1996).

6. **Comparative assessment of human activities, threats and impacts** for all parts of a flyway. A model here is the basically simple data collection methodology developed for the NCC Estuaries Review (Davidson *et al.* 1991), and used to produce an inventory of UK estuaries (Davidson & Buck 1997).

7. **Reviews of the flyway-wide patterns of site protection and conservation designations** for individual species, for wader assemblages and at different parts of the birds annual cycle.

8. **Preparation of species conservation and management strategies and action plans**, based on the types of information gathered in 1.-6. above. Such strategies might be developed under the auspices of the Bonn Convention AEWA. There are a number of models for this approach in waterfowl, including the AEWA White Stork conservation management plan (Goriup & Schultz 1991), the Dark-bellied Brent Goose Management Plan and the Greenland White-fronted Goose International Conservation Plan (Stroud 1992, 1998). A possible first target for such a strategy for waders could be the Knot, for which much factual preparatory work is available (Piersma & Davidson 1992; Piersma 1994). There are also proposals for an international action plan for threatened waders (Stroud 1997b).

9. **Preparation of wader conservation strategies for different flyways**, *e.g*, for the East Atlantic and/or the Mediterranean/West Asian flyways, and for countries within flyways, *e.g*, the national plan for shorebird conservation in Australia (Watkins 1993); and

10. Establishment of **a Western Palearctic wader reserve network**, perhaps along the lines of the Western Hemisphere Shorebird Reserve Network. An East Asian-Australasian shorebird reserve network (Watkins 1997) is now being developed, and there are proposals for developing worldwide networks (Butler 1995).

11. Establishment of **networks of species experts** and those with other data and information to contribute to the projects listed above. A first step might be through a questionnaire to WSG members and others to determine what expertise, data and information may be readily available to assist with progressing these initiatives.

For some of these initiatives it should be most effective to undertake pilot development of the approach using some simpler and/or better known systems (such as developing a flyway conservation plan for the Knot), as well as targeting those species and issues for which urgent action is believed necessary and for which little is known (Stroud 1997b).

There are many organisations and groups that can be key participants in co-ordinated development of some or all of these features. For the Western Palearctic these could include WSG, Wetlands International, WIWO, the Ramsar Bureau, BirdLife International, IUCN Species Survival Commission, WWF (*e.g*, WWF-Wattenmeerschelle Schleswig-Holstein), the International Wadden Sea Secretariat, RSPB, BTO, DOF, SOVON, JNCC, and the Russian Wader Studies Group as well as knowledgeable wader-workers throughout the flyways. For

Table 6. The percentage of various groups of waterfowl populations and species in the Western Palearctic that believed to be in an unfavourable state. Species and populations are included as in an unfavourable state if they are listed as threatened, rare, decreasing or vulnerable in the Western Palearctic Waterfowl Agreement Draft Management Plan (Netherlands Ministry of Agriculture, Nature Management and Fisheries 1991).

	% of species/populations in an unfavourable state
waders	**68**
divers and grebes	73
cormorants, herons, egrets, storks etc.	70
swans and geese	84
ducks	58
rails	57
gulls and terns	65

African-Eurasian flyways much of the activity could be developed through the Bonn Convention AEWA. WSG has a valuable role to play is all this, since its informal international links with those active in the fields of wader research and conservation in many countries have acted as the catalyst to the collation and publication of much vital background information, both as material in its regular *Bulletins* and compiled on special topics in its *International Wader Studies* series. There is great scope for this role to continue, for example through the collaborative preparation of further IWS volumes, notably the publication of this volume. WSG has also a responsibility to provide such expert information and advice on waders for conservation purposes, through its role for Wetlands International and IUCN-SSC as a Specialist Group.

It is perhaps fitting that these ideas for future wader flyway action were first presented at a uniquely international wader conference, held in Odessa, Ukraine, situated in the heart of major wader staging areas on the Mediterranean/West Asian Flyway, and at a time of year (April) when many thousands of waders were passing through *en route* to relatively little-known breeding grounds on a poorly-understood migration route. Many of the approaches proposed in this paper are also embodied in the *Odessa Protocol on international co-operation on migratory flyway research and conservation* (Wader Study Group 1992 and in this volume), developed at that conference.

Implementation of elements of the Odessa Protocol by WSG and others are described in Appendix 1. Appendix 1 also provides a summary of our recommendations for future priority activities for wader flyway conservation.

