Waterbirds around the world

A global overview of the conservation, management and research of the world's waterbird flyways

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Sustainable harvest of waterbirds: a global review

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ABSTRACT
Waterbirds have a long tradition of being harvested in various ways. In many countries, the harvest takes place as a primary food source, but recreational hunting is also very popular. Various methods are used. Subsistence hunting of waterbirds has a history that dates back to the dawn of modern mankind. In many remote regions, waterbirds are still an important food resource. At the same time, sustainable utilization at all levels is regarded as a cornerstone in the conservation of nature. Sustainability is considered from the perspectives of two main fields: ecology and socio-economic (political) issues. Aspects of ecological sustainability include the harvest and other direct impacts on bird populations, here regarded as the hunting pressure. Socio-economic aspects include the active participation in nature conservation by local communities, motivated by the access to natural resources and the degree of stability in local communities obtained through nature conservation. In many countries there is a long tradition of detailed wildlife harvest management including programmes for bag surveys and monitoring of harvest levels. In most countries, however, the management of waterbird harvests is poor or completely lacking, and very little information is available on the annual harvest and its impact on populations. In addition, international and flyway based co-ordination is lacking in many regions, and systems need to be developed in order to obtain reliable data on harvest rates in relation to population levels and trends. Models for analysing and achieving sustainability and examples of local and integrated management of waterbird harvest are presented.

INTRODUCTION
Most people equate sustainability with the definition first introduced in the Brundtland Report “Our Common Future”: “The ability of humanity to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission for Environment and Development 1987). This fundamental, but not very operational, definition will be the basis for this review. It can be rewritten as “ensuring a high quality of life for everyone, now and for generations to come”. This goal will – in this review – be related to the value of the world’s waterbirds per se and to the value of the human utilization of waterbird resources through sustainable harvest.

Some aspects of the harvest of waterbirds are poorly documented and understood compared to similar aspects for mammals and other wildlife taxa. Due to the high commercial value of meat and trophies, detailed management programmes, including research and monitoring programmes, have been set up for a large number of ungulates and other mammals in all continents. Likewise, it has been shown to be commercially beneficial to establish management programmes for fish resources, resulting very often in highly sophisticated models for sustainable fishery regimes based on scientific analysis. In contrast, the national and, even more so, international management of wild birds are in a much poorer state, as research and flyway-based harvest programmes still have to be developed in most regions. However, in North America and a number of European countries, there is an elaborate system of monitoring and regulation of waterbird hunting. After many years, a general overview of the impact of bird hunting on populations and sustainability of the harvest is now available for these regions.

Of the 868 species of waterbirds recognized world-wide (Wetlands International 2002), a large proportion are known to be migratory and regularly cross national borders during the course of their migrations. The conservation and sustainable utilization of migratory birds constitute huge challenges in terms of international co-operation, which is very often made difficult by great differences in political regimes, language and culture over relatively short distances. The challenges differ widely from continent to continent. In the Palearctic region in particular, the migratory routes of waterbirds cross a very large number of political borders or limits between political regions where there were until recently (and in some instances, still are) historical and other politically created barriers that impede or prevent the integrated management of bird life. Even though the process of democratization has progressed quite far in many of the world’s nations, and even though the last decade has witnessed radically improved means of communication, many countries and regions are lacking the resources and capacity for an elaborate programme of integrated waterbird management that also includes an assessment of harvest.

The terminology of international bird management and harvest assessment is imprecise and far from consistent. In this review, the term “harvest” is used to cover all kinds of active taking of wild bird resources, including any part or product of a bird, whatever the catching method used. Harvest in this sense does not cover the unintentional taking or killing of birds, and thus excludes the by-catch of waterbirds by fishing, and birds killed by oil disasters, traffic, pollution, etc. English terms for activities under this definition of harvest include collecting, gathering, hunting, shooting, wildfowling, trapping and netting.

ELEMENTS AND TERMS OF SUSTAINABILITY
A widely accepted analysis divides sustainability into three equally important dimensions: ecological, economic and social. This review will focus on the dilemmas between ecological components on the one hand, and social and economic components on the other, and deal less with the significance of the economic resource itself (measured in monetary and meat values) and social dimensions. In the following discussion, social and economic components are treated together under the term “political components”.

