

## S33-1 The impact and status of introduced waterbirds in Africa, Asia Minor, Europe and the Middle East

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**Abstract** As part of a British government-funded project, the number and distribution of introduced waterbird species in 77 of the 116 countries in the African-Eurasian Migratory Waterbird Agreement (AEWA) was determined from responses to questionnaires sent to government officials and ornithologists. Meeting predefined criteria, 112 species of introduced waterbirds were recorded. European countries held the most, with an average of 7.7 species per country. Across the AEWA area, the most common introductions were the mandarin duck (*Aix galericulata*) — 17 countries, Canada goose (*Branta canadensis*) — 16, and mallard (*Anas platyrhynchos*) and mute swan (*Cygnus olor*) — 15. The costs of introductions normally outweigh benefits, and we recommend that existing legislation for controlling introductions be augmented and better enforced.

**Key words** Introduced waterbirds, Distribution, Africa, Europe, Asia

### 1 Introduction

The African-Eurasian Migratory Waterbird Agreement (AEWA) under the Convention on the Conservation of Migratory Species (Bonn Convention) aims to create a legal basis for a concerted conservation and management policy for the 172 species of birds ecologically dependent on wetlands for at least part of their annual cycle in its 116 states in Europe, Africa, NE Arctic Canada, Greenland, Asia Minor, the Middle East, Kazakhstan, Turkmenistan and Uzbekistan. The AEWA agreement encourages member states to assess the impact of introduced and nonnative species on their native migratory waterbirds. The species of waterbirds covered include, amongst others, pelicans, storks, flamingos, swans, geese and ducks.

Article III General Conservation Measures Section 2 (g) states that "... the Parties shall prohibit the deliberate introduction of nonnative waterbird species into the environment and take all appropriate measures to prevent the unintentional release of such species if this introduction or release would prejudice the conservation status of wild flora and fauna; when nonnative waterbird species have already been introduced, the Parties shall take all appropriate measures to prevent these species from becoming a potential threat to indigenous species." In the AEWA Annex 3 Action Plan it is further stated that "Parties shall, if they consider it necessary, prohibit the introduction of nonnative species of animals and plants which may be detrimental to the populations listed ...", that "Parties shall, if they consider it necessary, require the taking of appropriate precautions to avoid the accidental escape of captive birds belonging to nonnative species", and that "Parties shall take

measures... to ensure that when nonnative species or hybrids thereof have already been introduced into their territory, those species or their hybrids do not pose a potential hazard to the populations listed ...".

There is an extensive literature on the translocation of nonnative species, their consequences for biodiversity conservation, their economic impacts and the control strategies available for pest and problem species outside of their original ranges (Williamson, 1996; McLean, 2001). Apart from a few high profile species, however, it is surprising how little is known about the number and distribution of nonnative waterbirds in most countries, and their ecological interactions with native species. Studies have often been driven by economic imperatives and have related to species that have obvious economic impacts in the country of introduction. In only few countries, such as New Zealand, has there been a greater long-term interest in the ecology and competitive abilities of such introductions (Williams and Basse, 2006).

This paper summarizes some of the information obtained from a survey of government officials and ornithologists that sought to assess the status of introduced and nonnative waterbird species and the extent to which these species affected native species in AEWA countries (Blair et al., 2000). Using four of the most commonly introduced waterbirds in the AEWA area as exemplars, we then detail some of the issues arising out of the introductions.

### 2 Materials and methods

Introduced species are those satisfying one of the five categories defined in Table 1.

**Table 1** Definitions of non-native birds

|                              |  |
|------------------------------|--|
| Naturalized introduction     | Established species that would not occur naturally without introduction by man   |
| Naturalized establishment    | Species that have become established in an area where previously they had occurred but had not bred naturally, having been a vagrant, passage migrant or winter visitor. |
| Naturalized re-establishment | Species successfully re-established in areas of former natural occurrence  |
| Naturalized feral            | Domesticated species established in the wild   |
| Vagrant naturalized species  | Species from established naturalized populations in a neighbouring country   |

After Holmes and Simons (1996), and Holmes et al. (1998).