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Appendix 1 - Implementation of the Odessa Protocol

1992-1998

Note. This table described international wader research and conservation activity in the parts of the world that are the focus of the Odessa Protocol - Asia, Europe, Africa and Australasia. Other similar activities are underway in the Americas, notably through the Western Hemisphere Shorebird Reserve Network (WHSRN). The WHSRN initiative pre-dates the Odessa Protocol and has provided a model for some of the activities summarised below, especially those in the Asia-Pacific region.

Key

AEWA	African-Eurasian Waterbird Agreement	EFNCP	European Forum for Nature Conservation and Pastoralism
AfWC	African Waterfowl Census	IWC	International Waterfowl Census
A-PMWCS	Asia-Pacific Migratory Waterbird Conservation Strategy	WHSRN	Western Hemisphere Shorebird Reserve Network
AWC	Asian Waterfowl Census	WIWO	Foundation Working Group International Wader and Waterfowl Research
AWSG	Australasian Wader Studies Group	WSG	International Wader Study Group
BOU	British Ornithologists' Union	WWF	World-wide Fund for Nature
CoP	Conference of Parties		

Odessa Protocol clauses	WSG actions undertaken/in progress	WSG actions proposed	Relevant actions by others undertaken/in progress	Relevant actions by others proposed
Flyway conservation strategies 1. STRESSES the need for the production of international flyway conservation strategies for each of the wader flyways (East Atlantic, Mediterranean/Black Sea; West Asia/Africa; Central Asia/India; East Asia/Australasia), and recommends that the Wader Study Group should co-ordinate the production of such strategies;			● Finalisation of the African-Eurasian Waterbird Agreement (AEWA) in 1996 ● Finalisation of Asia-Pacific Migratory Waterbird Conservation Strategy (A-PMWCS): 1996-2000 ● Development of Action Plan for A-PMWCS	● Proposed expansion of AEWA Action Plan to cover waders
International site networks 2. UNDERLINES the importance of the identification and effective conservation of international networks of sites and areas on which these birds depend;		● Proposed African-Eurasian wader flyways atlas will contribute to knowledge base	● Agreement of East-Asian-Australiasian Shorebird Reserve Network at Ramsar CoP6 and designation of 19 sites by 7 countries (by January 1998)	● AEWA to co-ordinate flyway network of protected areas in African-Eurasian Region

Odessa Protocol clauses	WSG actions undertaken/in progress	WSG actions proposed	Relevant actions by others undertaken/in progress	Relevant actions by others proposed
Common data standards 3. RECOMMENDS that, to allow geographical comparisons and time-series monitoring, common standards for field methodology and data collection and handling be adopted by all organisations for work on wader populations, and that close co-ordination of systems depending on data exchange, such as ringing centres and other databases, be enhanced;	● Workshop on field techniques held at WSG Conference in 1993 to identify best practise standard methods ● Two *Wader study methods* volumes in prep., compiling research methods papers published in *WSG Bulletin*	● Publication of methodological standards drawing on workshop conclusions and other inputs	● 1998 review, by Wetlands International, of International Waterfowl Census (IWC) as basis for flyway-level count co-ordination	● AEWA: production of conservation guidelines relating to: single species Action plans; emergency measures; preparation of site inventories and habitat management methods; hunting practises; trade in waterbirds; tourism; reducing crop damage; and a waterbird monitoring protocol; in order to underpin implementation of AEWA ● Global review of waterbird monitoring programmes (Wetlands International) to enhance basis for making waterbird population estimates
Resources for research in northern Asia 4. RECOMMENDS that governments and non-governmental organisations provide resources to address present urgent needs in the study and conservation of waders in eastern Europe and northern Asia (especially Ukraine, Russia, Moldova, Belarus, Lithuania, Latvia, Estonia, Kazakhstan, Kirgizstan, Uzbekistan, Turkmenistan, Georgia, Armenia, Azerbaijan, Tadzhikstan) which provide the areas of breeding and non-breeding usage for a high proportion of these shared populations;	● More than three person-years voluntary time contributed by WSG members to the editorial work required for this volume		● UK's Darwin Initiative ● Dutch government support for research in Siberian arctic and taiga regions ● Joint Swedish-Russian Tundra Ecology Expedition 94 ● Recent WIWO expeditions (WIWO Forward Plan 1994-1998 gives strategic direction) ● BOU has given priority in its small grants to projects in eastern Europe and northern Asia ● EFNCP has extended its work to central and eastern Europe ● BirdLife International and WWF has undertaken relevant activities impinging on waders	