The simplest component is the ecological one. This comprises the concept of the "harvest principle" which concerns population turnover and population dynamics. Basically, it is about production and mortality and the balance between these two. If production is greater than mortality, the population is growing; if production is smaller than mortality, the population is decreasing. In this context, it is important to consider the concepts of compensatory and additive mortality. The harvest principle is based on the fact that the causes of mortality may to some extent compensate for one another. If one mortality factor is reduced, another one increases, and the overall mortality remains constant. The same goes for mortality as a result of hunting. This effect appears to act within certain limits; it is most pronounced for r-strategists and least for K-strategists. If hunting mortality exceeds a certain limit, compensation mechanisms will no longer be sufficient to ensure that the other mortality factors are correspondingly reduced. Mortality has become additive, and hunting will, over time, cause a reduction in the population (see Fig. 1).

A fundamental concept in this context is maximum sustainable yield (MSY). This is defined on the basis of a given impact of utilization on the population in respect of density dependent productivity. Fig. 1 shows a classic relationship between utilization, or harvest, of a population and the response of the population. The maximum sustainable yield is defined as the percentage utilization that implies the largest yield. It may be viewed as an element in the perception of ecological sustainability.

Ecological sustainability is a quantitative concept and requires only that a given harvest causes neither the extinction of the population nor a long-term decline. The term “long-term decline” is an open concept that until recently has not been formally defined in international bird management. At its third Meeting of Parties however, the African-Eurasian Migratory Waterbird Agreement (AEWA 2004) decided that: “A population in ‘significant long-term decline’ is one where the best available data, information or assessments indicate that it has declined by at least 25% in numbers or range over a period of 25 years or 7.5 generations.” When, where and how the harvest takes place is of secondary importance in relation to ecological sustainability. A quantitative optimization of the annual yield may require that the harvest occurs in the period after reproduction and, at least in the case of waterbirds, in a system where the hunting areas and hunting methods are planned in such a way that disturbance is minimized and birds are not prevented from utilizing a given area. To ensure wider ecological sustainability of a given harvest, it is essential that the system is selective in

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**Fig. 1.** Terms of sustainability. Fields of activities: a) ecologically, but not politically, sustainable harvest; b) politically acceptable activities that cause reduction or local extinction (regulation) of populations according to clearly set goals; c) ecologically and politically sustainable activities (“wise use”). See text for examples. The maximum sustainable yield (MSY) is defined as the percentage utilization that implies the largest yield and is obtained at intermediate harvest levels. Upper curve (pink): the size of the population; lower curve (blue): the size of the yield in absolute numbers; horizontal axis: the level of utilization of the population in percent.
In this review, the concept covers the “active taking of wild birds and products thereof”. This makes a distinction between the gathering of what may be accepted as sustainable utilization of a species or species groups, so that the harvest does not unintentionally influence the populations of other species in an unsustainable way through incidental catch or extensive disturbance.

Far more complex is the concept of political sustainability. This will be determined by what is “allowable” within a political region, typically a country, and will vary from region to region. Traditions, culture, ethics and a series of other societal elements will characteristically play a role in political sustainability.

It seems fundamental that a harvest must be ecologically sustainable in order to be politically sustainable, i.e. political sustainability is a subset of ecological sustainability. There is, however, an exception when management is aimed directly at reducing or eliminating a given species in a given area. The means to achieve such an objective may be seen as ecologically unsustainable utilization – or what one may more appropriately call regulation or population control. Even though – or indeed because – the activity is ecologically unsustainable, it is politically sustainable. Hence, there is an extension of the politically sustainable field that falls outside the ecologically sustainable field (see Fig. 1).

In other words, in this model there are three fields within sustainability as a broad concept:

a) A field that expresses sustainable harvest ecologically, but not politically. Hence, there exists a series of species and species groups which, from a strictly ecological viewpoint, could be hunted, yet in most countries this does not occur because culture, tradition and other socially created conditions do not allow it;

b) A field that describes activities regarded as politically acceptable, in as much as they cause reduction or local extinction (regulation) of populations through management guided by clearly set goals. An example is the control measures taken against populations of waterbirds that damage agricultural crops. Even though there may not be a reduction in the overall population (meta-population), the objective of control is to reduce, or at best eradicate, a local population in a specific area; and

c) A field that describes the overlap between what is ecologically and politically sustainable. This field may be categorized within “wise use”, a well-known concept that figures in a number of the international conventions on nature conservation.

On the whole, ecological sustainability may be viewed as a well-founded concept that refers to a mathematical assessment of MSY based on monitoring of populations as well as harvest, while political sustainability varies a great deal between countries and cultures, just as individual persons, on the basis of purely subjective judgement, may have widely differing perceptions of what may be accepted as sustainable utilization of natural resources.