Much of the information presented here about species numbers was collated from responses received to questionnaires sent to the 116 AEWa countries (Blair et al., 2000). The questionnaire sought information on the identity of each introduced species, its location, habitat and history in the country, whether it exhibited sedentary or migratory behavior, its breeding and population status, hybridization, disease, habitat changes, escape recruitment, and threat to other waterbird species. Only considered in detail were the 112 species that fulfilled at least one of the following criteria in the country of introduction: minimum of three records of escape or release since 1960, survival for a year in the wild, and breeding successfully. Information also gathered from the completed questionnaires, but not discussed here, covered national conservation measures and legislation relating to introduced nonnative waterbirds, their effectiveness in stopping entry, countermeasures taken for control and against spread, and the extent of waterbird trading and keeping of live waterbirds and free-flying stock.

The information used in the four case studies below was extracted from the AEWa questionnaires and a review of the literature.

### 3 Results

AEWa questionnaires were returned from 77 countries. The number of introduced species of waterbirds per country was greatest in Europe (Table 2). Within Europe, Britain reported 72, Switzerland 43, Germany 21, The Netherlands 20, France and Italy 17, Austria 16 and Belgium 15 species. Outside of Europe, the United Arab Emirates and South Africa, with 24 species each, also reported unusually high numbers.

The most commonly introduced species in the AEWa area, the mandarin duck (*Aix galericulata*), is recorded for South Africa and 16 European countries. Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), mute swan (*Cygnus olor*), black swan (*Cygnus atratus*), bar-headed goose (*Anser indicus*), ruddy duck (*Oxyura jamaicensis*), wood duck (*Aix sponsa*), ruddy shelduck (*Tadorna ferruginea*), greylag (*Anser anser*), and Egyptian goose (*Alopochen aegyptiacus*) are all recorded in 10 or more countries.

### 4 Discussion

The results of the questionnaires were startling, and

the unexpected scale of the problem demonstrated clearly how little the issue had been investigated. Comments in the questionnaires about four of the most commonly introduced species are summarized below to illustrate the diverse yet particular issues raised by introduced species.

Because of its beauty, the mandarin duck is the most widely introduced waterbird within the AEWa area and perhaps in the world. It has been living in the wild in Britain since 1866 (Lever, 1987). Its status is classified as “Insufficiently Known”, and some of its native habitat in China is threatened by habitat loss. It has hybridized with at least four species of duck in captivity including the very closely related wood duck, and destroys the eggs of other cavity nesting species in the wild. It can be argued that there is benefit in having self-sustaining feral populations of this duck as insurance against major declines in its wild populations in China. Lever (1987) had suggested that the estimated 1 000 pairs in Britain could exceed the numbers present in its natural range outside of Japan.

The Canada goose is the second most widely introduced waterbird within the AEWa area, having been released in 16 European countries. Unlike the mandarin duck, this species is not globally threatened. It was first introduced in Britain and France in the 17th Century for wildfowl collections, food and hunting (Lever, 1977). Since the late 1960s its numbers have increased by a factor of six in Britain to a minimum of 82 000 birds (Musgrove et al., 2001; Rehfish et al., 2002); and yet much suitable habitat appears to be unused still (Graham Austin, unpublished). In captivity or in the wild, Canada geese are known to have hybridized with 16 species of Anatidae, including barnacle (*Branta leucopsis*), greylag (*Anser anser*), and white-fronted (*A. albifrons*) geese (Delany, 1993), as well as mallard.

**Table 2** The average number of introduced species of waterbird per country in the AEWa area

|                                |                             |
|--------------------------------|-----------------------------|
| Africa                         | 1.2 species in 29 countries |
| Asia                           | 0.3 species in 4 countries  |
| Asia Minor and Middle East     | 4.3 species in 7 countries  |
| Europe                         | 7.7 species in 37 countries |
| NE Arctic Canada and Greenland | 0 species in 2 countries    |

From Blair et al. (2000).