Odessa Protocol clauses	WSG actions undertaken/in progress	WSG actions proposed	Relevant actions by others undertaken/in progress	Relevant actions by others proposed
Transfer of expertise 5. EMPHASISES that all countries can learn from the experience of others and recommends that those people and organisations with experience in particular aspects should assist others by:				
● providing training and training materials, including publications,	● Training given during WSG expeditions to Banc d'Arguin, Senegal (1997) and Cameroon (1998)		● Wetlands International's training programme has targeted eastern and central Europe ● Several journal publishers are making their journals available at reduced rates	
● assisting in establishing compatible databases,	● Arctic breeding wader database established ● Guidance on redevelopment of Wetlands International wader counts database		● Wetlands International establish international wader database to hold data from International Waterfowl Census and other sources (1997-1998)	
● arranging exchange visits,	● Facilitation of editorial team meetings held at WSG meetings in 1993, 1994, 1995, 1996 & 1997		● Much activity by BirdLife International	
● supporting and helping to arrange conferences,	● Conferences held in Hungary (1992), UK (1993), Germany (1994), Portugal (1995), Belgium (1996), Denmark (1997) ● Workshop held on Dunlins (1993), wader field techniques (1994), Kentish Plovers (1995), E Atlantic flyway population sizes (1996), breeding waders in Europe (1997)	● Planned conferences in Cape Town (August 1998), Hungary (October 1998), France (1999) & UK (2000) ● Proposed workshop on flyway population estimates in 1998	● Conference on Shorebird conservation in the Asia-Pacific Region convened by the Australasian WSG - 1996	● Wetlands International 2nd International Conference on Wetlands and development, Senegal 1998 - includes flyway conservation workshop
● continuing co-ordination of colour-marking schemes,	● WSG Colour Mark Register maintained and further developed		● Wetlands International developing draft colour-marking protocol for waders on East Asian-Australasian flyway and seeking widespread adoption	

Odessa Protocol clauses	WSG actions: undertaken/in progress	WSG actions: proposed	Relevant actions by others: undertaken/in progress	Relevant actions by others: proposed
● assisting with publication of results and raising public awareness,	● Continued publication of *Wader Study Group Bulletin* three times a year ● Establishment of WSG WWW site ● Establishment of *International Wader Studies* as second WSG publication series and publication of: ● *Numbers and distribution of waterbirds in the Wadden Sea* - 1994 ● *Shorebird ecology and conservation in the Western Hemisphere* - 1996 ● *Conservation and management of shorebirds in the Western Great Basin of North America* - 1996 ● *Migration and international conservation of waders: Research and conservation on north Asian, African and European flyways* - 1998	● Continued commitment to develop scope and content of *Wader Study Group Bulletin* ● Further development of WSG WWW site ● Anticipated publication of International Wader Studies volumes on: ● Wader study methods: practical papers published in the WSG Bulletin. Part 1. Catching and handling birds and data - 1998 ● Part 2. Feeding, census and survey techniques - 2000	● Publication (1996) by Wetlands International of *Asia-Pacific Migratory Waterbird Conservation Strategy: 1996-2000* ● Publication of *Shorebird Conservation in the Asia-Pacific Region* by AWSG - 1997	
● encouraging further bilateral and multilateral agreements on co-operation;	● WSG continues to act and develop its rôle as Specialist Group for waders for both Wetlands International and IUCN's Species Survival Commission.	● Agreement of co-operation drafted between WSG and AWSG	● AEWA open for signature since 1996 (see above). ● Slender-billed Curlew Memorandum of Agreement	
● and underlines the facilitating role which the Wader Study Group and other international organisations can play in these respects;				
Collaboration between volunteers & professionals 6. RECOMMENDS that collaboration between volunteers and professionals be actively encouraged, with initial building of confidence, feedback of information, and other support;	● WSG commitment to further such links through all of its activities		● Many such initiatives included above	

