Flyway management: needs and uses

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A flyway is a geographically delimited unit appropriate for the assessment and monitoring of a single waterfowl species. There follows a discussion of why status assessment and monitoring must be undertaken at a flyway level, when management practices and actions can be more local. In order to decide upon appropriate waterfowl management practices there are some ideal requirements for information about the flyway. These information requirements are listed and suggestions are made about the types of monitoring and research necessary to fulfil them. Finally, Pintail *Anas acuta* is used as an illustrative example of how well existing monitoring schemes and reporting procedures perform, in terms of providing information necessary for identifying management practices and assessing their impacts on the species.

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Под термином "Flyway" (пролетный путь) подразумевается географически ограниченная единица, пригодная для оценки и мониторинга отдельного вида водоплавающих птиц. Обсуждается причина, почему оценку статуса и мониторинг надо обязательно проводить на уровне пролетного пути, тогда как практика и механизмы управления могут быть более местного характера. Для того, чтобы найти подходящую практику управления водоплавающими птицами, существуют идеальные требования к информации о пролетном пути. Приведен список этих требований и предложения о нужных типах мониторинга и список необходимых исследований для выполнения этих требований. В заключение на примере шилохвости *Anas acuta* продемонстрирована действенность уже существующих проектов мониторинга и методов представления для отождествления акций управления и оценки их влияния на данный вид.

Introduction

The term "Flyway" has been used widely in many contexts, but usually it is used to describe different units or populations of a migratory species or group of species. Therefore, the fundamental question is, "Why do we have to try to manage and monitor at a flyway level instead of concentrating on sites, political regions or whole species?

My definition of flyway is quite simple. I use the term to refer to the practical geographical groupings of a species that are selected for management purposes. Ideally, the flyways would include all individuals affected by management activities undertaken within the geographical limits described, but in practice such a perfect situation is hardly ever achieved. When this definition is used it is easier to see why we monitor and manage at this level, as the flyway should represent the far reaching extent of the ripples made by our wise-use and conservation practices.

As all species have a very different ecology, this practical definition of a flyway means that the units we manage do not have equal biological status.

Although the examples I use to illustrate flyway information and management are drawn from ducks (Anatidae), the points and principles are just as applicable to waders and other migratory waterbirds.

There are five biological categories of population within the Anatidae in Europe, which are all illustrated by the current treatment of the geese, as follows:

i) The whole population of a species (Red-breasted Goose *Branta ruficollis*);

ii) The whole population of a subspecies (Greenland White-fronted Goose *Anser albifrons flavirostris*);

iii) The population of a very distinct biologically isolated unit (Svalbard Barnacle Goose *Branta leucopsis*);

iv) The population of a species that is not distinct but combines biological with practical/political considerations in the definition of its boundaries (Greylag Goose *Anser anser*);

v) A geographical grouping of a species based entirely on practical/political considerations (White-fronted Goose *Anser albifrons*).

Most commonly, flyway is a term used to define an area common to a number of migratory species, but this is not always the case. In Europe, the flyways are similar for different species of Anatidae but not identical.

If changes in the status of a species are measured at a lower level, such as the site or country, it is impossible to assess whether the changes are due to wise local management or unwise management elsewhere in the flyway. With this unavoidable ambiguity in the results of lower level monitoring; the obvious conclusion is that management activities aimed at waterbirds or their habitats must be judged on a flyway level. This is true whether the management is aimed at the individual breeding pair, the site, or national landscape level.

What information is required to manage at a flyway level?

To manage a flyway we need to know:

i) the species using the region,
ii) the boundaries of the geographic units or populations these species are divided into (flyways),
iii) the dynamics and size of these populations, and
iv) the key sites for each flyway,
v) the seasonal distribution of the species,
vi) the critical (limiting) factors for the populations,
vii) the major gaps in information.

If this information is available, it is possible to ensure the health of the flyway by wise management. It is only possible to obtain this information if, for each species, a decision has been taken on the flyway boundaries and site-specific census information exists for all seasons across the entire area. Of course, this sounds easy but it is highly idealistic to expect that we can ever approach this level of monitoring for waterbird species. I can only think of one flyway population for which this ideal status of knowledge might be close to realisation: the Svalbard Barnacle Goose.

The idea of bioindicator or benchmark species, that can be indicative of the entire suite of species that depend on similar sites or habitats, has often been suggested. If this were truly possible it would be reasonable to assume that many species would be in close competition with each other over some resources. In reality, such situations are very unusual. For this reason, I prefer to assess each species independently as the unique member of its own flyway. Results can then be compared across species for which flyway boundaries are similar.