**HARVEST – WHAT AND WHY?**

As mentioned above, the term “harvest” is not unambiguous. In this review, the concept covers the “active taking of wild birds and products thereof”. This makes a distinction between the gathering of products (collecting), trapping (where the prey is utilized for consumption or in some instances kept or traded alive), and hunting. Methods differ widely from country to country and from one continent to another. The harvesting of waterbirds has been a very important activity for mankind since the Stone Age, and has been practised particularly by trapping in nets and snares and the collection of products from birds, notably their eggs. Only in recent times has the use of firearms become widespread. Collection of products is still very widespread in many parts of the world. One example is the collection of down of the Northern Lapwing *Vanellus vanellus* in The Netherlands. This remains a very popular activity. No detailed information is available on the extent of the harvest, but in 2003 the European Court of Justice recognized the activity as legal under the terms of the EC Birds Directive, Article 9, which states that such activities must only account for “small quantities” (European Community 1979).

The capture of waterbirds is still common the world over. Methods differ widely from poisoning to passive trapping with snares, nets or fish traps, and active trapping systems that involve the release of nets by the hunter or the bird itself. The driving of birds, e.g. molting geese, into nets is also a common activity. Nets are employed on land, in areas of shallow water, e.g. where birds are molting, and in deeper water where birds are caught during their dives. As one example of waterbird catching on a large scale, more than one million waterbirds may be caught in a single year at Lake Chilwa in Malawi (Malawi Government 2000).

Hunting with weapons began with the use of throwing and thrusting tools such as stones, lances and spears. Over 20 000 years ago, hunting was revolutionized by the development of the bow and arrow. Only much later – less than one thousand years ago – have real firearms come into play. Today, these weapons are crucial for hunting, particularly in Europe and North America, and in many countries, no other method of harvesting is permitted. The rifle is used in some types of hunting, but the shotgun is by far the most important weapon in the hunting of waterbirds.

One example is the hunting of ducks and geese in North America (Table 1). This hunting takes place in autumn during the migration of the birds from their breeding areas to their wintering areas, and also in the wintering areas. Another example is the spring hunting of geese in Siberia. It has been estimated that about 300 000 geese of several species, but particularly the Greylag Goose *Anser anser*, are killed during a single season (E.E. Syroechkovski, Jr. pers. comm.).

Why harvest? Throughout the millennia, the primary motivation for harvest has been to ensure a supply of food and other useful natural products. This is still a very important motivation,

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<th>Flyway</th>
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<td>Atlantic</td>
<td>2 371 000</td>
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<tr>
<td>Mississippi</td>
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<td>Pacific</td>
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not only in developing countries, but also in Arctic regions where access to food resources other than those produced by nature is limited. An element of this “consumptive” motivation is that the harvest may be converted into other values, including monetary value. In much of the developed world, however, the primary motivation for harvest is relaxation, leisure and a passion for the hunt. This may be referred to as “recreational” motivation.

A third motivation for harvest is “management”. Here, harvesting activities are carried out as part of the regulation or management of nature. Such activities include the control of wildlife to reduce damage to croplands, fisheries and the like. Usually, a harvest is driven by two of these motivations – or possibly by all three of them.

A typical example of hunting driven by both the need for food and the desire for recreation is the duck hunting in Western Europe, for example in Denmark. Here, the principal motivation is overtly the pleasure and excitement of hunting, but the reward in the shape of fresh, tasty meat is to many an equally strong factor. In Denmark, as in many other countries, one may encounter the whole three-fold motivation, for example in connection with goose hunting, where the hunt, in addition to providing recreation and the prospect of nice meat, may also be driven by a local need for management of the goose populations.

How much is harvested? – Impact and monitoring

An obvious question that most people might ask in relation to the harvest of waterbirds is “how much is actually harvested?” In order to assess the ecological sustainability of the harvest, it seems essential to be able to answer this question. Yet there are no surveys or censuses that give anything like a reliable estimate of the global extent of harvest of waterbirds. In North America and a number of Western European countries, quite detailed assessments of the harvest exist. In North America, it is even possible in the case of some species to compare measures of harvest with estimates of population size and thereby obtain an impression of the mortality imposed by hunting on the populations. The Mallard Anas platyrhynchos is considered to be the most heavily hunted species in North America. Judging from estimates of population size and harvest, the annual hunting mortality for Mallard is estimated to be below ten percent of the total population in autumn. Other species of waterfowl are pursued less intensively, and it is considered that the hunting mortality for these is in the order of a few percent.