Canada geese are considered to be a potential threat to native greylag geese in Scotland through hybridization and introgression (Welch et al., 2001), and if their eastwards spread continues in Europe they could threaten the endangered red-breasted goose (*Branta ruficollis*). Canada geese are aggressive towards native wildlife, cause ecological disturbance and habitat damage and can be an agricultural pest (Anon., 1973; Lever, 1977, 1987; Watola et al., 1996; Blair et al., 2000; Welch et al., 2001).

The mallard is the third most widely introduced species of waterbird within the AEWa area, having been introduced into seven European, five African, one Asian and two Middle Eastern countries for wildfowl collections, food and hunting; some 400 000 are released annually in Britain. In captivity or in the wild, it has hybridized with two species of geese, three species of shelduck, 38 species of duck, guineafowl and chicken (Lever, 1987; Blair et al., 2000). Within the AEWa area it has produced fertile offspring with the threatened African yellow-billed duck (*Anas undulata*) and perhaps the endemic Meller's duck (*Anas melleri*) of Madagascar. Elsewhere it has hybridized with a range of regionally threatened species, including the New Zealand grey duck (*Anas superciliosa*) (Williams and Basse, 2006) and Florida mottled duck (*A. fulvigula*) (Rhymer, 2006), potentially leading to local extinction of native species.

No summary of the impact of introduced species within the AEWa area would be complete without the ruddy duck, a species that has triggered governmental action to control its numbers (Hughes et al., 2006). This porcelain-billed duck, widespread in the Americas, is popular in wildfowl collections. In Britain, it apparently filled an unexploited niche and increased dramatically following its accidental release in the early 1960s (Sir Peter Scott in Lever, 1987). Had it remained in Britain it would not have become such a conservation issue. Unfortunately, it spread into 11 European countries, including Spain, Morocco and Turkey that constitute part of the restricted breeding range of the "Globally Threatened" white-headed duck (*Oxyura leucocephala*). There the ruddy duck has hybridized with the white-headed duck and could contribute to its possible extinction (Hughes et al., 2006).

Clearly, the level of ornithological interest in a country will determine the number of waterbird species that it introduces. Although the number reported in the AEWa area is a minimum, it is unlikely to be artificially inflated. There is a broad relationship between the wealth of a country and the introduction and keeping of waterbird species. The greater collections and captive breeding of birds in the wealthier countries make it much more likely that accidental escapes or releases will occur there. The increasing popularity of bird collections has increased the demand for exotic waterbirds, and this has been accompanied by ever more escapes.

## 5 Conclusions

Introductions of waterfowl may confer two major

benefits. First, they can be of economic value in providing human employment, food and sport. Secondly, they may help ensure the conservation of relic populations of endangered species, even though releasing them into a totally new habitat is usually not the only way to ensure their continued survival (Lever, 1987).

These benefits are normally much outweighed by the costs. Across many taxonomic groups, introductions have led to the extinction of native species, contributed to genetic pollution and caused economic and environmental damage. Whereas competition between species is a natural part of evolution, it can be argued that competition should not be so strongly directed by human influence on nature. The ruddy duck is an example of a species that is most unlikely to have reached Britain in sufficient numbers to establish itself without human assistance.

Our research has shown that considerable numbers of waterbirds have been introduced into the AEWa area. Many more waterbird species escape today than in the 1980s, because many more exotic species are being bred in captivity. A single recent issue of *Aviornis* (143), a journal aimed at breeders of captive birds, listed over 58 000 exotic birds for sale, 1 051 collections and many commercial breeders in Belgium and The Netherlands alone. Reducing escape events should become a high priority towards stopping introduced species from establishing themselves. To enable this, the marking of all captive birds with individual rings or transponders registered at a central data base should become a legal requirement. The recovery of such markers in the wild can then be used to impose heavy fines on the owner, rated at a level to reflect the risk posed to indigenous wildlife and the environment. As it stands, existing legislation can, if fully implemented, stop or at least severely restrict the further spread of introduced waterbirds throughout the world (IUCN, 1997; Shaw, 2006).

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