The final process of looking for dependence, correlation, interaction or overlap between species- specific flyways is an important flyway management process. It ensures that the gain for one flyway is not at the expense of another. For example, increasing water depth could benefit diving ducks at the expense of some grazing species. Perhaps the commonest interaction is seen when even the smallest jetty or pier is created in intertidal areas. The disruption to the siltation process very quickly effects the species composition of feeding waders over very unpredictable areas of the adjacent tidal system, often extending some distance in a number of directions.

Comparison of species- specific flyways with each other also allows decisions to be taken on whether to try and manage the flyways at a single species or multiple species level. For example, it might be beneficial to prohibit spring hunting of Garganey *Anas querquedula* because of the recently established practice of subsistence kill late in the winter in Mali. In contrast, the opening of the hunting season in autumn might most sensibly be set for all species. Even more obvious might be the creation of disturbance refuges, which have to be aimed at all species to have any value whatsoever. The possibility of allowing disturbance to one species using a site but prohibiting disturbance of a second species at the same site is inconceivable.

How is the information required to manage at flyway level obtained?

Nearly all of the information I am now presenting comes from the publication on Anatidae flyways initiated by Gerard Boere and Marc van Roomen in 1988 and published by Wetlands International (Scott & Rose 1996). This project aims to define the flyway boundaries in a universally acceptable way, thereby fulfilling one of the major requirements for successful flyway management. The other aims are to revise all flyway population estimates, list all key