Programmes for the monitoring of hunting harvests exist in a number of countries. In some cases, the reporting of harvests is voluntarily, while in others, it is mandatory. Denmark is one of the countries with the best reporting systems. The official Danish harvest statistics are derived from a mandatory reporting system for all Danish hunters, and have existed since 1942. They indicate that in Denmark about one million waterbirds are brought down annually. Of these, about one-third are thought to be Mallard that have been reared and released for hunting. However, the reporting is not carried out at the species level, but primarily refers to groups of species. For instance, six species of dabbling ducks, Northern Pintail Anas acuta, Eurasian Wigeon A. penelope, Common Teal A. crecca, Gadwall A. strepera, Garganey A. querquedula and Northern Shoveler A. clypeata, are grouped under the heading “other dabbling ducks”. Hence, no direct comparison of harvest and population size can be made at the species level. Therefore the Danish harvest statistics do not constitute a tool that can be used on its own for detailed management of species, either nationally or at the flyway level. First and foremost, the statistics provide basic information that can be used in a broader research context, e.g. interview surveys among hunters. For the last 20 years, the Danish harvest (bag) statistics have been supplemented by the collection of wings of bagged waterbirds and other migratory species. This is a voluntary system and provides valuable insight into the composition of the harvest with respect to species, age and sex. Moreover, it gives a picture of the geographical distribution of the harvest throughout the hunting season, as hunters report on the hunting ground. The number of collected wings has varied over the years, averaging about 11 000 per year (Clausager 2004).

Similar programmes for the collection of bag statistics are found in other countries, while at international level, there are various strategies, with that of Wetlands International’s Waterbird Harvest Specialist Group (WHSG) being the most relevant with regard to the integrated monitoring of waterbird harvests.

Statistics on hunting bags are based on reports by the hunters. In this regard, the following analysis is important. Two concepts of yield are employed: the real yield (B) which is unknown, and the reported yield (Br). The real yield (B) may be viewed as a product of the population size (N) of a given species or species group multiplied by the hunting mortality (mh): B = N x mh.

If it is assumed that the hunting mortality is constant, trends in the yield will reflect trends in the population size. If the hunting mortality is known, which is only rarely the case in waterbirds, the yield may be recalculated into an actual population size.

The reported yield (Br) is a product of the real yield and a factor (fh) that expresses the willingness and ability of the hunters to report. Hence, Br = B x fh.

This factor varies according to a series of circumstances, which include legislation for and promotion of the reporting system, the efficiency of the system, and the scepticism of the hunters towards the use of the data.

Given the above relationship, it must be recognized that the possibility for using reported bags as a reflection of the real bag and population size relies on a series of assumptions, and that sound management requires analysis of the various factors in play. Data, not least data at the flyway level, are considered to be vitiated by such uncertainty that for a broad range of species it is not possible to develop a reliable system that can serve as a stand-alone monitoring tool in international bird management. Assessments of yield are viewed first and foremost as a valuable supplement to internationally co-ordinated population counts, for instance, when special yield surveys are launched in relation to “hot species”, e.g. huntable species that according to international standards have an unfavourable conservation status. It is, however, important to note that in many countries game yield statistics constitute a very valuable scientific basis for bird management. The systems that have been developed and the efforts which, for example, Wetlands International’s Waterbird Harvest Specialist Group is carrying out at flyway level should therefore be promoted and supported.
HARVEST MANAGEMENT TOOLS

The world over, there is a large number of different management tools regarding the harvest of waterbirds. In a few regions and countries, there are complete bans on harvest, but in by far the most countries, there is management that allows for harvest within certain limitations. The framework within which harvest can occur may be internationally established. At a global level, for example, the Ramsar Convention on Wetlands (Ramsar, 1971) sets certain guidelines for harvesting by referring generally to the principle of wise use, although it makes no specific demands regarding harvest.

In order to make the management tools operative, it may be useful to divide them into the following categories: (1) tools that specify time periods; (2) tools that specify harvest methodology; and (3) tools that specify geographical areas (Fig. 2).

The classic tool for management of harvest is the establishment of hunting seasons and hunting timetables. In many European countries, the first regulations based on hunting periods were established long ago in the nineteenth century. As mentioned above, the framework for hunting periods is determined in some regions by an international forum, e.g. within the European Union (EU). Hunting seasons are determined at national or sub-national level, and the fundamental principle is that there is no hunting either during spring migration of during the birds’ breeding season, but rather immediately after reproduction when populations are at their largest and the biological potential for harvest is at its maximum. In many areas, however, hunting is also carried out before and during the breeding season. Such practice is not necessarily sustainable. In many countries, regulations are made concerning the time of day at which hunting is allowed. Thus, hunting at night is frequently regulated. In some countries, the hunting of geese, for example, is allowed only in the morning hours.