Odessa Protocol clauses	WSG actions undertaken/in progress	WSG actions proposed	Relevant actions by others undertaken/in progress	Relevant actions by others proposed
Use of existing information 7. RECOMMENDS that full use is made of existing relevant information, which should be made available, after being gathered by simple techniques including questionnaires, initially on aspects such as site inventories of wader habitats, information on trends in wader population sizes with time, and analyses of human activities potentially affecting these habitats;	● Co-ordination of international database collating information on arctic breeding conditions ● Ramsar Convention calls for further development of International Waterfowl Census (1996: Res. C.VI.4) as a basis for the identification of site networks	● production of flyway atlas of wader populations in Africa and Eurasia	● Three-yearly publication cycle of Waterfowl Population Estimates by Wetlands International commenced 1994	● Proposed funding of flyway atlas of wader populations in Africa Eurasia by Wetlands International and others
Collaborative flyway research 8. RECOMMENDS that programmes of research into crucial gaps in knowledge of the biology of waders be developed by the collaboration of relevant organisations along flyway routes;	● International collaborative research facilitated by WSG projects on: Non-Estuarine Coastal Waterfowl Counts - 1997/98 Ruff migration project - 1997-1999 ● collaborative WIWO/WSG/National Park authorities survey of Banc d'Arguin (1997) ● Cameroon (1998) research survey to provide new population estimates	● WSG survey project on Slender-billed Curlew and Sociable Plover in Kazakhstan (planned for 1999) ● Global wader flyway characteristics: compilation of a sourcebook for flyway conservation strategies	● Timetable for future revision of international waterfowl population estimates endorsed by Ramsar Contracting Parties at CoP6 - 1996 (Res. C.VI.4)	
Implementing international agreements 9. RECOMMENDS that all states along wader flyways sign and implement relevant international agreements;			● AEWA signed and/or ratified by The Netherlands, Sudan, Germany, Guinea, Ireland, UK, Switzerland, Jordan, Egypt, Mali, Morocco, Togo, Luxembourg, Equatorial Guinea, Spain, Greece and the European Community (as at June 1998) ● Since 1992, 41 new Contracting Parties to the Ramsar Convention and 430 new designated wetlands of international importance	● First Conference of Parties to AEWA scheduled for October 1999

A selection of recommended future priority activities for wader flyway conservation

	Topic	Suggested activities	Possible lead organisation(s)
IMPROVING THE KNOWLEDGE BASE	**Characteristics of flyway populations**	● sourcebook and comparative assessment of species/ populations on each flyway	WSG
		● review of knowledge on globally threatened wader species and populations	AWSG/WSG/WHSRN
		● continue to undertake single-species reviews (*e.g.* as for Knots *Calidris canutus*) as expertise permits, including publication of Kentish Plover *C. alexandrinus* results. Other priority species could include Avocet *Recurvirostra avosetta.*	WSG
	Population distributions	● African-Eurasian wader flyway atlas	Wetlands International/WSG
		● Asia-Pacific wader flyway atlas	Wetlands International/AWSG
		● compilation of population distributions including identification of Range States on all other flyways	WSG
	Population sizes and trends	● Development of the IWC especially in poorly covered areas areas (as requested by the Ramsar Convention in 1996)	Wetlands International
		● Co-ordination of international wader monitoring via IWC	Wetlands International/WSG
		● further development and maintenance of wader counts database	Wetlands International
		● maintenance, development and accessibility of IWC component censuses (WPWC, AfWC, AWC) to provide key wader count data for population assessments as requested by the Ramsar Convention	Wetlands International
		● global review of waterbird monitoring programmes and development of a global census alliance as basis of improving inputs to waterbird population estimates	Wetlands International
		● update on East Atlantic flyway populations, including non-estuarine species	WSG
		● review of population sizes on Black Sea - Mediterranean flyway	WSG
		● development of wader species expert network for advice on population sizes/trends	WSG
	Proportions of populations in protected areas	● analysis of wader population distribution in international site networks on African-Eurasian flyways	WSG for AEWA
		● global Ramsar site coverage of threatened wader populations	WSG with Threatened Waterfowl Specialist Group
TRAINING		● prioritisation of training needs required	Wetlands International
FLYWAY CONSERVATION		● Action Plan for globally threatened waders	AWSG/WSG/?WHSRN/ IUCN-SSC
		● Development of a flyway conservation strategy (and wader reserve network) for the East Atlantic flyway	AEWA to refine requirements