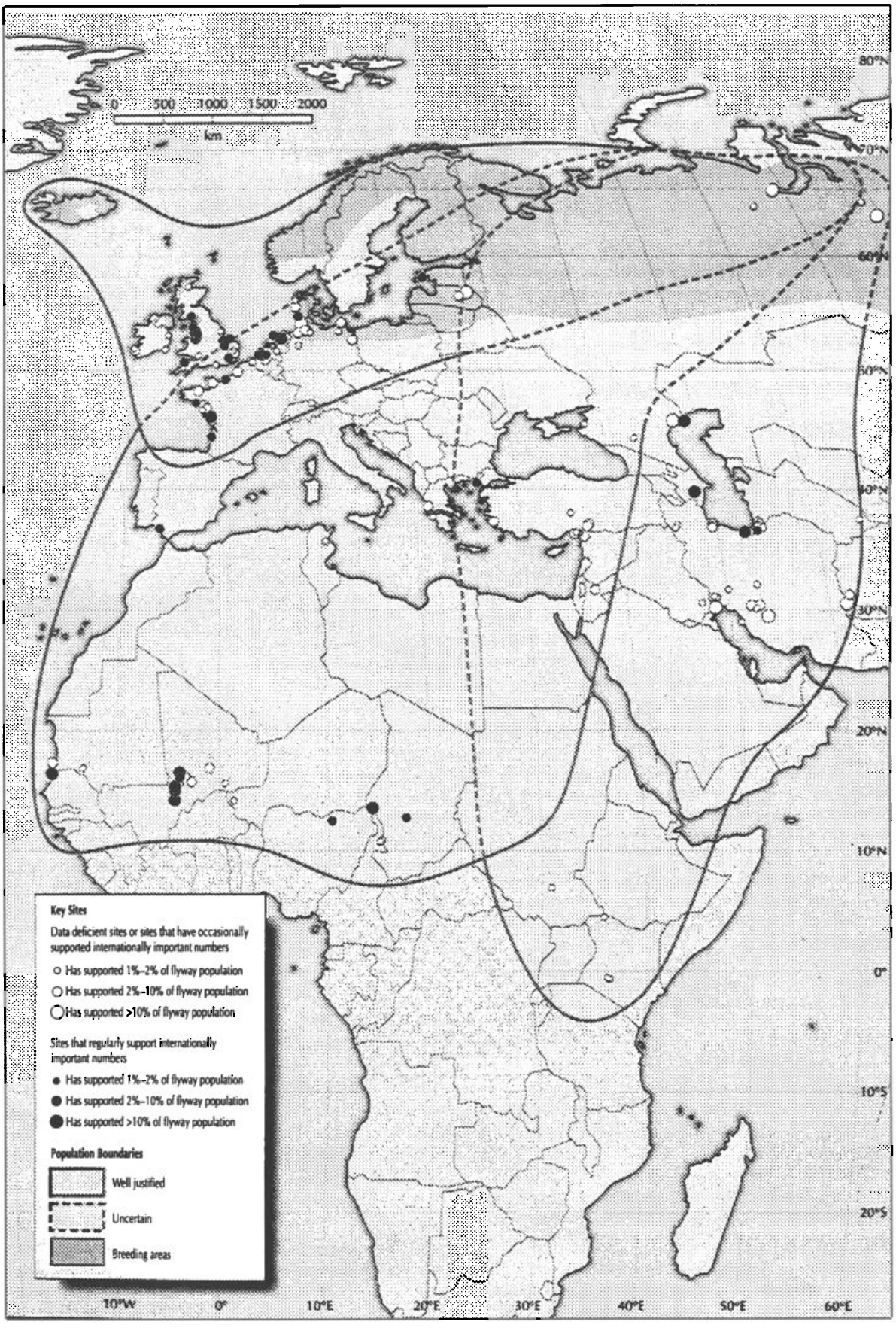

Figure 1. Population boundaries and known key sites for Pintail in Africa and Western Eurasia.

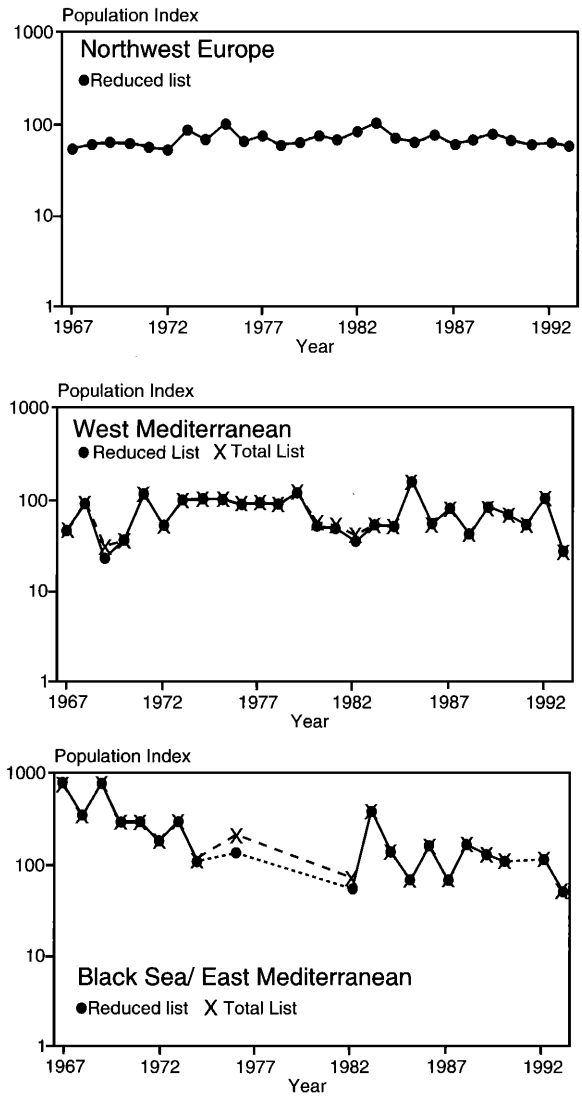

Figure 2. Population trends for wintering Pintail in Northwest Europe, the West Mediterranean and the Black Sea/ East Mediterranean. Total List = all sites monitored by International Waterfowl census; Reduced list = a sample of these sites.

sites known for the flyways and assess the degree of actual and potential protected status possible from the key site network identified. Through this approach, Wetlands International hopes to stimulate comment and thought, identify research and monitoring priorities, strengthen the technical basis for deciding on conservation actions and provide some of the essential technical support necessary to make the African Eurasian Waterbird Agreement (AEWA) under the Bonn Convention a success (Boere & Lenten 1998).

Monitoring at a flyway level is an essential activity for most management practices. A carefully designed monitoring system is the only way to recognise changes in the status of flyways, and hence determine the schedule and nature of necessary management practices. Ideally, monitoring programmes should be able to detect changes in geographic range, distribution, population size and population trends. It is unreasonable to think that a flyway level monitoring programme could detect changes in the behaviour of individuals within a flyway, but it is often useful to have this information available through monitoring schemes at site or national levels. Monitoring should also be highly strategic with clearly defined goals. A methodology for whole flyways must be standardised, simple, and clear so that full advantage can be taken of smaller scale programmes within the flyway. These smaller scale national or regional programmes often have very precise objectives and therefore necessitate a less flexible methodology. By keeping international schemes very simple there is much more chance of being able to incorporate information from the more intricate monitoring schemes. Geographical gaps should obviously be kept to a minimum.