Another management tool which is frequently applied is the establishment of bag limits. This is found in many regions of the Americas where the annual harvest is regulated by a special scoring system that sets limits on the number of waterbirds that a hunter may bag in a day. Bag limits are less widespread in Europe, where other means of regulation are more traditional. For certain species, the AEWA Action Plan (2.1.2 c) requires that its Parties to “establish limits on taking, where appropriate, and provide adequate controls to ensure that these limits are observed”. Bag limits provide an option for regulating the total size of the harvest. However, the drawback to daily bag limits is that this system contributes to increasing the number of hunting days, and hence potentially increasing the temporal extent of hunting disturbance to waterbirds.

This model, in which management tools are divided into three dimensions (time periods, spatial tools and methods), provides a basis for analysing harvest management and comparing systems from different regions and countries. If the legal potential for harvest (the volume of the blue cube in Fig. 2) is perceived as a level for a sustainable harvest of a given population of waterbirds, it is up to the appropriate authorities in cooperation with stakeholders to organize each one of the dimensions of the cube in such a way that they comply best with these management areas relate to an international classification, while others relate to national legislation. A well-known global network of areas some of which are especially designated for waterbirds are Ramsar sites, designated under the Convention on Wetlands. The Natura 2000 network is a network of sites established under the Birds and Habitats Directives of the EU. Even though the Ramsar Convention and the EU Directives do not specify particular rules for harvest in their respective designated sites, but merely call for general sustainability and a limitation of extensive disturbance, specific limitations on harvest have been established in both Ramsar sites and Natura 2000 sites in a number of countries. These limitations may constitute a complete ban on harvest, but more commonplace is the establishment of core areas with a very restrictive management regime, e.g. with prohibition of harvest, surrounded by a zone in which harvest may be regulated both in time and in the harvest methods that may be employed.

The third category of management tools is based on the methods of hunting and capture. As mentioned earlier, the methods of harvest of waterbirds vary widely throughout the world. Harvest methods are products of culture, tradition and technological development through the millennia. No quantification of the distribution of use of the various methods has ever been made. However, in the vast majority of western countries, the harvesting of waterbirds is carried out almost exclusively with firearms. Several international texts establish particular rules for harvest methods. The AEWA prescribes in its Action Plan (2.1.2 b) that the modes of taking are to be regulated. The EC Birds Directive (European Community 1979) prohibits the use of firearms. Several international texts establish particular rules for harvest methods. The AEW A prescribes in its Action Plan (2.1.2 b) that the modes of taking are to be regulated. The EC Birds Directive (European Community 1979) prohibits the use of firearms.
local traditions. This may produce an input to flyway-based management of migratory birds, with the Range States within the flyway first and foremost discussing and reaching agreement on levels of harvest, while the actual management takes place nationally or sub-nationally, and thereby in full compliance with the users and considering both ecological and social sustainability.

**IMPACT ON POPULATIONS**

An assessment of the ecological sustainability of a harvest should contain both an assessment of the actual yield and an assessment of the disturbance that a given harvest method inflicts on the population. Yield and disturbance both depend on the choice of harvesting methods. The use of firearms usually gives high selectivity in the yield itself, but has the potential to cause disturbance that has an impact on more species than just the target. The use of methods of passive capture, such as nets, traps and snares, gives low species selectivity, but also has a limited disturbance effect.

Fig. 3 shows a model that describes a gradient from the total number of individuals in a population to the number that are bagged. In between lie the number of birds that are affected by the disturbance caused by the harvesting activity (circle 2), birds that are shot at indirectly or directly (circle 3), and birds that are hit (circle 4).

One concrete example from Danish studies is shown in Fig. 4. This shows how the numbers of Eurasian Wigeon resting at Nibe Bredning are affected by the intensity of shooting from two types of shooting punts, i.e. small, flat-bottomed boats used...
for concealment during hunting (Madsen 1998). This analysis could open up a discussion of the selection of hunting methods. As trapping seems to cause less indirect impact on populations than other hunting methods, it might seem obvious to select this method instead of methods with a larger indirect impact. However, in most countries trapping is not seen as being selective (ecological aspects), and is therefore in direct conflict with national and international standards for the harvesting of waterbirds. Furthermore, in many countries, trapping of waterbirds does not meet ethical standards and does not comply with the general motivation for hunting. On the basis of the Danish studies, it could also be questioned why the use of mobile punts is allowed in Denmark. The answer is that mobile hunting can be managed in a sustainable way, even in areas with dense populations, as long as birds are provided with secure refuges (spatial tools). Furthermore, “stalking” birds with mobile punts is seen as a huge challenge, and complies very well with the “joy of hunting” motivation.