Equally important is the need to keep monitoring programmes adequately serviced, well reported on, regularly analysed and summarised. This requires an organisation to take responsibility for the international scheme and its funding, while ensuring that all contributors and users needs are fully met. Wetlands International has fulfilled this role for the International Waterfowl Census since its inception in 1967 (*e.g.* Monval & Pirot 1989; Rose 1995).

What is available to assist the management of Pintail *Anas acuta* in Europe?

As listed above, the information requirements for the successful management of flyways are: a list of the species using the region, a definition of the geographical flyway boundaries, flyway population sizes and trends, a list of key sites, seasonal distributions, limiting factors, and gaps in knowledge.

The list of species that could be affected by management practices is often best drawn up nationally or at other levels lower than the flyway and although an important information requirement, it cannot be illustrated through the example of a single species. Each of the remaining six categories of information required to manage flyways are explored through the example of Pintail. This species is chosen because it is the species of Anatidae most likely to become of conservation concern in Northwest Europe in the near future. In Europe, Pintail is a migratory dabbling duck that breeds in the tundra zone and winters along the North Sea and Atlantic coasts south of Denmark, in the Mediterranean region and in the Sahelian zone of West Africa. Throughout its range it is a quarry species and it is highly congregatory outside of the breeding season.

Geographical definition of flyways

The current flyways for European Pintail are shown in Figure 1. They are based on available ringing information, the dynamics (trends) of wintering populations and seasonal distribution. The

interchange of individuals between flyways seems to be commonplace and their is considerable overlap between flyways on the breeding grounds.

Consequently, the flyways are not biological populations, but rather units for management defined through a combination of biological and practical considerations. More recovery or tracking information would certainly help to clarify the boundaries and might give more confidence in the biological value of the divisions. Flyway population trend statistics are important for concluding that Mediterranean and Sahelian wintering populations come from the same flyway, and showed that there was some degree of independence between Northwest European wintering birds and the other regions. Seasonal distribution is not known well enough to help in the definition of boundaries.

Size and trends of flyway populations

The aim of the International Waterfowl Census is to provide whole flyway, simultaneous counts from which the minimum size of a population can be set. In addition, modelled population sizes can often be calculated and sometimes these give a better population estimate. For Pintail the final flyway population estimates are reached by combining either maximum counts or modelled population sizes with an assessment of gaps caused by incomplete geographical coverage. The assessment of gaps relies on a highly subjective expert judgement based on available habitat and likely wintering density. The final estimate is then substantiated by comparison with other numerical data sources. In the case of Pintail the only source of potentially corroborative data are the national estimates of breeding population sizes, compiled for the European Breeding Bird Atlas (Hagemeijer & Blair 1997) and the BirdLife International Dispersed Species Project (Tucker & Heather 1994). Although not currently used, I am sure that bag statistics could also be valuable if collected and interpreted in a standard way.

Trends in flyway populations can be calculated if monitoring is site- based, regular and covers the whole flyway. It is not possible to calculate trends for highly mobile, opportunistic or nomadic species (*e.g.* seaducks) for which monitoring must aim to count as close as possible to the whole population on a regular basis. This need not be annually, but at fixed intervals.

The population trends for Pintail in Europe are shown in Figure 2. Unfortunately, there is no appropriate data for the calculation of trends for West African wintering birds. The extreme year to year variation in the annual indices for the West Mediterranean wintering group suggests that the West African and West Mediterranean wintering group belong to the same flyway population. This flyway is also likely to include the East Mediterranean wintering birds for which the population trend is probably not very reliable, due to the inconsistent and incomplete coverage. In conclusion, the trends for the West Mediterranean portion of the wintering group are inconclusive and data is currently inadequate to calculate trends for the whole flyway.

For the north-west European wintering group, data is very good, and the population trend is very reliable. Although slight, a steady decrease is visible. This decrease is very close to being statistically significant and if confirmed through adding more data, will certainly require some action in the near future. Hunting statistics should support and add to information of population trend calculations but currently there is no mechanism for using them in the process.

Key sites

Perhaps one of the most frequently suggested ideas for managing flyways is the creation of a protected network of key sites. This approach recognises that flyway management most commonly involves the protection of sites, the formation of refuges and the production of site management plans. Obviously, these efforts are maximised if they are carried out for key sites that are linked by common individuals that migrate between the sites in the network. . Internationally, key sites for waterbirds are most commonly selected on the basis of the Ramsar Convention Criterion 3c, which can be modified or supplemented if more sites are required in the network.

The internationally important key sites for Pintail flyways are shown in Figure 1. This list is probably almost complete for wintering localities as there are good estimations of population size for all flyways and the IWC provides a comprehensive set of site based monitoring data from the entire region. For other seasons there is only very limited information available and the lists rely heavily on national experts who have been asked to compile information. The information is very rarely easy to obtain, so the consequence is that very few sites have been identified outside of midwinter. This means that the key site networks are very incomplete. It also highlights the enormous value of centralised, standardised data resources.
It might be possible to improve the key site information through synchronised censuses during other seasons (spring, pre-breeding, moult, autumn).

If these were designed solely for the purpose of gaining key site information, they need not be annual, synchronisation need not be precise and geographic gaps would not detract from the value of other information collected. Population sizes and trends could not be estimated but these can be achieved through the mid-winter census.
To assess the effectiveness of a key site network as a conservation tool, it is necessary to know the protected status of each of the sites, the degree of linkage between sites in terms of exchange of individuals and the degree of protection that the flyway is afforded by the network. None of this information is readily available at present. There is

no central source for protected status information and no international summary of ringing information that demonstrates linkages between sites.

If the effectiveness of the key site networks can be estimated it becomes possible to quantify the relative importance of broader international initiatives aimed directly at the whole flyway. In Europe some examples of broader flyway management initiatives include EC Directives, regulation of hunting, some national schemes, the BirdLife International Dispersed Species Project and Important Bird Areas projects, plus many others.

Seasonal distribution

The presence or absence of Pintail across Europe, according to season, is well known, but there is no quantitative seasonal distribution data. This huge gap in information contributes to flyway boundaries that are poorly defined and extensively overlapping in all parts of the range except wintering grounds. The extent of overlap in flyways is so great that it is often very difficult to decide to which a migratory or breeding concentration the wintering group belongs.

Bottlenecks

Flyway management is most effective if it is aimed directly at the immediate limiting factor for the population. If the direct cause of the unfavourable conservation status is known, it is often very easy and cost effective to restore a more favourable condition. The problems arise in trying to identify the limiting factor. This is usually only possible if an in depth knowledge of the ecology, dynamics and behaviour of the flyway population is available.

This can only be gained through many years of expensive research, so if action is already necessary there is rarely time to do the research needed to identify limiting factors. It follows that there is a great need to continue basic research on species with favourable conservation status in order that conservation actions could be carried out more efficiently if they were ever needed.

Because of the lack of detailed knowledge, most flyway management action is aimed more generally at improving conditions for the population. The removal of any negative influence on the flyway will always improve conservation status by partially compensating for the major limiting factor. Real successes are, however, unlikely to be frequent or long-term unless the major bottleneck is identified and widened.

Gaps in knowledge

It is extremely important to fully understand the weaknesses in the information used to take flyway management decisions. Gaps in knowledge can never be used as an excuse for avoiding action, but they must be acknowledged so that the potential error they could cause can be assessed. By identifying gaps in knowledge it becomes easier to identify and prioritise future work in terms of geographic region, subject and species.

Conclusions

It is hard to separate management and monitoring. Monitoring determines management priorities and then validates results. Management can rarely take place on a whole flyway level but even though it is often confined to detailed activities in a very small area, its results can be far reaching and must be assessed on a flyway basis.

The value of centralised, standardised collations of data on a flyway level are extremely valuable for making decisions concerning flyway management. More of these information systems need to be developed.

A mechanism for applying flyway management priorities is also essential. I very much hope that the AEWA under the Bonn Convention (Boere & Lenten 1998) will provide this mechanism for turning monitoring and ideas into action.

Acknowledgements

To provide this type of continental overview for waterfowl populations is an enormous privilege, for which I am forever greatly indebted to the dedicated army of enthusiastic waterfowl counters, count co-ordinators, national co-ordinators and researchers that have given their data so freely and in such vast quantity over the past 25 years or more. This scale of data collection is impossible to value too highly. I would also like to thank all staff at Wetlands International that have given their advice so freely, and especially Sharon Favell for preparing the presentation so painstakingly.

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