One more example to illustrate the model in Fig. 3 relates to circle 4, which describes the number of birds that are hit by shots. From a series of research programmes, it is known that only a subset of these are bagged. The difference between the two sets is calculated as the “non-retrieved harvest” which again may be subdivided into two groups: birds that die, and birds that survive. Birds that die without being retrieved should, from a management viewpoint, be added to the yield in as much as they are lost to the population. In the USA, the “non-retrieved harvest” must be reported together with the rest of the yield. Birds that survive after being hit are defined as “wounded”. This group has been the focus of attention in a number of countries, and the debate has been particularly directed towards the political (ethical) sustainability of the harvest. Experience in Denmark, for example, has shown that it has been possible to reduce the numbers of wounded Pink-footed Goose *Anser brachyrhynchus* by 75% simply by means of a campaign directed at hunters, and without legal interference.

**CO-MANAGEMENT**

In order to ensure political sustainability – in particular, the socio-economic aspects – programmes have been developed in many parts of the world to involve the local population in the management of natural resources, including the harvesting of waterbirds. An overall term for these efforts is “co-management”. Co-management may be described in terms of co-operation between international, national and local stakeholders, and between stakeholders at the same level, e.g. various local user interests. Co-management is necessary, partly because many communities around the world are dependent on the utilization of natural resources including wild birds, and partly because no ecosystem is now “beyond the reach” of humans.

An example that illustrates the need for co-management is hunting in Greenland – a vast area with huge natural resources...
and a very small human population. However, there are indications that waterbird management in Greenland is not sustainable in every respect (Hansen 2001). Greenland has developed from being a vast natural environment which, by virtue of its size, could not be overexploited, into an area that because of modern means of transportation and capture has become vulnerable to human exploitation. Fig. 5 indicates those coastal areas of Greenland within a 100 km radius of communities of more than 1,000 inhabitants and those within a 50 km radius of settlements of less than 1,000 inhabitants. The figure demonstrates that very substantial parts of the west coast of Greenland may be reached in a short time from both small and large villages by modern means of transportation such as fast motor boats.

Another example is found at Lake Chilwa in the southern region of Malawi. This wetland, which has been designated as a Ramsar site (Ramsar Convention 1996), comprises mainly open water, Typha swamps, marshes and floodplain grasslands. Every year, Lake Chilwa supports about 153 resident species of waterbirds and 30 species of Palearctic migrants. The Lake Chilwa catchment has a population density of 162 persons/sq. km, one of the highest in Malawi. Most of these people are subsistence farmers and/or fishermen. The waterbird populations are heavily utilized. There are at least 461 bird trappers using traditional traps and snares. Catching of birds takes place every year with a peak period in the rainy season. Birds are harvested for local consumption and for trade.

Management plans were developed at Lake Chilwa in 2001. The objectives were to enable the local communities to manage the natural resources in a sustainable manner for their own benefit. Bird hunting committees and a bird hunters’ association were formed. A project was initiated in 2004 to build capacity in the local community, to encourage the participation of local NGOs in advising communities on sustainable bird management, and to encourage international NGOs to participate in research and monitoring.

CONCLUSION
Waterbird harvest is widespread and is an important activity in local communities around the world. It is diverse and includes a huge variety of management systems. Although there are some examples of harvest practices being non-sustainable, there seems to be no reason to believe that harvesting/hunting is a general contradiction to the conservation of bird life. On the contrary, the right to use natural resources can motivate local people – especially hunters – to get involved in conservation. Training is a vital element. To build capacity at all levels, more knowledge is needed in terms of (a) the direct impact of harvest (bag, products) and indirect impact (disturbance); (b) population status and trends at flyway, migration route and population level; (c) mankind and nature, vis-à-vis development and conservation systems. To secure the conservation of flyways across borders and across continents world-wide, co-operation is needed at all levels – including that of the hunters.

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The Mallard Anas platyrhynchos is one of the most widely hunted waterbirds in the world. Photo: Niels Søndergaard.